EVALUATION OF SORBENT INJECTION FOR MERCURY CONTROL

Topical Report for:
Sunflower Electric's Holcomb Station
Reporting Period: October 1, 2003 – June 30, 2005

Principal Author:
Sharon Sjostrom

June 28, 2005

U.S. DOE Cooperative Agreement No. DE-FC26-03NT41986
Topical Report No. 41986R07

Submitted by:
ADA-ES, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120
(303) 734-1727

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ACKNOWLEDGMENTS

This project was made possible through the generous funding of the Department of Energy's National Energy Technology Laboratory and industry partners including ADA-ES, Inc., Arch Coal, Associated Electric Coop, City of Sikeston, Empire District Electric Company, EPRI, Kansas City Board of Public Utilities (KCKBPU), Kansas City Power and Light, Missouri Basin Power Project, Nebraska Public Power District, NORIT Americas, Southern Minnesota Municipal Power Agency, Sunflower Electric Power Corporation, Tri-State Generation & Transmission, TransAlta Utilities, TransAlta Energy, Westar Energy, Western Fuels Association, and Wisconsin Public Service.

Andrew O'Palko was the project manager for DOE/NETL. Wayne Penrod provided project management for Sunflower Electric and Cory Linville was the project engineer for Holcomb Station. The team gratefully acknowledges their efforts and the support of the staff at Holcomb Station. Ramsay Chang was a key technical advisor and provided project management for EPRI. The on-site test team was led by Travis Starns, the site manager for ADA-ES. Jerry Amrhein led the mercury measurement group. The test team included Brian Donnelly, Chad Sapp, Erik Zipp, Chris Rusin, and Paul Brignac from ADA-ES and Greg Burns from ALSTOM Power Inc. Connie Senior from Reaction Engineering International led the coal and byproduct analysis effort. Jean Bustard, Mike Durham, and Cam Martin from ADA-ES and Leif Lindau from ALSTOM Power Inc. provided key technical input into the project. Richard Schlager managed the contracts and Cindy Larson edited and assembled all technical reports.

ABSTRACT

The power industry in the U.S. is faced with meeting new regulations to reduce the emissions of mercury compounds from coal-fired plants. These regulations are directed at the existing fleet of nearly 1,100 boilers. These plants are relatively old with an average age of over 40 years. Although most of these units are capable of operating for many additional years, there is a desire to minimize large capital expenditures because of the reduced (and unknown) remaining life of the plant to amortize the project. Injecting a sorbent such as powdered activated carbon into the flue gas represents one of the simplest and most mature approaches to controlling mercury emissions from coal-fired boilers.

This is the final site report for tests conducted at Sunflower Electric's Holcomb Station, one of five sites evaluated in this DOE/NETL program. The overall objective of the test program is to evaluate the capabilities of activated carbon injection at five plants: Sunflower Electric's Holcomb Station Unit 1, AmerenUE's Meramec Station Unit 2, Missouri Basin Power Project's Laramie River Station Unit 3, Detroit Edison's Monroe Power Plant Unit 4, and AEP's Conesville Station Unit 6. These plants have configurations that together represent 78% of the existing coal-fired generation plants.

The goals for the program established by DOE/NETL are to reduce the uncontrolled mercury emissions by 50 to 70% at a cost 25 to 50% lower than achievable with technologies demonstrated prior to the contract award. The goals of the program were exceeded at Holcomb Station by achieving over 90% mercury removal at a cost savings of 67% compared to using standard activated carbon. The increase in mercury removal over baseline conditions is defined for this program as a comparison in the outlet emissions measured using the Ontario Hydro method during the baseline and 30-day long-term test periods. The increased removal over baseline was 96%.

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INTRODUCTION

One of the most likely air pollution control configurations to be considered for new units burning subbituminous Powder River Basin (PRB) coal will be a spray dryer absorber (SDA) followed by a fabric filter (FF), because it offers cost advantages to meet stringent multi-pollutant control regulations. However, available data indicate that this configuration demonstrates particularly low native mercury removal and the effectiveness of non-chemically treated activated carbon is limited.

ADA-ES, Inc., with support from the Department of Energy's National Energy Technology Laboratory (DOE/NETL) and industry partners, conducted a full-scale field test of mercury control using sorbent injection into the SDA-FF at Sunflower Electric's 360-MW Holcomb Station. This report presents results from testing including the effect on mercury emissions of 1) blending PRB coal with western bituminous coal, 2) injecting chemical additives onto the coal, and 3) injecting alternative sorbents specifically designed to operate in a halogen-deficient flue gas.

EXECUTIVE SUMMARY

New units burning PRB coal are likely to consider installing a spray dryer absorber (SDA) and fabric filters (FF) for combined SO_2 and particulate control. However, past results indicated that power plants that burn Powder River Basin (PRB) coal and have SDA-FFs for air pollution control systems represent a challenging application for controlling mercury emissions. ICR measurements and subsequent full-scale field tests have confirmed that the spray dryer removes halogens that are critical for the adsorption of vapor-phase mercury onto solid surfaces such as native fly ash or activated carbon-based mercury sorbents. This results in very low levels of native mercury removal, typically <20%, at plants with this configuration and greatly diminished effectiveness of standard activated carbon for mercury control.

The test program at Holcomb was designed to provide a full-scale evaluation of different technologies that can overcome the limited mercury removal achievable with native fly ash or standard activated carbon. Each technology was based on supplementing certain halogens that were not available in sufficient quantities in PRB coals.

The program was very successful in that three different technologies were found that have the potential to produce high levels (>80%) of mercury removal in this difficult application. These technologies are:

1. Coal Blending: By blending western bituminous coal with PRB coal, the mercury removal across the system increased to almost 80% even without injecting another sorbent.
2. Chemical Addition to the Coal: KNX, a proprietary chemical developed by ALSTOM Power, was found to enhance the performance of a standard activated carbon. Mercury removal of 86% was measured at a carbon feed rate of just 1.0 lb/MMacf.
3. Chemically Enhanced Sorbent: A proprietary product of NORIT Americas Inc., DARCO® Hg-LH, produced mercury removal in excess of 90% during long-term tests at a carbon feed rate of 1.2 lb/MMacf. Throughout long-term testing, the average outlet mercury emission was less than 1 lb/TBtu.

It should be noted that the first two approaches were tested for very short periods and that ash collected during the coal blend tests indicated a maximum removal of 55% during the highest blend test. However, the effects were verified using two different vapor-phase mercury measurement techniques and demonstrated the potential of these technologies. Additional longer-term tests need to be conducted to fully realize their capabilities.

The goals for the program established by DOE/NETL were to reduce the uncontrolled mercury emissions by 50 to 70% at a cost 25 to 50% lower than achievable with technologies demonstrated prior to the contract award. The goals of the program were exceeded by achieving 90% mercury removal at a cost savings of 67% over using standard activated carbon. The increase in mercury removal over baseline conditions is defined for this program as a comparison in the outlet emissions measured using the Ontario Hydro method during the baseline and long-term test periods. The increased removal over baseline was 96%.

DESCRIPTION OF OVERALL PROGRAM

This test program is part of a five-site program to obtain the necessary information to assess the feasibility and costs of controlling mercury from coal-fired utility plants. Sorbent injection for mercury control was successfully evaluated in DOE/NETL's Phase I tests at scales up to 150 MW, on plants burning subbituminous and bituminous coals and with ESPs and fabric filters. During the Phase I project, several issues were identified that still needed to be addressed, such as evaluating performance on other configurations, optimizing sorbent usage (costs), and gathering longer-term operating data to address concerns about the impact of activated carbon on plant equipment and operations.

The overall objective of this test program is to evaluate the capabilities of activated carbon injection at five plants with configurations that together represent 78% of the existing coal-fired generation plants in the U.S. Host sites that will be tested as part of this program are shown in Table 1. Table 2 shows the schedule for testing at the five sites.

The technical approach that will be followed during this program allows the team to 1) effectively evaluate activated carbon and other viable sorbents on a variety of coals and plant configurations and 2) perform long-term testing at the optimum conditions for at least one month. These technical objectives are accomplished by following the series of technical tasks listed below. These tasks are repeated for each test site.

1. Host site kickoff meeting, test plan, and sorbent selection
2. Design and installation of site-specific equipment
3. Field tests
4. Data analysis
5. Sample evaluation
6. Economic analysis
7. Reporting and technology transfer

A detailed description of each task is included in the Holcomb Test Plan. A copy of the Test Plan is included in Appendix A.

Table 1. Host Site Key Descriptive Information.

	Holcomb	Meramec	Laramie River	Monroe	Conesville
Test Period	3/04–8/04	8/04–11/04	2/05–3/05	3/05–6/05	3/06–6/06
Unit	1	2	3	4	5 or 6
Size (MW)	360	140	550	785	400
Coal	PRB	PRB	PRB	PRB/Bit blend	Bituminous
Particulate Control	Joy Western Fabric Filter	American Air Filter ESP	ESP	ESP	Research-Cottrell ESP
SCA (ft^2/kacfm)	NA	419	599	258	301
Sulfur Control	Spray Dryer Niro Joy Western	Compliance Coal	Spray Dryer	Coal Blending	Wet Lime FGD
Ash Reuse	Disposal	Sold for concrete	Disposal	Disposal	FGD Sludge Stabilization
Test Portion (MWe)	180 and 360	70	140	196	400
Typical Inlet Mercury ($\mu g/dNm^3$)	10–12	10–12	10–12	8–10	15.8
Typical Mercury Removal	0–13%	15–30%	<20%	Not Available	50%

Table 2. Field-Testing Schedule.

Site	2004				2005					
	May	Jul	Sep	Nov	Jan	Mar	May	Jul	Sep	Nov
Holcomb										
Meramec										
Laramie River										
Monroe										
Conesville Spring '06										

There are more than 100 individual team members from 33 organizations participating in this five-site program. Co-funding for testing at Sunflower's Holcomb Station was provided by a subset of the participants. The organizations providing co-funding for tests at Holcomb include:

ADA-ES, Inc.
Arch Coal
Associated Electric Coop
City of Sikeston
Empire District Electric Company
EPRI
Kansas City Board of Public Utilities (KCKBPU)
Kansas City Power and Light
Missouri Basin Power Project
Nebraska Public Power District
NORIT Americas Inc.
Southern Minnesota Municipal Power Agency
Sunflower Electric Power Corporation
Tri-State Generation & Transmission
TransAlta Utilities
TransAlta Energy
Westar Energy
Western Fuels Association
Wisconsin Public Service

Key members of the test team include:

- ADA-ES, Inc.
- ALSTOM
- EPRI
- NORIT Americas Inc.
- Reaction Engineering International
- Tetra Tech, Inc.
- Others
  - Stack test firms
  - Analytical laboratories

HOLCOMB PROJECT OBJECTIVES AND TECHNICAL APPROACH

The primary objective of this project was to determine the cost and effects of sorbent injection for control of mercury in stack emissions at Sunflower Electric's Holcomb Station. Holcomb is located near Garden City, Kansas. The general technical approach to meet the objective is defined by a series of field tasks, as listed below.

1. Sorbent selection and screening
2. Sample and data coordination
3. Baseline tests
4. Parametric tests
5. Long-term tests

Parametric tests conditions were chosen to meet an overall objective of identifying options to enhance mercury removal for units firing subbituminous Powder River Basin (PRB) coal and configured with spray dryer absorbers (SDA) and fabric filters (FF). Options included coal blending with western bituminous coal, injecting activated carbon into the SDA and FF, and introducing chemical additives onto the coal. The evaluation was conducted on the entire 360-MW flue gas stream, except when sorbent was injected just upstream of the FF when only one-half of the unit (180 MW) was tested.

Importance of Testing at Holcomb

New power plants must meet stringent emission limits for all pollutants, including mercury. For example, the air permit for the new power plant being built by MidAmerican and the Council Bluffs station requires capture of 86% of the mercury. New plants that will burn PRB coal, such as the plant planned in Council Bluffs, Iowa, will use a configuration of air pollution control equipment that includes an SDA and FF. However, data available through EPA's Information Collection Request (ICR) database[1] and through other EPRI programs indicate that units burning low-rank fuels and that are configured with SDAs followed by fabric filters demonstrate particularly low mercury removal.[2] Initial mercury measurements using the ASTM M6784-02 (Ontario Hydro) at Holcomb indicated 13% mercury removal was achieved in the absence of mercury controls. Vapor-phase measurements using a semi-continuous mercury monitor indicated an average of 0% removal. These results are consistent with trends observed at other plants. Therefore, the test team considered mercury control testing at Holcomb critical to provide necessary information as Sunflower Electric establishes plans to meet future regulations and for others who either have or are considering SDA with FFs for new installations.

Prior to testing at Holcomb, EPRI conducted full-scale carbon injection tests at Great River Energy's Stanton Station Unit 10 in April 2002. Although Stanton is configured with an SDA-FF and burns a North Dakota lignite coal, the coal has similar calcium and chlorine concentrations to PRB coal and the results provided insight into potential sorbent performance at Holcomb. No recent results from units firing PRB coal with an SDA-FF were available for review. Results from the Stanton test program suggested that the mercury removal

effectiveness of standard, non-chemically treated, activated carbon injected upstream of an SDA and FF was limited. At an injection concentration of 6.1 lb/MMacf of non-chemically treated activated carbon, 70% mercury removal was achieved. This injection concentration is much higher than would likely be required for a plant without an SDA (90% removal is expected across a fabric filter at an injection concentration of 3 lb/MMacf for a unit without an SDA).[3]

SDAs are designed to remove sulfur dioxide, but they also effectively remove other acidic flue gas components such as HCl. Halogens, including HCl, which is typically present in fairly low concentrations in most low-rank coals (<10 ppm), are critical to the effective removal of mercury with standard activated carbons. For example, injection of 1 lb/MMacf of a carbon treated with iodine resulted in >90% removal at Stanton Station. This was significantly better than the performance of the untreated carbon. Because of these results and the expected low flue gas HCl concentrations at Holcomb, ADA-ES contacted several vendors and requested sorbents specifically designed for effective mercury capture in low-halogen environments for testing at Holcomb. Both treated and untreated carbons were tested at Holcomb.

Holcomb Site Description

Holcomb Station is located near Garden City, Kansas. The unit is a load-following sub-critical 360-MW pulverized coal opposed-fired Babcock & Wilcox Carolina-type radiant boiler designed to burn PRB coal. The existing unit is equipped with three spray dryer absorber modules followed by two very low air/cloth ratio reverse air fabric filters. A sketch of the Unit 1 gas path is shown in Figure 1 and a photograph is shown in Figure 2. Key operating parameters are included in Table 3. The plant was originally equipped with "first generation" low-NO_x burners. During a recent upgrade, these burners were optimized, and coal flow controls and in-furnace sensors were installed to balance burners and optimize combustion. These modifications have been done in conjunction with DE-FC26-03NT41418 under DOE's Power Plant Improvement Initiative.

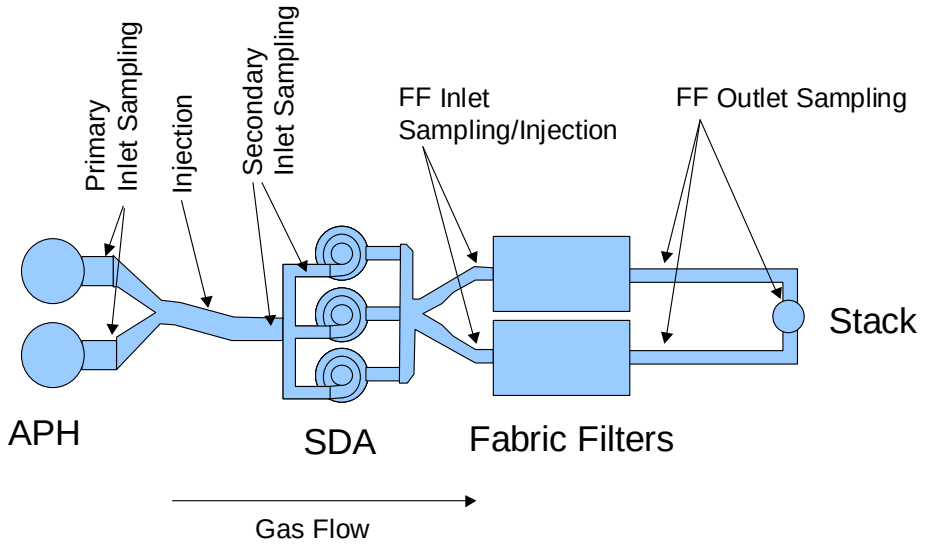


Figure 1. Sketch of Holcomb Unit 1 Spray Dryer Absorber and Fabric Filter Modules.

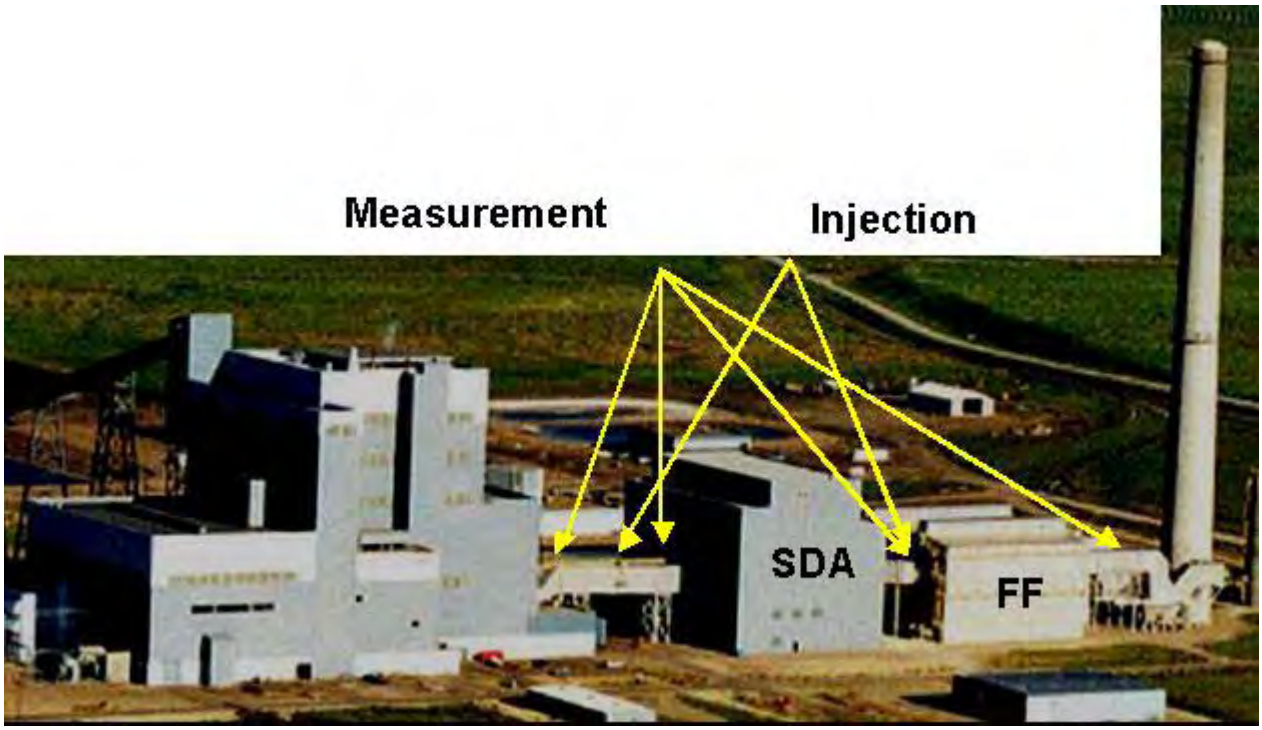


Figure 2. Photo of Holcomb Unit 1.

Table 3. Holcomb Key Operating Parameters.

Unit	1
Size (MW)	360
Test Portion (MWe)	180 and 360
Coal	PRB
Heating Value (as received)	8,700
Sulfur (% by weight)	0.4
Chlorine (%)	<0.01
Mercury (μg/g)	0.056
Particulate Control	Fabric Filter (Joy Western)
Sulfur Control	SDA (Niro Joy Western)
Ash Reuse	Disposal

Description of Coals Fired During Testing

Coals from four PRB mines were fired during testing at Holcomb. The coals fired during the baseline and parametric testing were from the Jacobs Ranch and Cordero mines, except during the coal blend tests. During coal blending, the PRB coal was from the Black Thunder mine and the western bituminous coal was from the West Elk mine. Jacobs Ranch

coal was fired during the entire long-term test except for the last few days when a train of coal from the Caballo Rojo mine was delivered to the site. Coal quality data for the coals fired during testing are included in Appendix B.

Equipment Descriptions

Carbon Injection and Delivery System

Figure 3 is a photograph of the sorbent silo and feeder trains designed to treat a 150-MW boiler on a unit with an ESP. The unit is approximately 50 feet high and 10 feet in diameter with an empty weight of 10 tons. The silo will hold 20 tons of sorbent.

Powdered activated carbon (PAC) was delivered in bulk pneumatic trucks and loaded into the silo, which was equipped with a bin vent bag filter. From the discharge section of the silo, the sorbent was metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent through flexible hose to distribution manifolds located on the flue gas ducts, feeding the injection lances. Regenerative blowers provided the conveying air. A Programmable Logic Controller (PLC) system was used to control system operation and adjust injection rates.

Figure 3. Carbon Injection Storage Silo and Feeder Trains for 150 MWe (Phase I System).

Mercury Analyzers

Two mercury semi-continuous emissions monitors (SCEM) were used during testing at Holcomb to provide real-time feedback during baseline and sorbent injection testing. The monitor, shown in Figure 4, consisted of a cold-vapor atomic absorption spectrometer (CVAAS) coupled with a gold amalgamation system (Au-CVAAS). The analyzers are capable of measuring both total vapor-phase mercury and elemental vapor-phase mercury. The analyzer determines total vapor-phase mercury concentrations by reducing all of the oxidized mercury to the elemental form near the extraction location. To measure elemental mercury, the oxidized mercury is removed while allowing elemental mercury to pass through without being altered. The system was calibrated using vapor-phase elemental mercury.

The extraction probe was an inertial separation design that separates the particulate matter from the sample with minimal sampling artifacts from fly ash or injected sorbent.

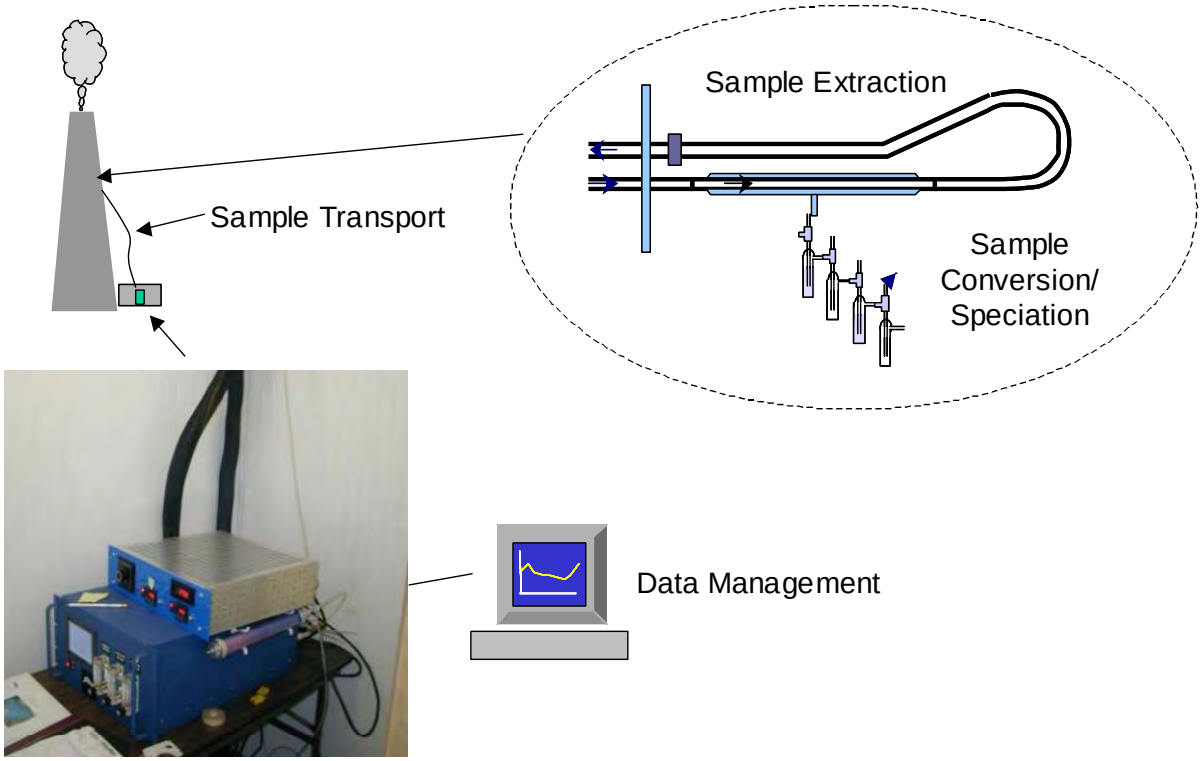


Figure 4. Sketch of Mercury Measurement System.

Prototype Mercury Analyzers – Thermo Electron

A prototype mercury analyzer developed by Thermo Electron Corporation was also installed on site and operated by ADA-ES under a different test program. These data were made available to this program. The measurement technique of the Thermo analyzer is cold-vapor atomic fluorescence spectroscopy (CVAFS). It is a real-time analyzer that does not employ gold amalgamation. This system uses an extraction probe similar to the Au-CVAAS analyzers described above, with the addition of a dilution module. Diluting the gas sample reduces the moisture content for measurement and the potential interference that may be

caused by other flue gas species. Because most of the vapor-phase mercury at Holcomb was in the elemental phase, no converter was used and only elemental mercury was measured. The Thermo extraction probe can be configured with a converter to measure total vapor-phase mercury.

Ash Sampling Cyclone

The mercury analyzers used at Holcomb measure only vapor-phase mercury. Fly ash samples were collected at the inlet of the spray dryer for subsequent mercury analyses using sampling cyclones. Cyclones are more effective at collecting ash samples without changing the vapor/particulate speciation than sampling through a filter because the interaction of the vapor with the particulate is minimized. The cyclones used at Holcomb were Cegrit samplers. The Cegrit is a sampling cyclone designed for continuous sample collection at a permanent installation. One unit was installed at the inlet to each of the three spray dryer modules. A photo of one of the Cegrit samplers at Holcomb is shown in Figure 5.

Figure 5. Cegrit Fly Ash Sampler.

Sorbent Screening Apparatus

Several groups have conducted mercury sorbent screening tests over the past few years and the performance of the sorbents has been reported as the maximum mercury that can be collected by the sorbent, or the capacity of the sorbent.[4] Although these data provide valuable information to compare the relative performances of several sorbents, they do not provide a direct indication of the injection concentration required to achieve a given level of mercury removal. To overcome these shortcomings, ADA-ES developed a sorbent screening device (SSD) that allows simultaneous comparison of several sorbents, provides an indication of the maximum mercury removal achievable with a particular sorbent, and provides an estimate of the amount of sorbent required to achieve various mercury removal levels in a full-scale application.

The SSD is shown in Figure 6 and Figure 7. It consists of a heated enclosure that houses three sample filters, and is designed to simulate the range of gas velocities, temperature, sorbent loading, and ash loading typical of full-scale fabric filters. Tests can be conducted on site with extracted flue gas or with simulated flue gas in the laboratory. Sorbent loading can be varied to provide data over a range of injection concentrations, nominally 1 to 10 lb/MMacf. A typical test lasts up to 12 hours or can be terminated when the outlet mercury concentration equals the inlet mercury concentration (100% breakthrough).

The important parameters that are measured and controlled consist of the SSD temperature, the inlet and outlet elemental mercury concentration in the flue gas, the gas flow rate through each of the filters, and the weight of the sorbent sample applied to the filter media. The addition rate of any flue gas conditioning agents is also controlled. The mercury SCEMs are calibrated at the beginning and end of each run for quality assurance.

At Holcomb, flue gas was extracted from between the dry scrubber and baghouse using an inertial separation probe to remove particulate. The gas was then transported through a heated line to the SSD. Test samples consisted of a mixture of sorbent and Holcomb baghouse ash, and were evenly deposited onto glass filter paper in appropriate concentrations. Treated gas exited the heated box through chemical impingers to convert all mercury to elemental mercury, and a chiller to remove moisture. The total vapor-phase mercury concentration was measured at the inlet and outlets of the samples using CVAAS Hg SCEMs. Flue gas conditioning agents could also be added ahead of the sample filters to evaluate the effect of conditioning agents on sorbent performance.

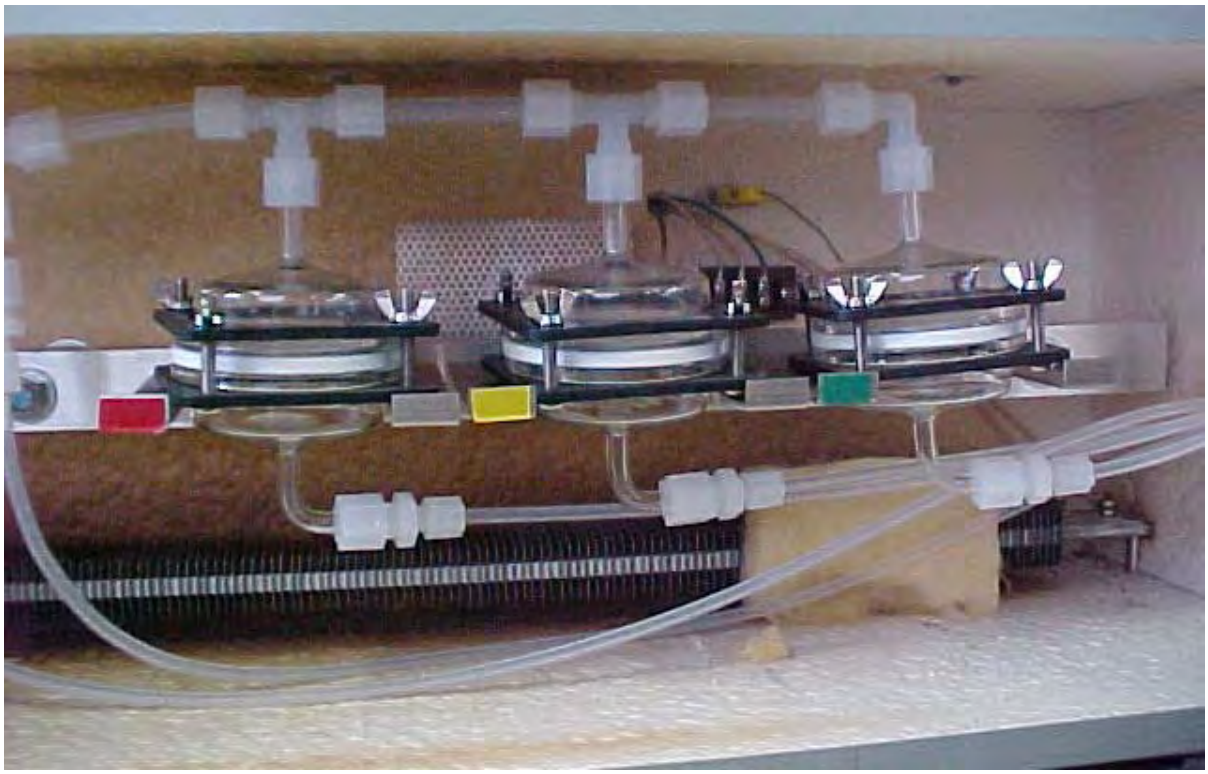


Figure 6. Sorbent Screening Device—Sample Filters.

Figure 7. Sorbent Screening Device—Heated Box and Impingers.

The SSD was designed to simulate the conditions present across the filter in a full-scale fabric filter and the results can be used to estimate the sorbent injection concentrations required for various levels of mercury removal. This type of information cannot be calculated directly from the usual information provided by vendors or from laboratory tests using a bed of sorbent. Fixed-bed testing can provide both capacity and reactivity (slope of the breakthrough curve) data and this can be incorporated into a model for predictions. However, the applicability of the data is limited because sorbents are typically removed from the gas stream before the equilibrium capacity has been reached.

The equivalent sorbent injection concentration (EC), in lb/MMacf, is calculated as shown in equation 1.

Equivalent Concentration=(Sorbent Loading)/(Cumulative Gas Volume)/2 (1)

Therefore, if 0.01 g sorbent is preloaded onto a filter and the average flow for the first hour is 1 actual liter per minute, the equivalent loading is 5.2 lb/MMacf.

EC=0.01 g*(1 lb/454 g)/[1 lpm*(1 cf/28.32 l)*(60 min/hr)*1 hr]/2*1E6 cf/MMacf

EC=5.2 lb/MMacf

The sorbent loading represents the amount of sorbent that would have collected on a section of a full-scale bag over the entire filtering cycle. To calculate the equivalent concentration, the loading is divided by two because the ***average*** amount of sorbent present on a full-scale bag between cleaning cycles is half the amount present on the bag at the end of the filtering cycle. For the sorbent screening tests, since the test sorbent is pre-loaded onto the filter before being introduced to flue gas, the *equivalent sorbent injection concentration* is much higher at the beginning of the test and decreases as the test progresses. In this example, if 90% mercury removal is achieved over the first hour, this indicates that 90% removal would be achieved in a full-scale application at an injection rate of 5.2 lb/MMacf. If the cumulative average mercury removal of this sorbent was 40% after 4 hours, this suggests that 40% removal would be achieved by this sorbent at an injection rate of 1.3 lb/MMacf (5.2/4).

Description of Field Testing Tasks

The field tests were accomplished through a series of five subtasks: 1) sorbent selection and screening, 2) sample and data coordination, 3) baseline testing, 4) parametric testing, and 5) long-term testing. The subtasks are independent of each other in that they each have specific goals and tests associated with them. However, they are also interdependent, as the results from each subtask will influence the test parameters of subsequent subtasks. A summary of each subtask is presented.

Sorbent Selection and Screening

A key component of the planning process for these evaluations is identifying potential sorbents for testing. Results from EPRI and Great River Energy (GRE)-sponsored testing at GRE's Stanton Station Unit 10 suggest that the mercury removal effectiveness of standard, non-chemically treated, activated carbon injected upstream of an SDA and FF was limited and that using a halogen-treated material could be very effective. In an effort to advance

sorbent technology, ADA-ES invited sorbent developers and manufacturers to provide material designed for effective mercury removal in halogen-deficient flue gas for screening at Holcomb. A sample copy of the letter of invitation is included in Appendix C. When requested by the vendor, ADA-ES provided suggestions to help vendors identify sorbent properties that may enhance performance, such as recommending halogen treatment. Letters of invitation were sent to 12 sorbent manufacturers, as shown in Table 4.

Sorbents were selected for screening based upon a review of the proposals by the project team to determine potential improvements over the benchmark sorbent and the relative sorbent costs. Screening tests were conducted to evaluate the mercury removal performance of various sorbents under conditions simulating a full-scale fabric filter. At least one material from each participating manufacturer was included in the screening tests. Overall, 23 tests were conducted with 20 different sorbents from 10 manufacturers.

Table 4. Sorbent Screening Test Invitees.

Manufacturer/Developer	Sorbent Submitted for Testing	Included in Testing
Advanced Fuel Research	No	No
Amended Silicates	No	No
Calgon/Barnebey Sutcliffe Corp.	Yes	Yes
CarboChem Inc.	Yes	Yes
Columbia Chemicals	Yes	Yes
Donau Carbon	Yes	Yes
General Technologies SPC	Yes	Yes
EPRI/ISGS	Yes	Yes
NORIT Americas Inc.	Yes	Yes
RWE	Yes	Yes
Sorbtech	Yes	Yes
Superior Absorbents	Yes	Yes

Sample and Data Coordination

Collecting, analyzing, and archiving samples and plant operating data is a key aspect of any field test program. A copy of the Sample and Data Management Plan for the evaluation at Holcomb is included in Appendix D. An example of samples and data collected during testing is presented in Table 5.

Table 5. Data Collected during Field Testing.

Parameter	Sample/Signal/Test	Baseline	Parametric/ Long-Term
Coal	Batch sample	Yes	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly ash	Batch sample	Yes	Yes
Feed lime, feed water	Batch samples of slaked lime milk, reactivator sludge, and feed slurry	Yes	No/Yes
Unit operation	Plant signals: boiler load, etc.	Yes	Yes
Temperature	Plant signal at SDA inlet, FF inlet and outlet	Yes	Yes
Temperature	Full traverse at SDA inlet and FF outlet	Yes	No
Duct gas velocity	Full traverse at SDA inlet and FF outlet	Yes	No
Total mercury	Method 324	Yes	Yes
Mercury (total and speciated)	Hg monitors at SDA inlet/outlet and FF outlet	Yes	Yes
Mercury (total and speciated)	ASTM Method 6784-02 (Ontario Hydro) at SDA inlet and FF outlet	Yes (1 set)	No/Yes (2 sets)
Multi-metals emissions	Method 29 at SDA inlet and FF outlet	Yes, outlet	No/Yes, outlet
HCl, HF, Br	EPA Method 26A at SDA inlet and FF outlet	Yes	Yes
Sorbent injection rate	PLC, lbs/min	No	Yes
Plant CEM data (NO_x, O_2, SO_2, CO)	Plant data – stack	Yes	Yes
Stack opacity	Plant data – stack	Yes	Yes
Pollution control equipment	Plant data (fabric filter cleaning, pressure drop, etc.)	Yes	Yes

Grab samples of ash were collected from the fabric filter hoppers each day of testing and analyzed for mercury. A sketch of one of the fabric filters with the row numbers is presented in Figure 8. The hoppers shown in gray were sampled.

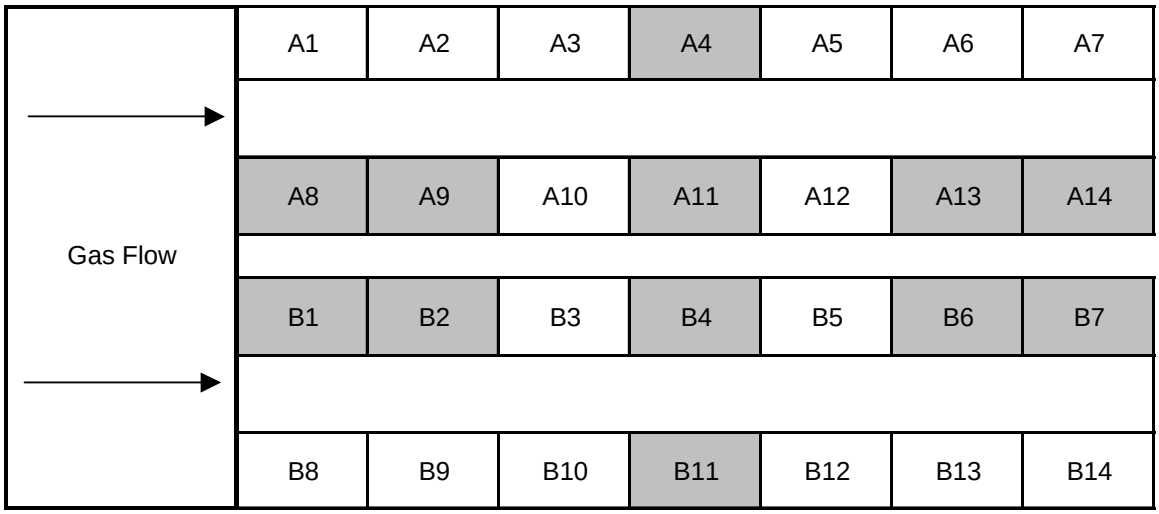


Figure 8. Sketch of Fabric Filter showing Module Numbering.

Baseline Testing (No Sorbent Injection)

Two weeks of baseline testing was conducted. During week 1, the unit fired 100% PRB coal from the Jacobs Ranch and Cordero mines. The unit was maintained at constant, full-load operation and the air pollution equipment was operated under standard full-load conditions (standard soot blowing, fabric filter cleaning logic, SDA recycle rate, etc.). ASTM Method 6784-02 (Ontario Hydro) mercury measurements, M29 multi-metal measurements, and M26A, HCl, and HF measurements were conducted in conjunction with the mercury monitors during this subtask.

Although the focus of testing at Sunflower Electric's Holcomb Station was to determine the cost and effects of sorbent injection for control of mercury in stack emissions, additional options for reducing mercury emissions were also planned because of their potential to enhance baseline mercury removal or mercury removal with injection of un-treated activated carbon. One option of interest was the influence of blending small percentages of western bituminous coal with the PRB coal. Many western bituminous coals have slightly higher chlorine content than PRB coals. If the chlorine content of the blended fuel is slightly higher at both the inlet and outlet of the SDA, the ability of the native fly ash and standard activated carbon to remove mercury should improve and approach the level that might be expected in boilers with fabric filters only. Based on results from EPA's Information Collection Request for mercury, the average mercury removal across a baghouse without a spray dryer, for plants burning subbituminous coals, was 72%, which is a significant improvement over the baseline mercury removal at Holcomb.

During the second week of baseline testing, tests were conducted to measure the effect of co-firing PRB coal from the Black Thunder mine with western bituminous coal from the West Elk mine on both mercury removal and speciation across the system. Tests were conducted at two blend ratios. Coal blending was accomplished by partially loading a train of PRB coal and loading western bituminous coal on top of the cars with a front end loader before the cars were emptied by the rotary car dumper at the plant. The front-end loader had a 9-yard bucket. Two blends were tested: one bucket load per car on half of the

train (59 cars) and two buckets per car on the other half of the train. The blend ratios were roughly 93% PRB and 7% western bituminous on half the train and 86% PRB, 14% western bituminous on the other half. The coal blending operation at Holcomb is shown in the photograph in Figure 9. The coal was well mixed before entering the boiler. Mercury measurements were made with EPA draft Method 324 and mercury monitors during these tests.

Figure 9. Coal Blending at Holcomb Station.

Parametric Testing

Following baseline testing, three weeks of parametric testing was conducted as shown in the test matrix on Table 6. The testing fell into three areas of interest:

1. Comparison of the effectiveness of untreated activated carbon injected upstream of the SDA versus in between the SDA and FF.
2. The impact of coal additives on enhancing standard activated carbon.
3. An evaluation of alternate sorbents.

One way to improve sorbent performance in halogen-deficient flue gas, such as that present in a fabric filter downstream of an SDA on a unit burning PRB coal, is the addition of halogenated compounds into the system. During the second half of the first week of parametric testing, an additive was added to the coal. It was expected that this would result in two effects: 1) increase the fraction of oxidized mercury in the flue gas (which should be

removed fairly well in the SDA), and 2) enhance the effectiveness of non-chemically treated activated carbon at Holcomb. It was estimated that nominally 24 to 48 hours would be required to "condition" the system after introducing an additive onto the coal. Therefore, two days of additive addition were completed before characterizing the combined effect of additive and activated carbon injection. The first three days of testing were dedicated to characterizing the performance of DARCO® Hg alone (no additive addition). DARCO® Hg, previously sold as DARCO® FGD, is an activated carbon made from Texas lignite coal. This sorbent has been used extensively in DOE and EPRI mercury control evaluations. General physical properties for DARCO® Hg are:

- Surface area = 600 m^2/g
- Bulk density, tamped = 32 lb/ft^3
- Particle size, mean = 17–20 µm

During the second week of testing, the performance of DARCO® Hg injected downstream of the SDA was evaluated with and without co-injection of chemicals to enhance the performance of the DARCO® Hg. During the final week of parametric testing, two alternate sorbents were evaluated at two injection concentrations and the best option for long-term testing was rechecked at the estimated optimized condition in preparation for long-term testing.

Alternate sorbents were chosen based upon results from the screening tests. These results are summarized in the Results section of this report. A brief description of the two sorbents chosen is shown below:

- **208CP—**Highly activated carbon made from coconut shells and provided by Calgon (previously Barnebey Sutcliffe). This material was chosen for testing because of the promising results from the screening tests and because it is not chemically treated with any chemicals that may off-gas in the flue gas or leach from the collected solids. The mass mean diameter of this material is 46 µm.
- **DARCO® Hg-LH—**This is a Texas lignite coal-based activated carbon treated with bromine for improved performance in halogen-deficient gas streams. This sorbent is available on an experimental basis through NORIT Americas Inc. It has similar physical characteristics as DARCO® Hg.

The fabric filters at Holcomb typically operate in a continuous cleaning mode. There are 14 modules in each of the two fabric filters and cleaning takes approximately 10 minutes per module or 2.3 hours for an entire fabric filter. In addition, approximately 75% of the material collected in the fabric filter is recycled into the SDA. Therefore, 6 to 8 hours were scheduled during each parametric test condition to assure the system was at equilibrium condition.

Long-Term Testing

Long-term testing was conducted at the "optimum" settings as determined in the parametric tests and approved by both DOE and Sunflower Electric/Holcomb. It was the intent of DOE that these settings represent the most cost-effective conditions for mercury removal. The goals of this subtask were to obtain sufficient operational data over a 4-

week period on removal efficiency, to determine the effects on the particulate control device, to determine the effects on the SDA equipment, to determine the effects on byproducts, and to evaluate impacts to the balance of plant equipment to prove viability of the process and determine the economics. During this test, ASTM M6784-02, M29, and M26A measurements were conducted at the inlet and outlet of the SDA-FF.

The standard operation for Holcomb Unit 1 is to recycle approximately 75% of the material collected in the fabric filter back into the SDA. Therefore, during continuous sorbent injection some injected sorbent will also be recycled into the SDA and may improve the overall mercury removal. Not all units configured with SDA and FFs use recycle.

The long-term test of continuous injection is considered the single most important step in gaining acceptance from the utility industry as to the practical implementation of mercury removal technologies on coal-fired power plants.

Table 6. Full-Scale Test Sequence for Holcomb Unit 1.

Test Description	Start Date	Parameters/Comments
Baseline Week 1 PRB/Western Bituminous Blend	4/5/04 – 4/9/04	Day 1 – 100% PRB Day 2 – 90/10 PRB/w. bit blend Day 3 – 90/10 PRB/w. bit blend cont. /100% PRB Day 4 – 80/20 PRB/w. bit blend Day 5 – 80/20 PRB/w. bit blend cont. /100% PRB Measure Hg with monitors
Baseline Week 2	5/17/04 – 5/21/04	Day 1 – Test crew set-up no restrictions on boiler load Day 2 – ASTM M6784-02, M26A & M29 Day 3 – ASTM M6784-02, M26A & M29 Day 4 – ASTM M6784-02, M26A & M29 Day 5 – Contingency
Parametric Week 1 Benchmark Testing Chemical Injection (6-Day Week)	5/22/04 – 5/29/04	Start with injection lances at SDA inlet Day 1 – DARCO® Hg, 1 lb/MMacf Day 2 – Contingency Day 3 – DARCO® Hg, 5 lb/MMacf Day 4 – DARCO® Hg, 3 lb/MMacf, start coal additive Day 5 – No sorbent, coal additive Day 6 – No sorbent, coal additive, M26A Day 7 – Coal additive + DARCO® Hg Rate C
Parametric Week 2 FF Outlet, Enhancements	6/1/04 – 6/6/04	Day 1 – DARCO® Hg, 1–10 lb/MMacf @ SDA outlet Day 2 – DARCO® Hg, 3 lb/MMacf @ SDA inlet Days 3–5 – DARCO® Hg, enhancements Day 6 – Contingency
Parametric Week 3 Alternative Sorbents	6/7/04 – 6/11/04	Days 1–2 – Contingency Day 3 – CP 208 Sorbent, 1 and 3 lb/MMacf Day 4 – DARCO® Hg-LH, 0.75 lb/MMacf Day 5 – DARCO® Hg-LH, 1 and 3 lb/MMacf, optimized conditions
Long-Term Tests	7/7/04 – 8/6/04	Operate at consistent injection rate 24 hours a day, 4 weeks, while load following. Conduct ASTM M6784-02, Method 29, M26A tests during week 3.

RESULTS FROM HOLCOMB TESTING

The field test program at Holcomb was divided into five primary tests, as listed below. Results from each series of tests are included in this section.

1. Baseline tests
2. Coal blending tests
3. Sorbent screening
4. Parametric tests
5. Long-term tests

Baseline Mercury Removal with 100% PRB Coal

The baseline testing was conducted between May 17 and May 20, 2004. Boiler load was held constant at full-load and the air pollution equipment was operated normally (standard soot blowing, fabric filter cleaning logic, SDA recycle, etc.). ASTM Method 6784-02 (Ontario Hydro) mercury measurements, M29 multi-metal measurements, and M26A, HCl, and HF measurements were conducted in conjunction with the mercury monitors.

Results from the Ontario Hydro are presented in
Table 7 with the corresponding total vapor-phase mercury measurements from the SCEM. The full Ontario Hydro report for baseline testing is included in Appendix E.

Table 7. Ontario Hydro and SCEM Mercury Measurements during Baseline Tests.

	Inlet ($\mu g/Nm^3$)	Outlet ($\mu g/Nm^3$)	Removal Efficiency (%)
Particulate	0.47	0.01	98.9%
Oxidized (ASTM)	2.38	0.47	80.4%
Elemental (ASTM)	7.71	10.75	-39.5%
Total (ASTM)	10.55	11.22	-6.4%
(SCEM)	*11.75*	*10.01*	*14.8*

Daily averages of the mercury concentrations measured using the analyzers are presented in Table 8. The SCEMs show that the mercury at the inlet to the SDA and at the stack was primarily elemental and the removal was less than 25%. Mercury speciation data collected with Ontario Hydro indicated a higher fraction of oxidized mercury at the inlet to the SDA and a net increase in elemental mercury across the system (Table 7). Fly ash can oxidize elemental mercury and it is likely that the fly ash collected on the Ontario Hydro sampling filter was altering the species of the mercury within the sampling train, thus causing a sampling artifact. The results from the two measurement methods compared well and the total mercury measured matched within 11%.

Table 8. Daily Average Vapor-Phase Mercury during Baseline Tests.

Date	Inlet Hg ($\mu g/Nm^3$)	Inlet Hg^0 ($\mu g/Nm^3$)	Outlet Hg ($\mu g/Nm^3$)	Outlet Hg^0 ($\mu g/Nm^3$)	Hg Removal (%)
5/18/04	10.4	10.3	8.3	7.7	19
5/19/04	11.9	12.8	9.2	8.7	23
5/20/04	12.7	12.8	12.9	12.0	-3

Note: All mercury values measured by the SCEM and corrected to 3% O_2.

Coal Blending Tests

During the week of April 5, 2004, two blend ratios of PRB and western bituminous coal were tested to evaluate the influence of the bituminous coal on mercury removal by native fly ash. Holcomb was firing Jacobs Ranch before coal-blending tests began. During the blend tests, the PRB coal was Black Thunder and the western bituminous coal was from the West Elk mine. The first blend ratio was nominally 92.7% Black Thunder and the balance West Elk. The second blend ratio consisted of 85.6% Black Thunder and the balance West Elk. The unit operated normally during the week except that one of the five coal mills, Mill C, was out of service.

Vapor-phase mercury concentrations were monitored at the outlet of the air pre-heater on the A-side of the unit and at the stack. A summary of these tests, including the blending ratios and the average mercury concentrations, is shown in Table 9. There were some operational problems associated with the inlet mercury analyzer immediately prior to beginning the first blend test that may have compromised the concentrations measured on April 6 and 7, 2004. Therefore, a triplicate set of EPA Draft M324 (sorbent trap) samples was collected at the air pre-heater outlet location on April 6, 2004, for a secondary mercury measurement. During the second blend test, simultaneous M324 samples were collected at the air pre-heater outlet and stack. These data are also included in Table 9. There were no Ontario Hydro tests run during the period of the blend testing.

There was no measurable vapor-phase mercury removal measured while firing 100% Jacobs Ranch PRB coal. At the first blend ratio, the mercury removal across the SDA-FF increased to 50%. The mercury removal during the second blend test increased to 76% (81% based upon M324 samples). These results are summarized in Figure 10.

Table 9. Vapor-Phase Mercury during Coal Blending Tests.

Date	Test Coal	Inlet Hg (µg/Nm^3)	Inlet Hg^0 (µg/Nm^3)	Outlet Hg (µg/Nm^3)	Outlet Hg^0 (µg/Nm^3)	Hg Removal (%)
4/5/04	100% JR PRB	9.8	8.1	10.4	9.6	-6
4/6/04 6:40 am– 4/7/04 9:50 am	7.3% WE 92.7% BT	NA *(7.24)* [M324]	7.7	3.6	3.3	NA[a] *(50)* [M324]
4/7/04 2:00 pm	100% JR	14.4 [a]	12.9 [a]	9.2 [b]	8.3 [b]	
4/8/04 6:20 am– 4/9/04 7:05 am	14.4% WE 85.6% BT	5.8 *(5.28)* [M324]	5.4	1.4 *(0.97)* [M324]	1.4	76 *(81)* [M324]

All concentrations shown corrected to 3% O_2
[a] Analyzer operational problems–data suspect
[b] Did not reach stable concentration before next blend started
[M324] Mercury concentration measured with EPA Draft M324

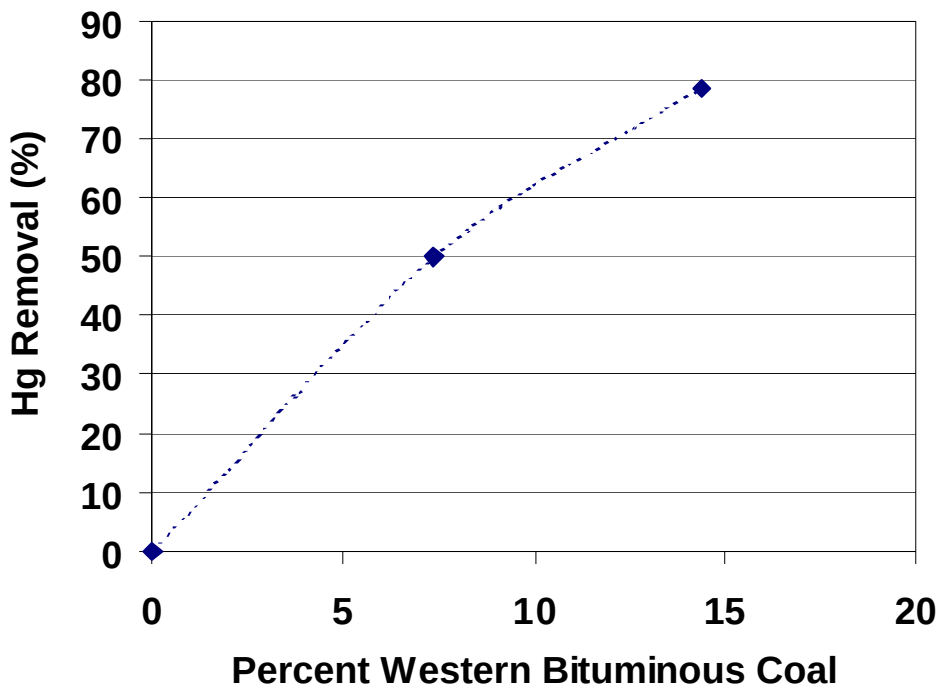


Figure 10. Summary of Coal Blending Tests.

Boiler load and coal flow during the coal-blending test were fairly stable, as shown in Table 10. The Black Thunder coal has lower sulfur content than the Jacobs Ranch coal. Therefore, during periods of coal blending, less lime was required to maintain the outlet SO_2 concentration at the desired level. Total slurry flow, SDA lime milk flow, and SDA inlet SO_2 are also included in Table 10. Other than the change in mercury concentration, the change in the SO_2 concentration at the inlet to the spray dryer was the clearest indicator when the blended coal was in the system.

Table 10. Unit Operation during Coal Blending Tests.

Date		Unit Load (MW)	Total Coal Flow (Klb/hr)	Total Feed Slurry Flow (gpm)	SDA Lime Milk Flow (gpm)	SDA Inlet SO_2 (lb/MMBTU)
4/5/04	100% JR	358	188	297	45	1.1
4/6/04	Blend 1	351	178	272	27	0.6
4/7/04	100% JR	345	182	286	54	1.1
4/8/04	Blend 2	333	163	242	34	0.7

Sorbent Screening Tests

Sorbent screening tests were completed between February 23 and March 2, 2004, using a sorbent screening device (SSD) developed by ADA-ES. Tests were conducted on a slipstream of flue gas extracted from between the SDA and FF. Overall, 23 tests were conducted with 20 different sorbents from 10 different suppliers. Typically, each run was conducted for at least 12 hours or terminated when the outlet mercury concentration equaled the inlet mercury concentration (100% breakthrough). The types of sorbents ranged from ash collected in the Holcomb fabric filter to commercially available activated carbons to experimental sorbents treated with a variety of conditioning agents such as sulfur, iodine, bromine, and chlorine.

CB200xF, an iodine-treated sorbent available from Calgon, was designated the high-removal benchmark sorbent, based upon results from tests sponsored by EPRI and GRE at Stanton Station Unit 10. Stanton Unit 10 fires North Dakota lignite coal and has a spray dryer absorber and fabric filter for SO_2 and particulate control. Based upon the chlorine concentrations in the coal from Stanton and the coal from Holcomb, sorbents should demonstrate similar performance at these two sites. DARCO® Hg was identified as the low-removal benchmark sorbent, also based upon results from Stanton testing. Prior to testing at Stanton, URS Group conducted screening tests in their laboratory with each of these sorbents at conditions simulating the flue gas at the inlet to the SDA. The resulting equilibrium adsorption capacity for each of these sorbents was 450 µg/g normalized to 50 µg/Nm^3 for DARCO® Hg, and 550 µg/g normalized to 50 µg/Nm^3 for CB200xF.[3] It is expected that the capacity of the DARCO® Hg would be lower at the outlet of the SDA because of the enhancing effect of halogens present in the flue gas upstream of the SDA. The CB200xF should remain unchanged in the presence of the SDA.

The equivalent concentration for a full-scale application is calculated using equation 1 from the Equipment Descriptions section. For comparison purposes, the equilibrium adsorption capacity can also be extrapolated from the data collected at Holcomb by assuming the slope of the outlet mercury concentration time trend continues until the mercury concentration at the outlet equals the concentration at the inlet. For CB200xF (Sorbent A, Table 11), the calculated equilibrium adsorption capacity normalized to 50 µg/Nm^3 is 962 µg/g (compared to 550 µg/g from the fixed-bed screening tests in the URS laboratory).

The mercury removal performance results for sorbents tested at Holcomb at three different equivalent injection concentrations are shown in Table 11. This information was used as one of the criteria to select sorbents for full-scale testing.

Reviewing Table 11, it is apparent that some sorbents (such as Sorbent D) show little improvement at increased injection concentrations. This sorbent achieved fairly high removal early in the screening test and continued to remove mercury at the same level throughout the test. This translates to little improvement in performance at increasing injection concentrations. In comparison, Sorbent F showed high removal early in the screening test but the performance degraded over time. This translates to high removal at high injection concentrations (96% at 3–4 lb/MMacf), but unlike Sorbent D, the resulting performance at lower injection concentrations was measurably lower (63% at 1–2 lb/MMacf). It is possible that the capacity of the sorbents in the previous two examples is similar, but it is obvious that their full-scale performance will be very different and either may be chosen for full-scale mercury control depending upon the level of removal required. For example, if the costs of the two sorbents are similar and only 70% mercury removal is required, Sorbent D would be the recommended sorbent because it can achieve >70% removal at low injection concentrations. However, if >90% mercury removal is required, Sorbent F would be recommended because it can achieve very high removal efficiencies at higher injection concentrations. The sorbents identified with "Mod" were studied in the presence of enhancing agents such as chlorine and bromine gas. Sorbents B and T showed significant improvement with the addition of enhancing agents, while Sorbent S did not.

Four sorbents are highlighted in the table: the two benchmark sorbents (Sorbent A: CB200xF, and Sorbent B: DARCO® Hg) and the sorbents chosen for parametric tests at Holcomb (Sorbent F: DARCO® Hg-LH, and Sorbent L: Calgon's 208CP). Costs for these sorbents are included in the table. The best performance was obtained with the CB200xF, indicating 94% removal at an equivalent injection concentration of 2–3 lb/MMacf. DARCO® Hg-LH was chosen for parametric testing at Holcomb because of its promising performance and relatively low cost. The second sorbent chosen for parametric testing at Holcomb was 208CP. This material demonstrated much better performance than the DARCO® Hg and was one of two non-treated sorbents that demonstrated promising performance. Recall that the extraction location for the screening tests was downstream of the SDA. It is possible that the untreated materials will perform differently when injected upstream of the SDA where the halogen content is higher.

Table 11. Results of the Sorbent Screening Tests at Holcomb.

Sorbent	Cumulative Average Mercury Removal, %			Cost (FOB) $ / lb
	1–2 lb/MMacf	2–3 lb/MMacf	3–4 lb/MMacf	
A		94	99	$7.71
D	85	85	89	
C	79	88	91	
F	63	82	96	$0.65
G		78	93	
Mod B	71	79	80	
H	70	65	55	
E	60	77	87	
I	52	65	63	
J	60	58	51	
L	55	53	54	$0.85
N	58	48	35	
K	45	55	69	
M		45	52	
O	34	40	39	
B	28	30	29	$0.42
Mod T	22	28	36	
Q	21	23	21	
R	21	20	16	
Mod S	17	15	12	
S	14	13	10	
P		16	23	
T		4	0	

Parametric Tests

A series of parametric tests was conducted to evaluate sorbent injection for several levels of mercury control, especially sorbents and halogen-enhancement options with the potential to achieve mercury removal levels above that which is possible with standard activated carbon. Parametric tests were conducted between May 22 and June 11, 2004. Primary variables of interest included:

- Sorbent type
  - DARCO® Hg (benchmark sorbent, no chemical treatment, previously known as DARCO® FGD)
  - Calgon 208CP (highly activated, no chemical treatment)
  - DARCO® Hg-LH (bromine-treated, previously known as DARCO® FGD-E3)
- Sorbent injection concentration
- Sorbent injection location
  - Upstream and downstream of SDA
- Enhancement additive with/without sorbent injection
  - Coal additive
  - Flue gas additive

DARCO® Hg and DARCO® Hg-LH were tested at two different injection locations–upstream and downstream of the SDA. 208CP was evaluated upstream of the SDA only. For comparison purposes, all sorbent injection concentrations included in this report were calculated based upon the stack flow from the plant CEM and calculated at the SDA inlet temperature (nominally 290ºF), regardless of injection location (inlet or outlet of SDA), unless otherwise noted.

Alternative Sorbents and Injection Concentration

The alternative sorbent tests were conducted at the SDA inlet injection location. These results are presented in Figure 11. The duration for these tests was between 4 and 7 hours, which was enough time for the outlet mercury to reach a stable concentration. The mercury removal achieved with the 208CP was similar to the benchmark DARCO® Hg. The DARCO® Hg-LH demonstrated the best performance of the three sorbents, resulting in 77% mercury removal at an injection concentration of 0.7 lb/MMacf as compared to 50–54% for the 208CP and DARCO® Hg at an injection concentration of 1.0 lb/MMacf. Two of the injection concentrations shown for DARCO® Hg-LH (1.5 and 4.3 lb/MMacf) represent fairly short tests (<130 minutes) and the mercury removal had not yet reached steady state. Additional testing during the long-term test period confirmed that with continuous injection of DARCO® Hg-LH, the mercury removal at 1.5 lb/MMacf would be higher than the 77% measured during the short parametric test.

It should be noted that mercury removal without sorbent during parametric testing is somewhat higher than measured during baseline testing. The system was typically allowed to recover overnight (approximately 15 hours) but some residual mercury removal was often

noted prior to beginning the next test. This higher mercury removal is believed to be above baseline levels and likely associated with activated carbon remaining in the system from the previous day's test.

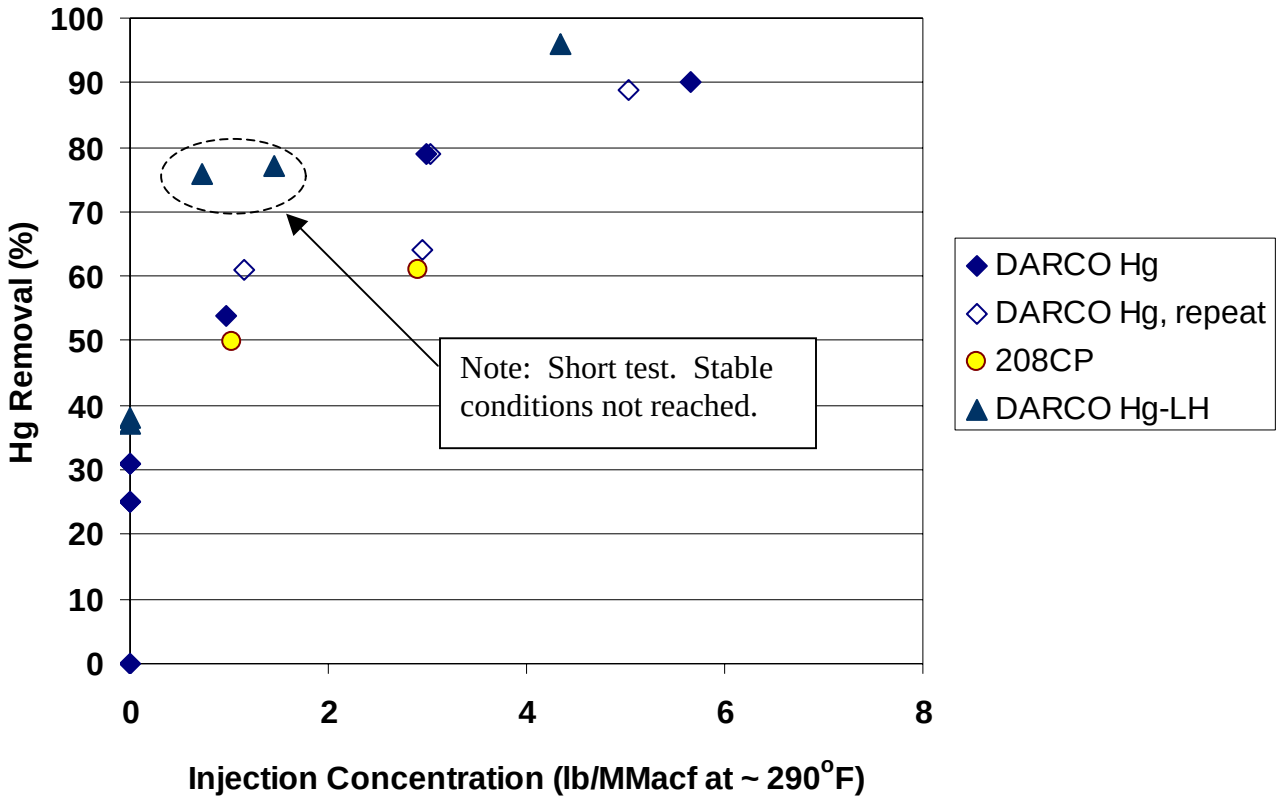


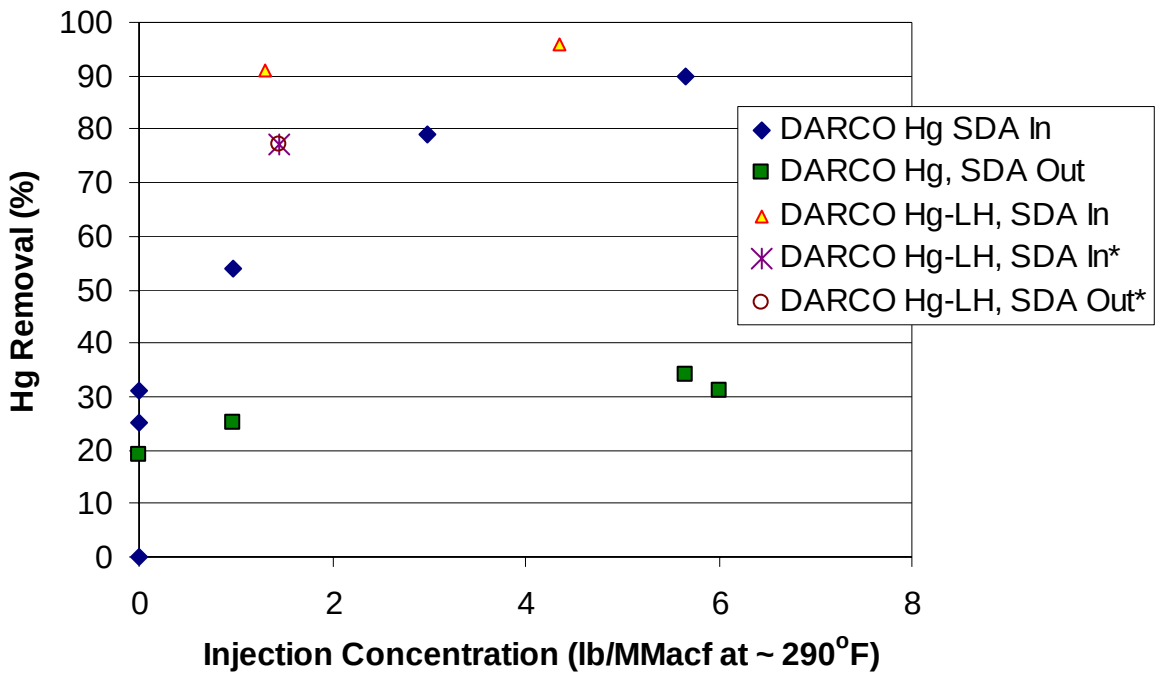
Figure 11. Results of Alternative Sorbent Tests, Holcomb Station, SDA Inlet.

Sorbent Injection Location

The results from sorbent injection testing upstream of the SDA indicated higher mercury removal for the sorbent treated with bromine than the untreated material. This result indicates that bromine promotes the effectiveness of activated carbon for mercury removal. Another indicator of the importance of halogens can be seen when comparing the performance of DARCO® Hg injected upstream and downstream of the SDA (Figure 12). Ninety percent mercury removal was achieved with DARCO® Hg at an injection concentration of 5.7 lb/MMacf upstream of the SDA at Holcomb. The mercury removal was limited to less than 35% when DARCO® Hg was injected downstream of the SDA at injection concentrations up to 5.7 lb/MMacf. The injection concentrations indicated above are both calculated at the SDA inlet temperature for comparison purposes. The injection concentration in pounds per *actual* cubic foot is approximately 17% higher at the SDA outlet location due to the reduced gas volume at the lower temperatures (175ºF downstream of the SDA as compared to 290ºF upstream of the SDA).

Results from EPA M26A tests conducted during the baseline test period indicate that HCl and HF were fairly low at the inlet to the SDA (0.5 and 1.5 ppm respectively) and 41% of the HCl and 75% of the HF was removed in the SDA. These results are discussed later in this report. Adsorption of HCl or HF by DARCO® Hg may contribute to the improved performance when the sorbent is injected upstream of the SDA. The concentration of these halogens may be too low at the SDA outlet when the unit is firing 100% PRB coal to enhance sorbent performance. These results are presented in Figure 12.

A short test of DARCO® Hg-LH injection at the outlet of the SDA was also conducted. These results are compared to a short test of DARCO® Hg-LH injection upstream of the SDA. As shown in Figure 12, there was no change in the DARCO® Hg-LH performance when injected either upstream or downstream of the SDA, indicating that flue gas constituents such as HCl or HF are not required for the effective performance of DARCO® Hg-LH.



**** Short (<2 hour) results.***

Figure 12. Results of Injection Location Tests, Holcomb Station.

Enhancement Additive With/Without Sorbent Injection

Results from the DARCO® Hg and DARCO® Hg-LH tests confirm that a bromine-treated carbon outperformed a non-treated carbon on an SDA-FF configuration such as Holcomb. Another option for introducing halogens is to increase the halogen content of the gas stream rather than using treated carbons. Two tests were conducted at Holcomb to evaluate this option.

One of the parametric testing conditions was to add a chemical to the coal to increase the halogen concentration in the flue gas in an attempt to enhance mercury capture. The additive was KNX, a proprietary ALSTOM Power mercury control technology.

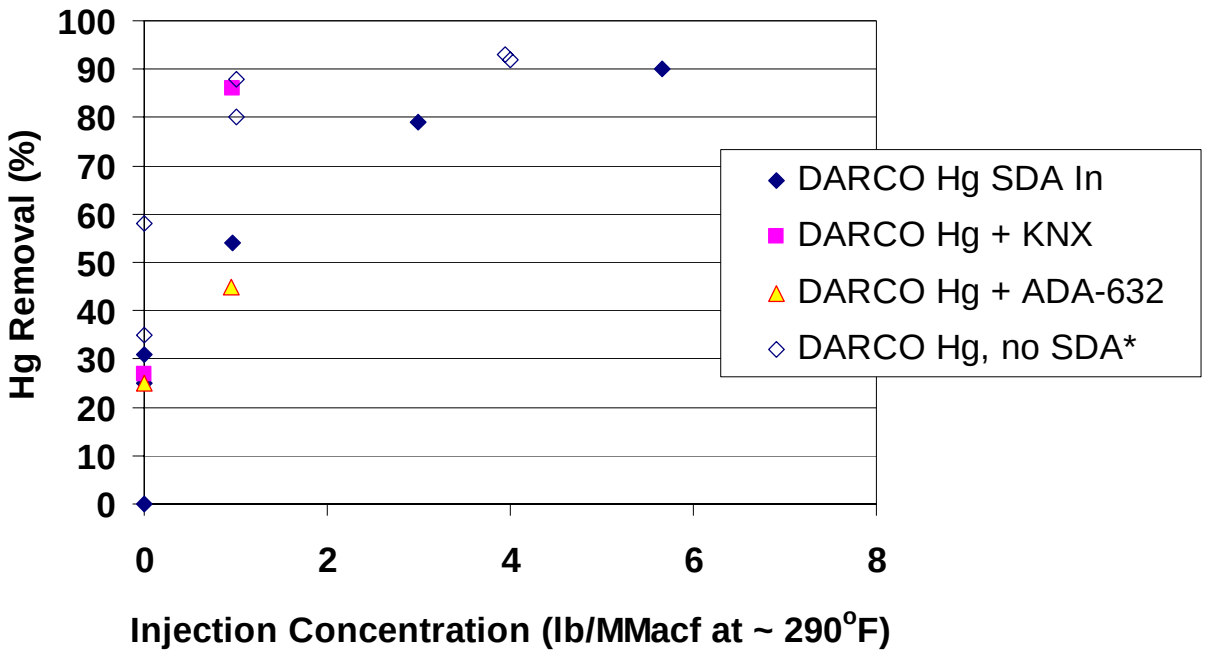
KNX was applied to the coal at the crusher house prior to entering the transfer house and coal bunkers. At this chemical injection location, it was estimated that it would take 4–5 hours before the "treated" coal would be fired in the boiler. The chemical additive was applied to the coal continuously for a period of 48 hours prior to injecting activated carbon to ensure that the entire system was "conditioned" with the additive.

During testing with KNX injection, the unit was burning coal from the Jacobs Ranch mine. At normal operating conditions, this coal yielded a total vapor-phase mercury concentration of 18–22 $\mu g/Nm^3$ at the outlet of the air preheater with 70–90% in the elemental form. During the chemical additive tests, the fraction of elemental mercury at the air preheater outlet decreased to 20–30%.

Although the fraction of oxidized mercury at the inlet of the SDA increased substantially, no increase in mercury removal across the system was noted. The fraction of oxidized mercury at the outlet of the fabric filter was also lower (nominally 80% elemental compared to typically >90% elemental mercury when KNX was not present with the coal). This suggests that either the KNX addition resulted in a sampling artifact that biased the elemental mercury measurement at the air preheater outlet, or the SDA-FF was reducing oxidized mercury back to the elemental form.

The final day of KNX testing included the injection of the DARCO® Hg sorbent at the SDA inlet location in conjunction with addition of the KNX additive to the coal. The sorbent injection concentration at the inlet to the SDA was 1.1 lb/MMacf, while the chemical additive flowrate was held steady. This parametric testing condition showed the total mercury capture across the system was 86% compared to 54% with DARCO® Hg alone (no KNX). These data, plotted in Figure 13, clearly indicate the improved performance of DARCO® Hg when halogens are added to the flue gas.

An additional data set included on the graph in Figure 13 compares the performance of DARCO® Hg injected upstream of the SDA during KNX coal additive injection with performance of DARCO® Hg on a unit burning PRB coal with a fabric filter and no SDA.[5] The data suggest that the addition of KNX allows the DARCO® Hg to perform as well as it would in the absence of an SDA.



** Data collected with DOE pilot plant at Xcel Energy's Comanche Station in 1997.*

Figure 13. Impact of the Addition of Coal Additive (KNX) on Mercury Removal.

An additional enhancement additive test was conducted to determine if a halogenated compound could be added directly to the flue gas to improve the performance of untreated activated carbon. The chemical was ADA-623, a proprietary chemical provided by ADA-ES. This material was chosen based upon promising screening tests. ADA-623 was injected at the outlet of the SDA with and without DARCO® Hg. No change in speciation or removal was noted above that expected without the additive. It is possible that the solid ADA-623 material tested was not adequately ground to the appropriate size for in-duct injection. Therefore, the results are inconclusive.

Slipstream vs. Full-Scale Results

Figure 14 is a comparison of the results from the sorbent screening tests and full-scale parametric testing at Holcomb for DARCO® Hg and DARCO® Hg-LH. The figure shows that the data from the SSD agrees very well with full-scale results. DARCO® Hg-LH clearly outperforms DARCO® Hg as predicted by the SSD tests. It also confirms the prediction that DARCO® Hg would not perform significantly better even at high injection rates. ADA-ES now feels confident that the SSD and corresponding method of data analysis can be used at any plant and with any sorbent to collect the data necessary to estimate the full-scale mercury removal performance of a fabric filter.

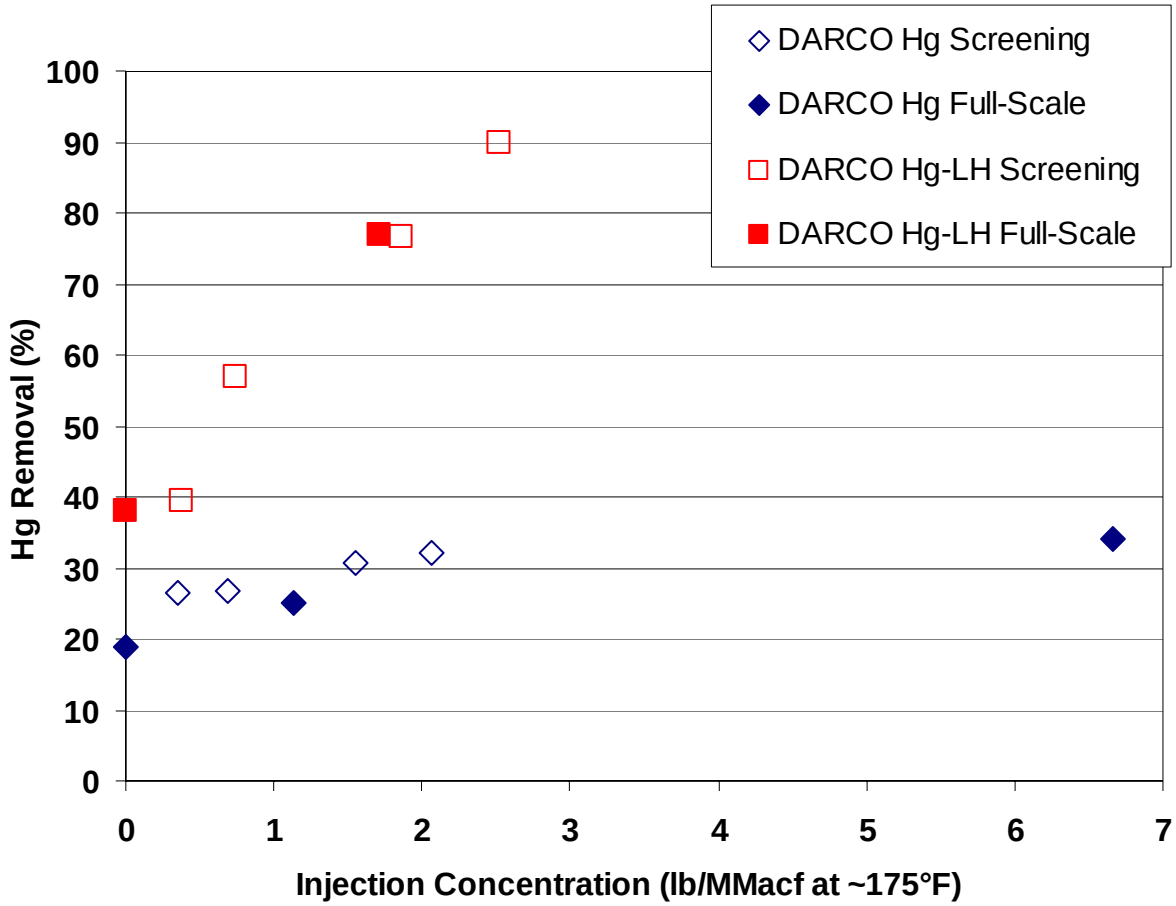


Figure 14. Comparison of Sorbent Screening and Full-Scale Test Results, SDA Inlet.

Long-Term Testing

Following completion of the Parametric Test Period, ADA-ES, Sunflower Electric, DOE, and EPRI reviewed the results to determine the configuration for long-term testing. The test team decided to evaluate DARCO® Hg-LH during the long-term period because:

- of the favorable performance and economics of DARCO® Hg-LH compared to DARCO® Hg
- a similar product is available from another supplier (not sole-sourced)
- only one injection system would be required at the plant (lower projected capital and O&M costs)

DARCO® Hg-LH was injected upstream of the SDA for 30 days from July 7 through August 6, 2004. For the first six days of testing, the injection concentration was increased until 90% mercury removal was achieved. From Day 6 through 30, the injection concentration was set for nominally 1.2 lb/MMacf. The logic on the injection skid was set to adjust the sorbent feed rate with boiler load. The average removal for the 30-day test was 91%, with an average removal of 93% for Days 6 through 30. The average outlet

concentration for Days 6 through 30 was 1.13 µg/Nm^3 (0.83 lb/TBtu, standard deviation = 0.30 lb/TBtu). Trend graphs of the inlet and outlet mercury concentrations, mercury removal, and injection concentration for the 30-day test are presented in Figure 15.

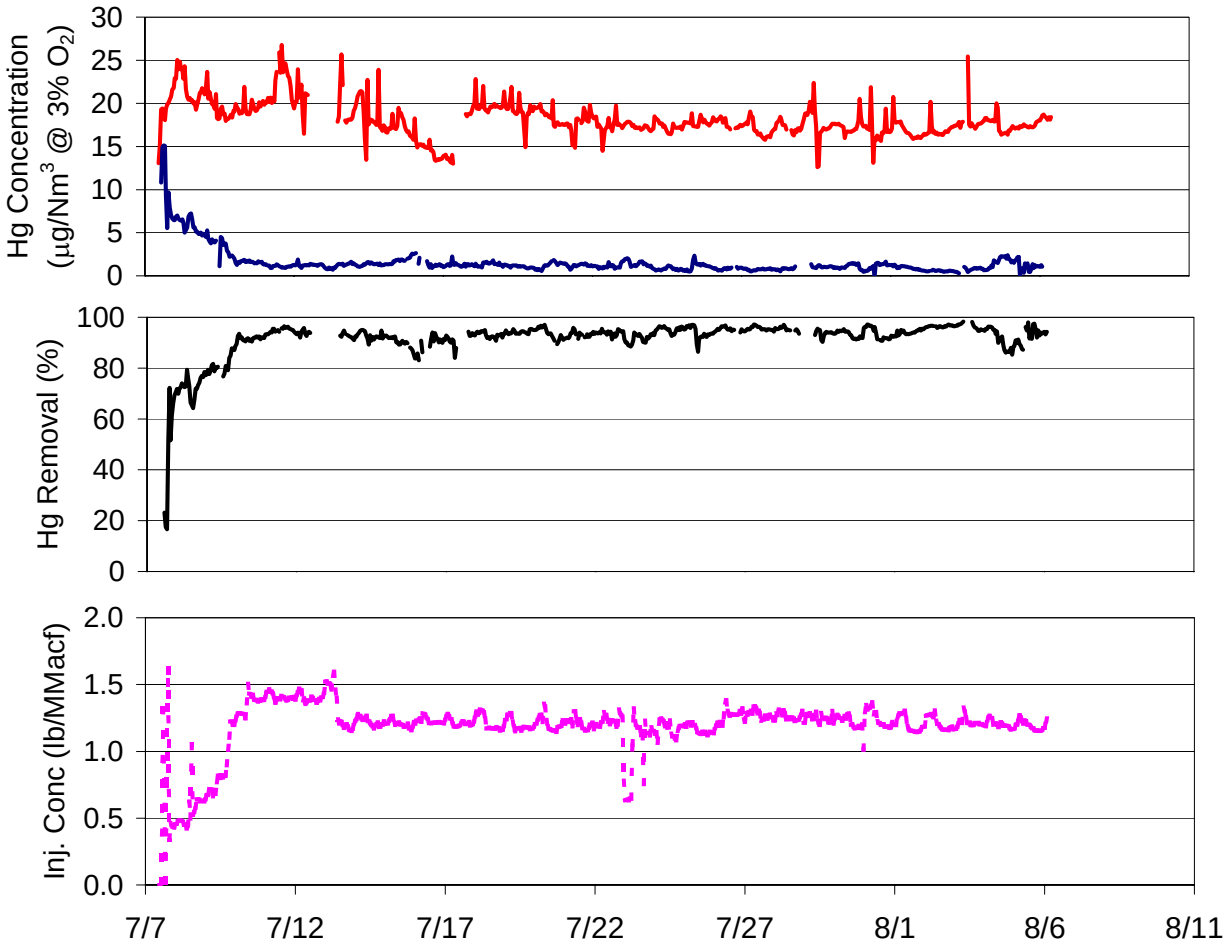
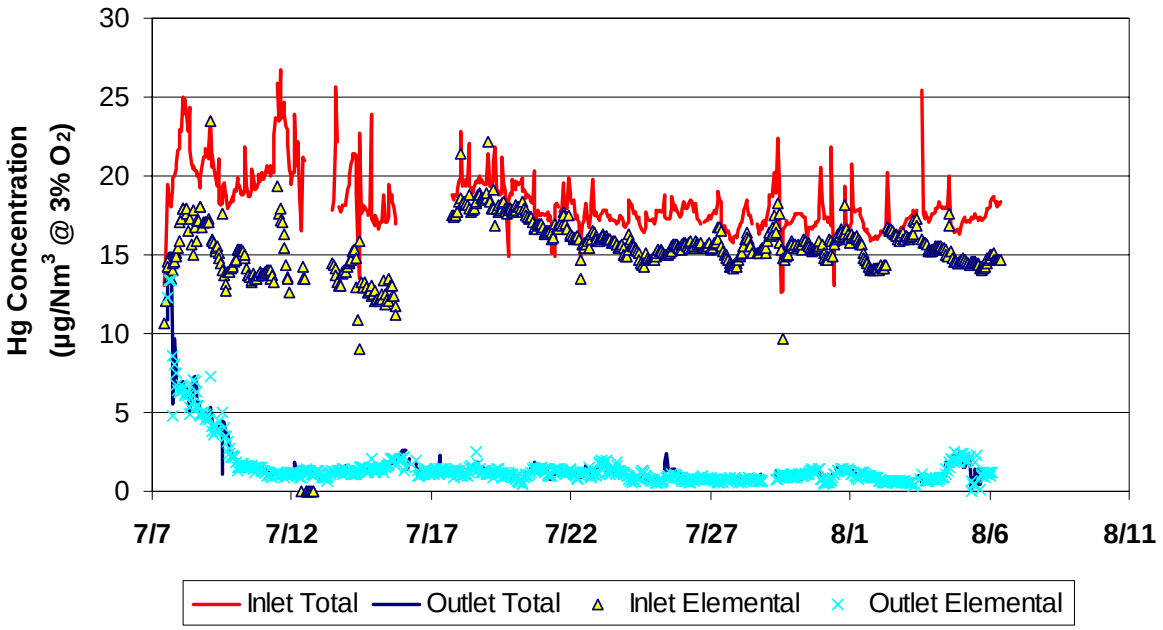


Figure 15. Mercury Removal during 30-Day Continuous Injection of DARCO® Hg-LH, 2004.

Both elemental and total mercury measurements were made during the long-term test period. Trend graphs of these data are shown in Figure 16. The data indicate that the fraction of oxidized mercury at the inlet to the SDA was typically less than 10% of the vapor-phase mercury. At the outlet of the fabric filter, the mercury was primarily in the elemental form.

Additional analyzers were installed at Holcomb for a portion of the long-term tests under a separate program. These analyzers are described in the Equipment Descriptions section of this report. The trend graph in Figure 17 shows measurements from five locations: 1) upstream of the SDA and upstream of sorbent injection, 2) upstream of the SDA and approximately 0.5 seconds downstream of sorbent injection, 3) downstream of the SDA, 4) downstream of the baghouse, and 5) at the stack. During these tests, the Thermo analyzers were configured to measure only elemental mercury, which represented over 80% of the

vapor-phase mercury at the inlet to the SDA and the bulk of the mercury at the outlet of the fabric filter. Analyzers that were used to collect the data presented in Figure 17 are designated as Thermo and EMC. As shown, the two analyzers matched fairly well at the inlet to the SDA. The extraction probe on the Thermo analyzer was experiencing particulate buildup which resulted in a reduction in the measured mercury over time. This system was designed to automatically blow back the filter, but the cleaning air was not connected during these tests. The filter was manually cleaned on July 12 and 30, 2004, which correspond to periods with higher measured mercury.



All data corrected to 3% O_2

Figure 16. Mercury Speciation during Long-Term Testing at Holcomb, 2004.

Measurements from the analyzer installed downstream of sorbent injection but upstream of the SDA indicate that 30–50% of the mercury is removed prior to the SDA. Reviewing the results from the analyzer installed at the outlet of the SDA indicates that nominally 50% of the incoming, vapor-phase mercury was removed between the injection location and the outlet of the SDA. Measurements from the Thermo analyzer installed at the outlet of the fabric filter matched well with the project analyzer and the Thermo analyzer installed at the stack.

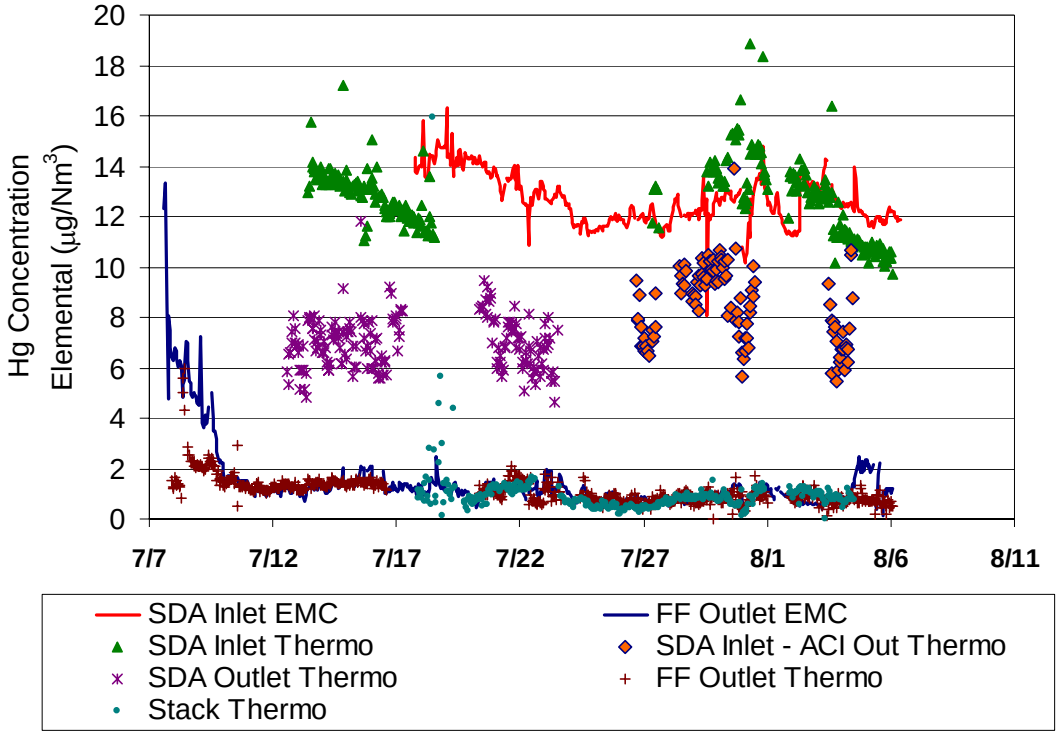


Figure 17. Mercury Measurements from Five Extraction Locations at Holcomb.

Several different techniques were used to measure mercury at Holcomb. These included flue gas measurements using EPA Method 29, EPA draft Method 324, Ontario Hydro, and mercury analyzers and analysis of mercury in coal and ash samples. Data collected during the long-term test is presented in Figure 18 from the techniques listed above. The data from the coal samples are presented as calculated vapor-phase mercury and the data from the fly ash samples are presented as amount of particulate-phase mercury captured in the fabric filter. As shown, there is fairly good correlation between the methods. The flue-gas measurements from the baseline and long-term tests are compared on Table 12. In general, the techniques compare well. During the long-term test, the Ontario Hydro test recorded lower mercury than the other methods (27% lower than the SCEM) even though the M29 and M324 techniques were both within 10% of the SCEM value. The full Ontario Hydro test report is included in Appendix G.

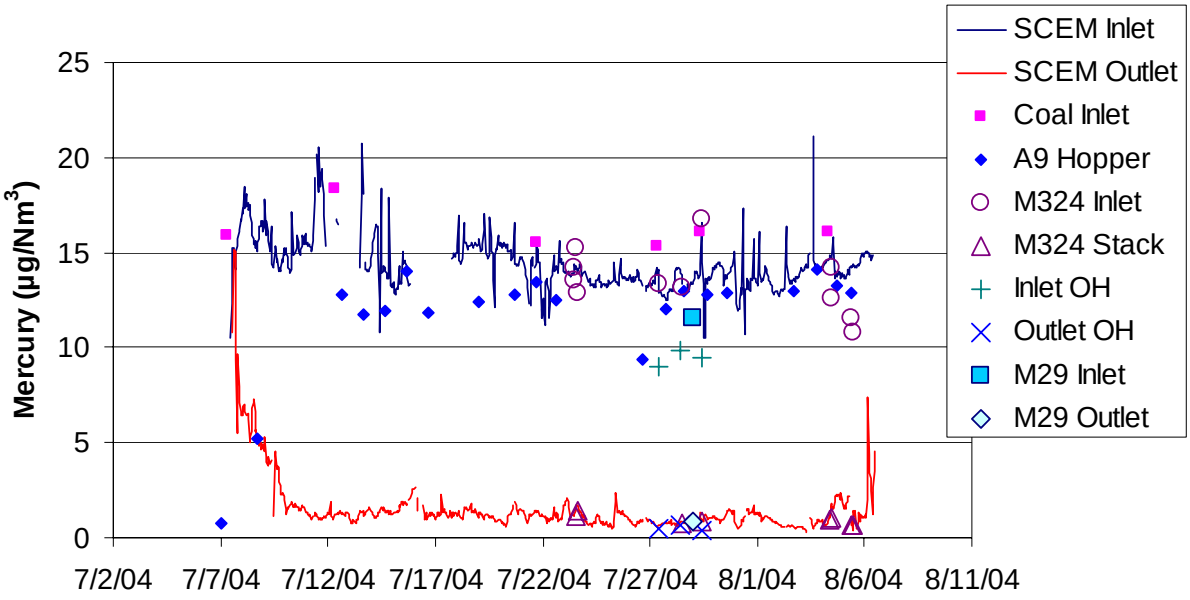


Figure 18. Comparison of Vapor and Solid Mercury Measurements.

Table 12. Ontario Hydro, EPA M29, and SCEM Results from Holcomb.

		Ontario Hydro				M29	M324	SCEM
		Hg Part. (µg/Nm^3)	Hg Elem. (µg/Nm^3)	Hg Oxid. (µg/Nm^3)	Hg Tot (µg/Nm^3)	Hg Tot (µg/Nm^3)	Hg Tot (µg/Nm^3)	Hg Tot (µg/Nm^3)
Baseline	Inlet	0.47	7.71	2.38	10.55	9.25	NA	11.75
Baseline	Outlet	0.00	10.63	0.45	11.08	11.69	9.4	10.21
RE (%)					-5.04	-26.33		13.16
Long-Term	Inlet	0.01	8.52	0.90	9.43	11.55	13.24	12.90
Long-Term	Outlet	0.01	0.37	0.10	0.49	0.89	0.8	0.79
RE (%)					94.81	92.34	93.96	93.88

Effectiveness of DARCO® Hg-LH on Multi-Metals

Results from EPA M29 multi-metals measurements collected during baseline testing are presented in Figure 19. As shown, many of the species measured at the outlet of the fabric filter were below the detection limit of the technique. Selenium and thallium levels were below the detection limit at the inlet. At least 50% removal was measured for several elements including arsenic, barium, chromium, cobalt, copper, and nickel. All of these except arsenic should be in the particulate phase at the fabric filter and readily removed.

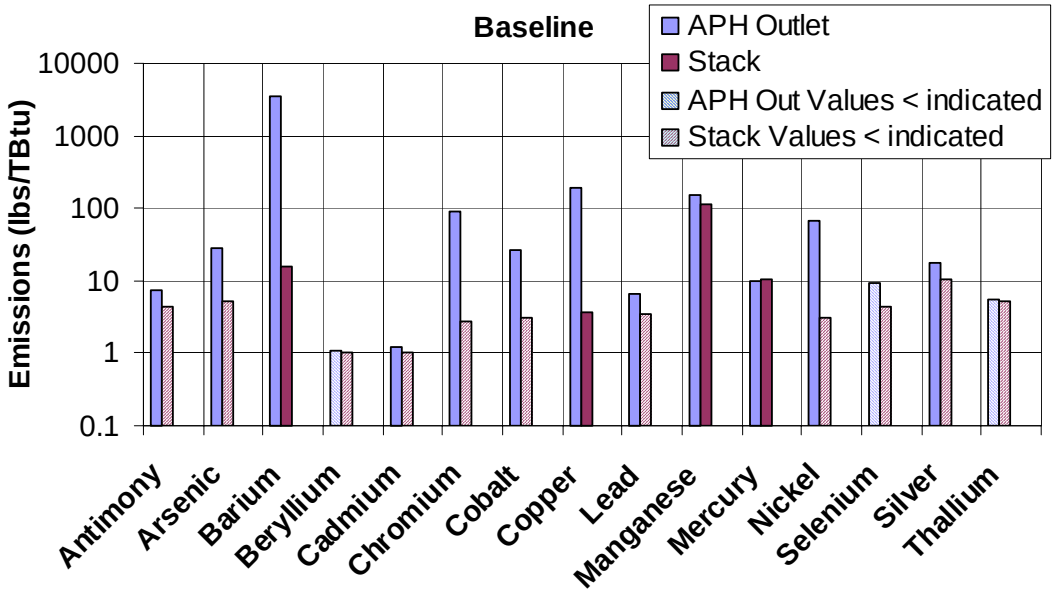


Figure 19. EPA Method 29 Measurements from Baseline Test Period.

EPA Method 29 measurements were also made during the long-term test period. These data are included on Figure 20. The outlet measurements for all elements except barium, copper, and mercury were below the detection limit for the method. These results are compared to the measurements from the baseline test period in Figure 21. As shown, the removal for many elements including arsenic, lead, mercury, and silver is higher during continuous DARCO® Hg-LH injection. The data are not definitive for many of the elements because of the limited method detection limits. The full Method 29 test reports for baseline and long-term testing are included in Appendices E and G.

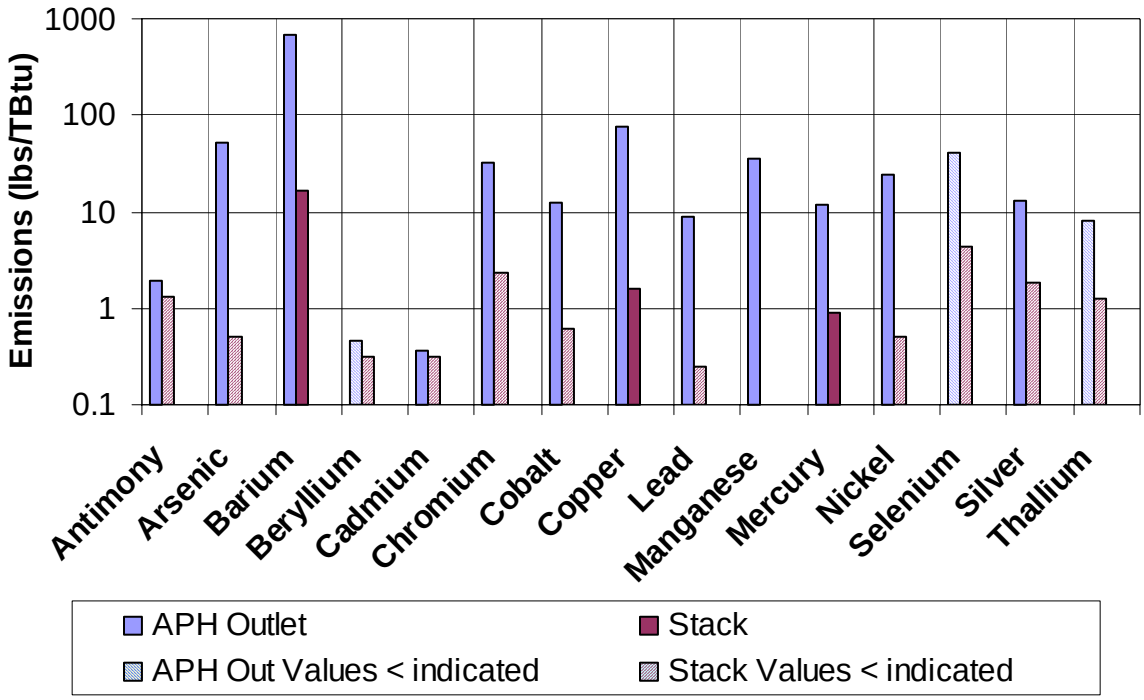
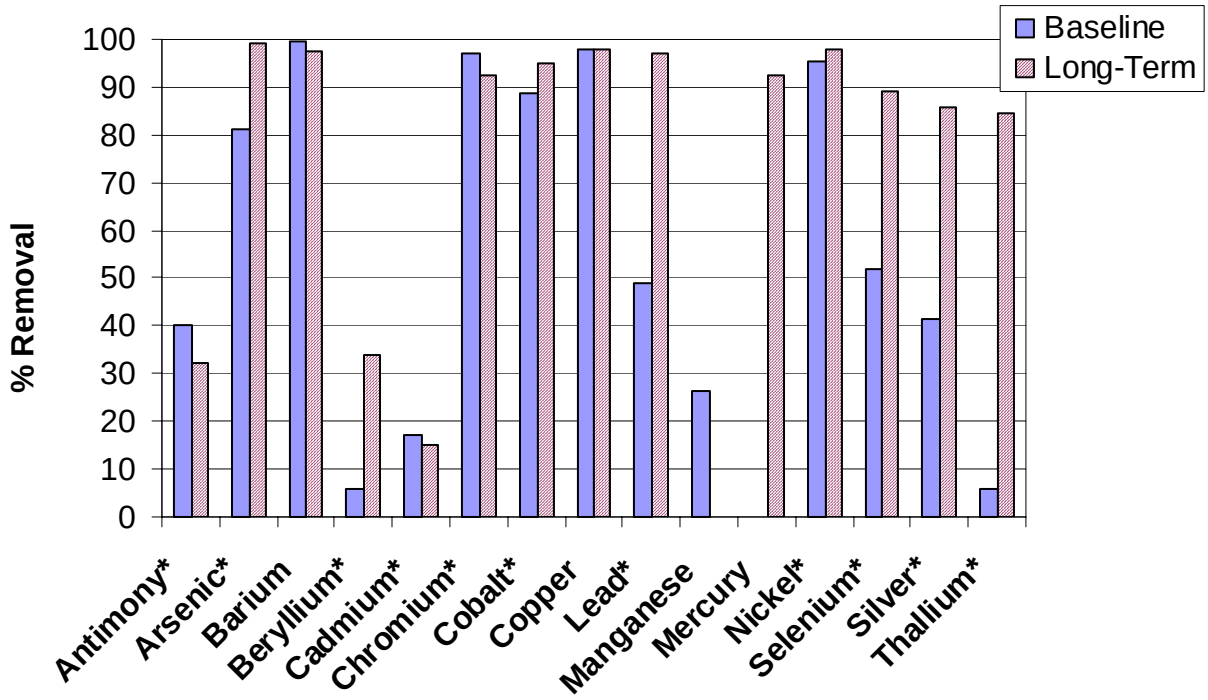


Figure 20. EPA Method 29 Measurements from Long-Term Test Period.



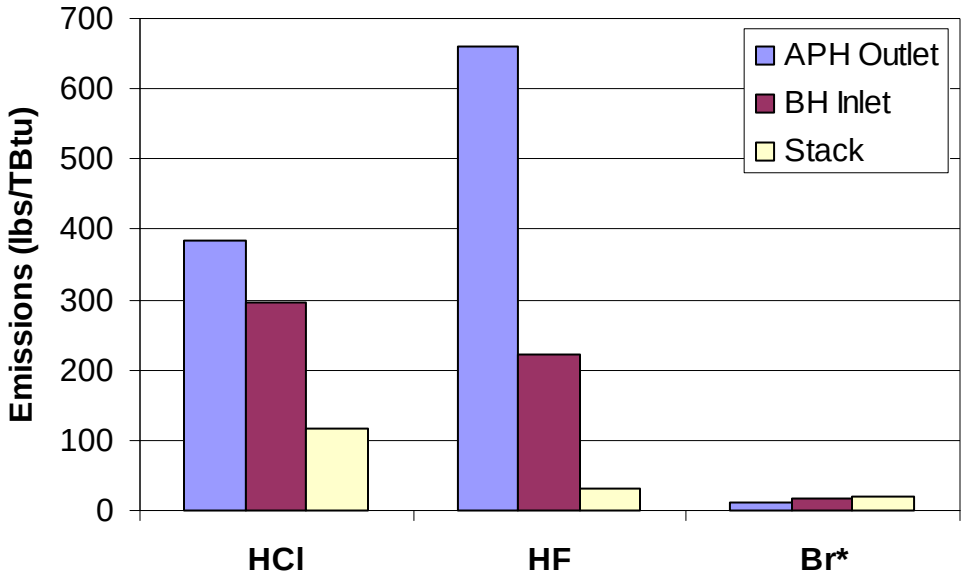
*** Levels measured were below detection limit Removal efficiencies reported might be greater than reported.**

Figure 21. Multi-Metal Removal during Baseline and DARCO® Hg-LH Injection.

Effectiveness of DARCO® Hg-LH on Halides

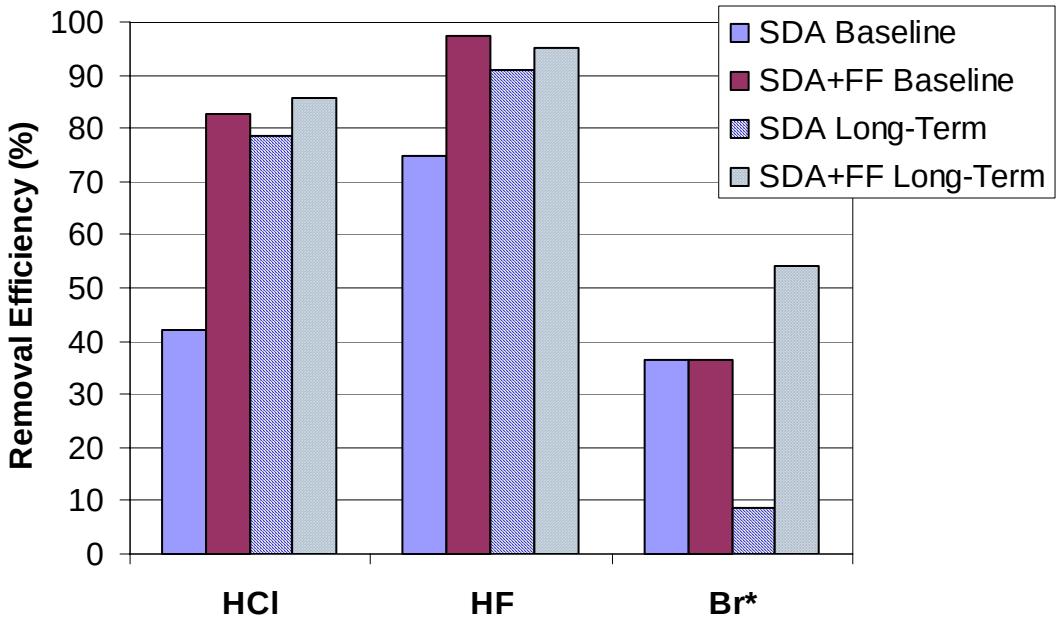
Results from EPA M26A measurements indicate that the SDA and fabric filter combination is fairly effective at removing HCl and HF. More than 40% of the HCl was removed in the SDA and a total of nominally 80% was removed across the SDA and FF combined. The removal effectiveness was higher for HF with over 70% removed in the SDA and more than 90% across the SDA and FF. The combined HBr/Br_2 levels were below the detection limit for the technique. These results are presented in Figure 22 and Figure 23.

DARCO® Hg-LH injection did not appear to affect the removal effectiveness of the SDA or FF for HCl or HF removal. The SDA-FF system did appear to be more effective at removing vapor-phase bromine, but these numbers were near or below the detection limit for the technique and should be reviewed with caution. These results are presented in Figure 23. The full EPA Method 26A test reports are included in Appendices E, F, and G.



***Br levels below method detection limit. Removal efficiencies reported might be greater than reported.**

Figure 22. Results of EPA Method 26A Measurements during Baseline Testing.



***Br levels below method detection limit. Removal efficiencies reported might be greater than reported.**

Figure 23. Comparison of Halide Removal across SDA and FF at Holcomb without and with DARCO® Hg-LH Injection (Baseline and Long-Term).

Characterization of Process Solids and Liquids

Several process samples were collected during mercury control testing at Holcomb. These were analyzed for their mercury content and compared to gas-phase measurements. Other tests were also conducted including determining the halogen content of select coal and fly ash samples and evaluating the leaching characteristics of the fly ash samples.

Three ash samples were submitted for mercury analyses to four laboratories for quality assurance purposes. The results, presented in Figure 24, indicate that three laboratories reported mercury concentrations within 6% of each other. One laboratory reported concentrations more than 30% lower than the average of the other three labs. Laboratories were chosen for the bulk of the tests based upon performance in these inter-laboratory comparison tests.

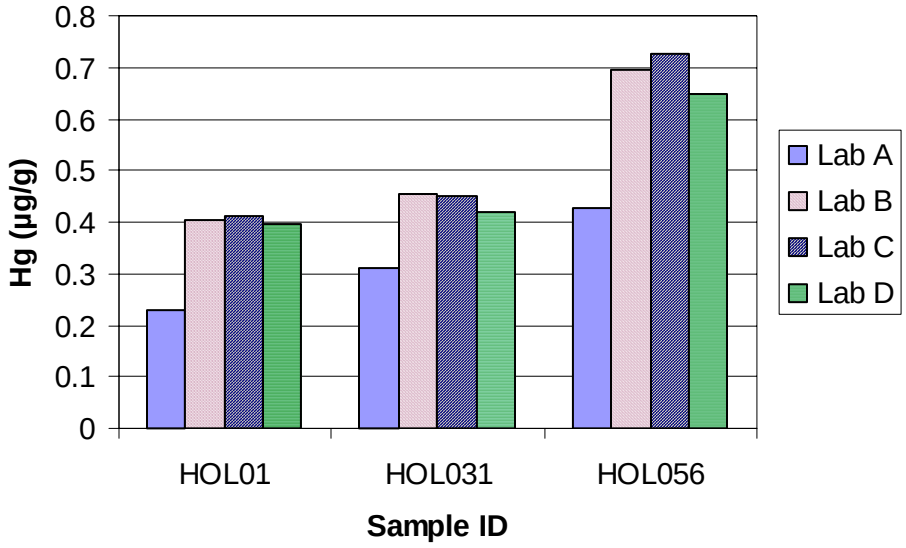


Figure 24. Inter-Laboratory Variability in Fly Ash Mercury Concentrations.

Mercury and Halide Analyses

Results from analyses of the mercury, chlorine, fluorine, bromine, and sulfur levels in the coals fired during the baseline and coal blending tests are presented in Table 13. The results indicate that the only parameter included on the table that changed significantly from baseline PRB levels during the coal blend test was the chlorine. The West Elk coal contains over ten times the chlorine as the Black Thunder, resulting in an estimated chlorine concentration for the two blended coal tests of 15 and 22 µg/g. Even at the low blend ratio, the chlorine concentration is nearly twice the concentration in Black Thunder.

Although the estimated coal mercury, fluorine, and bromine levels during blend testing were similar to the baseline Jacobs Ranch coal samples, the concentrations of chlorine, fluorine, and bromine were highest in the hopper ash samples collected during the blend tests. This would suggest that the coal burned during the blend test contained more "active" particulate, such as high surface area carbon particles. This may have contributed to the improved mercury removal with blending. Mercury content in the ash collected during the first blend is only ~12% higher than compared to baseline levels; however, data from the mercury analyzers suggested 50% mercury removal from the flue gas. It should be noted that each blend test was relatively short (~36 hours) and the sample collected may not be representative of testing conditions. These data are presented in Table 14.

The carbon content of the ash increased slightly (nominally 0.2%) during the blending period, as shown on Table 14. For reference, injecting 0.7 lb/MMacf of activated carbon upstream of the SDA at Holcomb would increase the carbon content of the ash by 0.2%. Recent evaluations on the effect of unburned bituminous carbon on mercury removal on pilot-scale combustors firing PRB coal suggest that low levels of unburned carbon may result in significant improvements in mercury removal.[6,7] This increase in carbon may have contributed to the significant increase in mercury removal observed at Holcomb during the coal blend test.

Table 13. Results from Coal Analyses (Dry Basis) Collected during Blend Test Period.

Coal	Hg (µg/g)	Cl (µg/g)	F (µg/g)	Br (µg/g)	S (%)
Jacobs Ranch (PRB)	0.105	7.9	76	1.82	0.56
Black Thunder (PRB)	0.077	8.0	80	0.56	0.32
West Elk (W. Bit)	0.103	106	84	1.38	0.93
Blend 1 (est)	*0.079*	*15*	*80*	*0.62*	*0.36*
Blend 2 (est)	*0.081*	*22*	*81*	*0.68*	*0.41*

Table 14. Mercury Halide and Carbon Concentration in Fly Ash Samples Collected during Coal Blend Test Period.

Description	Coal	% Carbon	Hg (µg/g)	Cl (µg/g)	F (µg/g)	Br (µg/g)
SDA inlet ash	100% JR	<0.5	0.016	---	---	---
SDA inlet ash	Blend 1	<0.5	0.015	---	---	2.19
SDA inlet ash	Blend 2	0.76	0.089	---	---	1.18
A9 ash	100% JR		0.405	841	978	38
A9 ash	Blend 1		0.453	---	---	60.3
A9 ash	Blend 2		0.696	1,100	1,390	69

Initial calculations suggest that very little mercury was collected with the ash at the inlet to the SDA during the coal blending tests (0.11–0.64 µg/Nm3, or 1.1–6.3% of the incoming mercury). The mercury concentration on the ash collected in the fabric filter was higher than on the SDA inlet sample. This indicates that additional mercury was removed either in the SDA or on the fabric filter dustcake during the coal blending tests. The estimated mercury removal based on coal and ash data is shown in Table 15. In this table, mercury in the coal and ash in µg/g is used to calculate an estimated mercury concentration. These data suggest that the mercury removal was nearly 25% during baseline testing compared to insignificant removal measured with the mercury analyzers, and limited to 55% at the high blend ratio compared to 76–81% removal with the mercury analyzer and M324 techniques. If the inlet measurements from the analyzers of 5.3–5.8 µg/Nm3 are used for the removal calculation instead of the 10.12 µg/Nm3 based on the coal analysis, the estimated removal during the second blend test is nominally 90%. It is not clear why there was a discrepancy between the mercury concentration predicted by the coal and what was measured in the duct during the coal blending tests. Although some operational problems were experienced with the mercury SCEMs during coal blend tests, EPA draft M324 measurements were also made to check the results and these matched fairly well with the

SCEM measurements. Recall that the entire coal blend test period at Holcomb was limited to 36 hours. The ash sample collected for analysis may include some ash from coal fired before the blend test started, which would result in a low mercury value.

Table 15. Estimated Mercury Concentrations in Flue Gas based on Coal and Ash Samples Collected during Blend Test Period.

Description	Coal	*Est. Hg from coal µg/Nm^3*	*Est. Hg on particulate µg/Nm^3*	*Calculated % Hg on ash*
Baseline	100% JR	*13.13*		
SDA inlet ash	100% JR		0.12	0.9
A9 ash	100% JR		3.27 [a]	24.9 [b]
Blend 1		*9.88*		
SDA inlet ash	Blend 1		0.11	1.1
A9 ash	Blend 1		3.66 [a]	37.0 [b]
Blend 2		*10.12*		
SDA inlet ash	Blend 2		0.66	6.5
A9 ash	Blend 2		5.61 [a]	55.5 [b]

[a] Estimate assumes 9% lime in baghouse ash; ash loading from combustion calculations.
[b] Based upon coal and ash analyses.

Additional ash analyses were conducted to determine if the mercury concentration varied throughout the fabric filter. Baseline data, presented in Table 16, show mercury concentrations in the A-side hoppers and suggest there is little difference from hopper to hopper.

Table 16. Mercury Concentration in Fly Ash Samples Collected during Baseline Testing; March 29, 2004.

Hopper Description	Hg in ash, µg/g
A4	0.393
A9	0.405
A11	0.432
A13	0.356

Mercury variation throughout the fabric filter was also evaluated for samples collected during the long-term test period. The variation in the mercury concentration measured in the hopper ash from front to back is presented in Figure 25. In general, the mercury concentration is fairly consistent in the hopper samples. It does appear that the mercury concentration in the front hopper, A8, is slightly lower than in the other hoppers, and the concentrations in the back hoppers, A13 and A14, are typically slightly higher than average. The variation from side-to-side by row is presented in Figure 26. As shown, there are a few low values in the outer rows (A1-7 and B8-14), but in general there is little difference throughout the hoppers.

The mercury concentration in the in-situ ash sample is also included in Figure 25. As shown, nominally 20% of the mercury was collected with the fly ash at the SDA inlet location, which was approximately 2 seconds downstream of carbon injection. This suggests that most of the mercury was captured in the SDA and fabric filter.

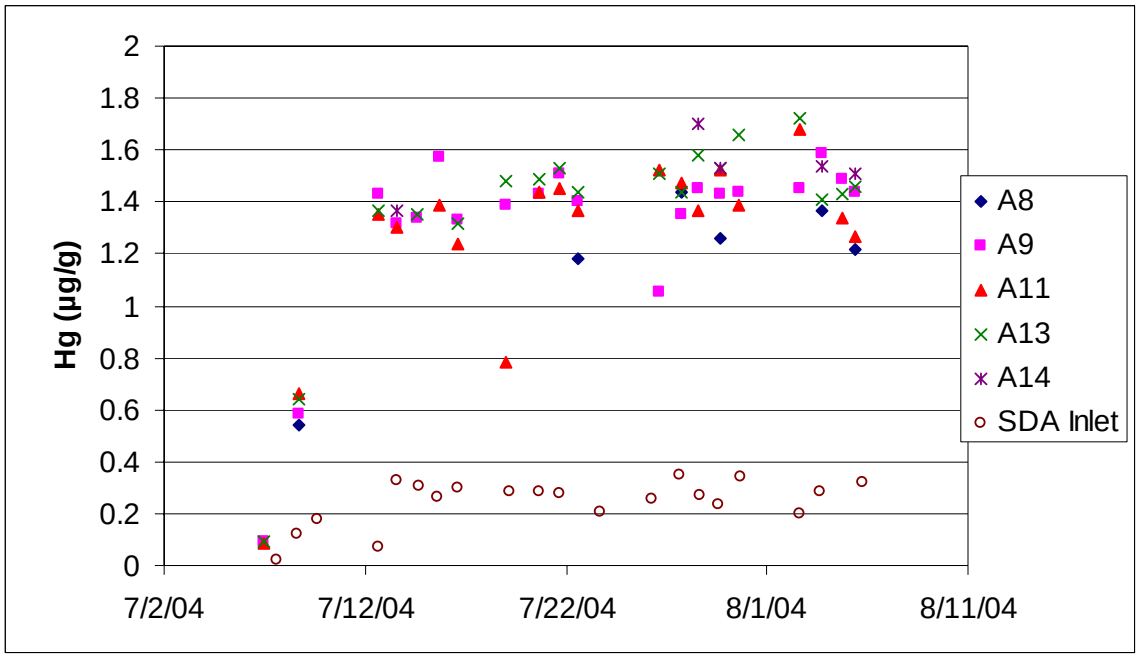


Figure 25. Mercury in Ash Samples Collected during Long-Term Testing—Variation Front to Back.

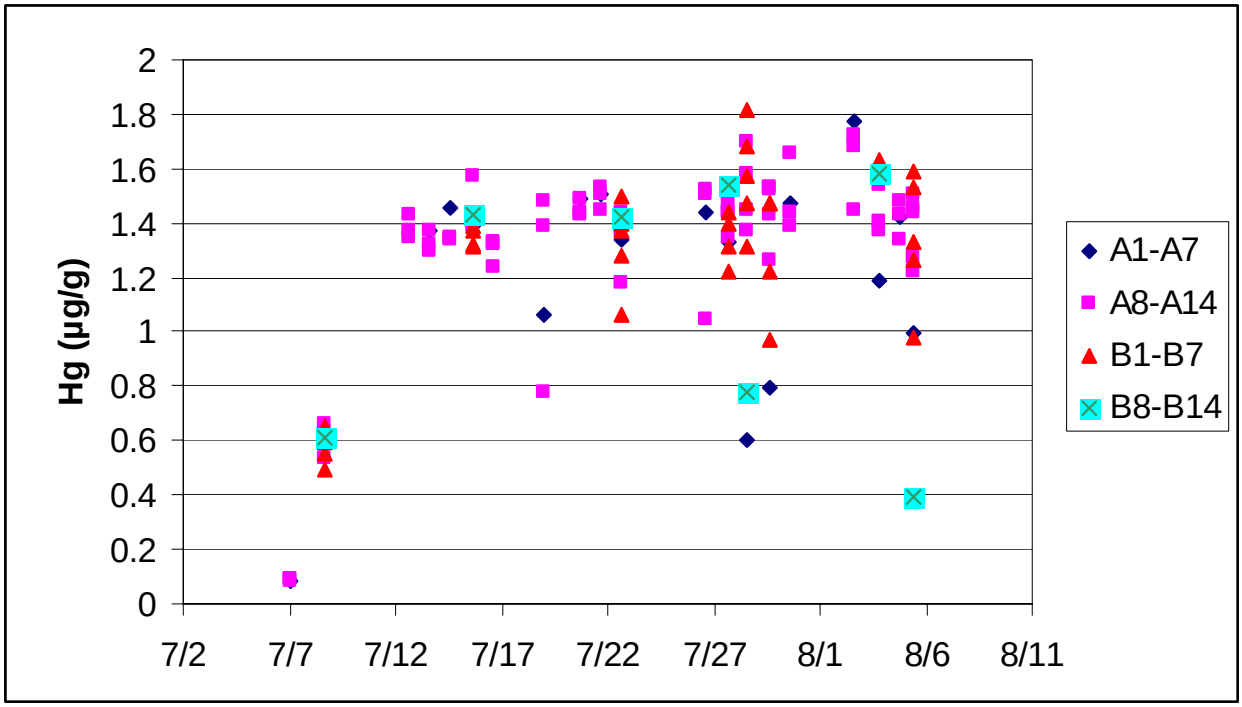


Figure 26. Mercury in Ash Samples Collected during Long-Term Testing—Variation by Module.

The estimated mercury concentration in the flue gas due to mercury in the coal and the fraction of mercury removed from the gas based on ash analyses can be calculated. For the long-term test period, these calculated values were shown in Figure 18. As shown, the mercury projected from coal values is similar to the mercury measured by the SCEMs. The projected fraction of mercury removed by the ash is somewhat lower than the difference in the measurements made at the inlet of the SDA and the outlet of the FF by the SCEMs.

During one day of the long-term test period, several samples were collected to assure that no sources or sinks of mercury were being neglected in the analysis. Samples included the obvious coal, ash, and lime feed, and also included the coal dust suppression agent and SDA recycle water. The results, shown in Table 17, suggest that there were no other sample streams with significant levels of mercury to alter the mass balance presented in Figure 18. It is curious that the coal dust suppression agent contains a fair amount of mercury (2.6 µg/g) compared to the other samples, but since very little is used in the system, it is not a significant contributor to the overall mercury content.

Table 17. Mercury Content in Samples Collected at Holcomb Station; July 28, 2004.

Sample Type	Hg (µg/g)	Hg (ng/l)
Coal	0.07356	
Chemical Dust Suppression Agent	2.615	
Bottom Ash	0.002	
Economizer Ash	0.005	
Air Heater Fly Ash	0.005	
Hopper Ash (Average)	1.45	
Pebble Lime	0.009	
Lime Slurry (ng/l)		4.08
SDA Recycle Water (ng/l)		10.01
Land Fill Ash/Soil	0.005	

Coal quality data for trains delivered to Holcomb during the parametric and long-term tests are included in Appendix B. During these periods, coal from the Jacobs Ranch, Cordero, and Caballo Rojo mines were fired at Holcomb. Data from the coals fired during the coal blending test are included in Table 18. Ultimate and proximate analyses of other select coals are included in Appendix B.

Table 18. Results from Jacobs Ranch and West Elk Coal Analyses.

Analyte	As-Received			Dry Basis		
	Black Thunder	Jacobs Ranch	West Elk	Black Thunder	Jacobs Ranch	West Elk
Hg (µg/g)	---	---	---	0.0771	0.105	0.103
Br (µg/g)	---	---	---	0.496	1.82	1.38
Cl (µg/g)	---	---	---	8	7.9	106
F (µg/g)	---	---	---	80.2	76	84
Proximate						
Total moisture (wt%)	27.09	26.14	4.29	---	---	---
Ash (wt%)	4.78	5.36	9.9	6.56	7.26	10.34
Total sulfur (wt%)	0.23	0.41	0.89	0.32	0.56	0.93
Heating value (Btu/lb)	8,879	8,897	12,460	12,179	12,046	13,018
Volatile matter (wt%)	30.92	32.14	37.16	42.41	43.51	38.83
Fixed carbon (wt%)	37.21	36.36	48.65	51.03	49.23	50.83
Ultimate						
Total moisture (wt%)	27.09	26.14	4.29	---	---	---
Ash (wt%)	4.78	5.36	9.9	6.56	7.26	10.34
Total sulfur (wt%)	0.23	0.41	0.89	0.32	0.56	0.93
Carbon (wt%)	53.3	51.89	71.14	73.1	70.25	74.33
Hydrogen (wt%)	6.77	6.44	5.34	5.13	4.76	5.08
Nitrogen (wt%)	0.7	0.75	1.58	0.96	1.02	1.65
Oxygen (by difference) (wt%)	34.22	35.15	11.15	13.94	16.16	7.67
Mineral Analysis (wt%)						
SiO_2	---	---	---	36.02	29.21	51.44
Al_2O_3	---	---	---	15.37	14.76	22.96
TiO_2	---	---	---	1.17	1.13	0.75
Fe_2O_3	---	---	---	5.47	5.88	8.42
CaO	---	---	---	19.61	20.44	3.03
MgO	---	---	---	3.97	3.94	1.19
K_2O	---	---	---	0.49	0.33	0.75
Na_2O	---	---	---	1.39	1.57	2.67
SO_3	---	---	---	12.58	18.28	7.82
P_2O_5	---	---	---	1.14	0.81	0.46
SrO	---	---	---	0.29	0.26	0.31
BaO	---	---	---	0.56	0.49	0.29
MnO_2	---	---	---	0.02	0.02	0

Leaching Stability and Thermal Desorption (Hg and Halogens)

Analyses were conducted on ash samples collected during the baseline and long-term testing phases to determine the stability of mercury and bromine. Two leaching procedures were conducted: Method 1311, Toxicity Characteristic Leaching Procedure (TCLP) and the Synthetic Groundwater Leaching Procedure (SGLP). The TCLP procedure measures metal mobility, primarily As, Ba, Cd, Br, Se, and Ag, in a sanitary landfill. The TCLP extraction fluid recipes were developed by computer modeling to simulate a worst-case scenario where the waste is co-disposed with municipal solid waste. For highly alkaline samples, such as those from Holcomb, a solution with a pH of 4.93 buffered using sodium hydroxide is used. TCLP is the only leaching procedure approved for characterizing hazardous waste under RCRA. The SGLP procedure was developed by Hasset at EERC to better simulate the pH of groundwater to determine if mercury will leach from the samples under conditions designed to simulate actual field conditions. The leaching solution is synthetic groundwater. Thermal desorption tests were conducted to determine the thermal stability of the samples in air.

The TCLP results are shown in Table 19. The leach of the long-term sample was repeated for quality assurance. The duplicate sets of data for this sample agree well. Mercury concentration in the leachate from the baseline sample was higher than that from the long-term sample. Recall that the mercury concentration in the ash samples collected during the long-term tests was on average 1.45 µg/g, which is nominally ten times the mercury concentration measured in the ash sample collected during baseline testing. This indicates that the activated carbon is fairly effective at retaining mercury during the leach. Chromium and barium concentrations in the leachate were also lower in the long-term samples than in the baseline. Arsenic, cadmium, and lead were below detection limits in all leachates; chromium was below detection limits in the leachate from the long-term samples. Selenium concentration in the leachate from the long-term samples was about twice that of the leachate from the baseline sample. Based on these data and the Method 29 measurements, it appears that the activated carbon is adsorbing gas-phase selenium in a form that is leachable via TCLP.

Table 19. TCLP Results from Holcomb Ash Samples.

	Baseline (µg/L)	Long-Term (µg/L)	Long-Term (repeat) (µg/L)	Acceptable RCRA levels (µg/L)
As	<4	<4	<4	500
Ba	1	0.558	0.535	100,000
Cd	<0.6	<0.6	<0.6	1,000
Cr	12	<2	<2	5,000
Pb	<4	<4	<4	5,000
Hg	0.089	0.032	0.04	200
Se	48	87	81	1,000
Ag	<0.6	<0.6	<0.6	5,000

The SGLP results from samples collected at Holcomb are presented in Table 20. As shown, the levels of mercury are below the detection limit for samples collected during both the baseline and long-term tests. The levels of bromine leached from long-term sample are much higher than from the baseline sample. In both cases, >95% of the bromine contained in the ash leached in the 30-day SGLP test. Since DARCO® Hg-LH is a brominated material, bromine levels in the long-term ash samples are higher. The level of chlorine in the leachate remained unchanged from baseline to the long-term sample. The levels of fluorine and iodine in the leachate from the long-term sample both increased.

Table 20. SGLP Results for Select Holcomb Samples.

	Baseline (mg/L)		**Long-Term Testing (mg/L)**	
	SGLP 18-hr	SGLP 30-day	SGLP 18-hr	SGLP 30-day
As	<0.005	<0.005	<0.005	<0.005
Br*	1.48	1.55	10.10	10.40
Cl	4.40	4.60	4.50	4.70
F	0.22	0.18	.66	.73
I	<0.05	0.05	.10	.13
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Se	0.045	0.033	0.038	0.02626

**** A bromine-based water treatment chemical is used for the spray dryer feed water and may have influenced the leaching results.***

Holcomb dry landfills fly ash generated at the plant. Because of the pozzolanic characteristics of PRB ash, most plants firing 100% PRB dry landfill ash not sold for cement. Model studies estimate that it takes nominally 100 years for moisture to migrate through the Holcomb landfill. The ratio of water to ash for the SGLP test, 20:1, obviously does not represent conditions in the Holcomb landfill. It is expected that leaching results obtained during this program represent a worst-case scenario for dry landfills that are properly managed.

Because Holcomb dry landfills their ash and brominated activated carbon was specifically designed for use at plants firing low-halogen coals like PRB, it is difficult to gain a perspective on the significance of the bromine leaching data for similar plants. If a plant that ponds their ash chose to use brominated activated carbon, bromine leaching can be important because halogens can contribute to the formation of trihalomethanes (THM) when they react with organic matter in lakes or streams. For example, chloroform is a THM that forms when free chlorine reacts with dissolved organics. Chloroform is considered by the EPA to be a carcinogen. For reference, the primary drinking water standards indicate that the maximum contaminant level for THMs is 0.1 mg/L. According to the American National Standards Institute, the recommended residual bromine in swimming pool water is 1–2 mg/liter, and the level of bromine in seawater is 65 mg/liter. Bromine in discharge water is typically not included in the operating permits of most plants.

In addition to leaching studies, mercury thermal desorption analyses were carried out on samples collected during the baseline and long-term test periods. In these experiments, the samples were heated from a temperature of 22ºC, at a rate of 25°C/minute, to 750°C. The mass of mercury desorbed was measured as a function of temperature. The results in terms of the amount of mercury desorbed at each peak per gram of original sample are presented in Table 21 and Figure 27. The long-term sample was repeated for quality assurance and the thermal desorption curve was very reproducible.

Table 21. Thermal Desorption Peaks and Amount of Mercury Evolved from each Peak, when Samples were Heated from 22ºC to 750ºC, at 25ºC/min.

	Baseline		**Long-Term**		**Long-Term (repeat)**	
Peak	***T, °C***	***ng/g***	***T, °C***	***ng/g***	***T, °C***	***ng/g***
1st	240	56.2	315	1,482.6	318	1,585.6
2nd	338	33	460	49.9	463	65
3rd	425	26.6	497	60.7	497	43.6
4th	524	33.4	696	23.2	643	2.8
Total		*149.2*		*1,616.5*		*1,696.9*

The baseline ash sample evolved mercury at four different temperatures: 240, 338, 425, and 524ºC (464, 640, 797, 975ºF). Approximately equal amounts of mercury were evolved at these temperatures. In contrast, no measurable mercury was released from the long-term ash samples until the temperature reached 224ºC (435ºF), the leading edge of the first mercury desorption peak. More than 90% of the mercury evolved in the first peak, with the highest level at 315–318ºC (599–604ºF). Minor amounts (less than 5% of the mercury) evolved at higher temperatures for both the baseline and long-term samples.

The comparison of the baseline and long-term samples suggests that mercury is bound to these samples in different forms because the desorption peaks occurred at different temperatures for the two samples. Connie Senior, Reaction Engineering International, suggests that when activated carbon is injected into the duct, *there is no "native" mercury capture by the fly ash*; instead, the more reactive activated carbon reacts with gaseous mercury before reacting with fly ash. This is an important result when assessing the effectiveness of activated carbon. The effectiveness of activated carbon is often described as the ability of the material to remove mercury above that achieved during baseline conditions. The thermal desorption results for Holcomb suggest that the activated carbon preferentially removes mercury that would be otherwise collected by the native fly ash in addition to any incremental increase in the mercury removal. At Holcomb, where little baseline mercury was noted, this subtle difference is not as apparent as it might be at a site with significant baseline mercury removal. The mercury also appears to be stable in the ash containing activated carbon up to 224ºC.

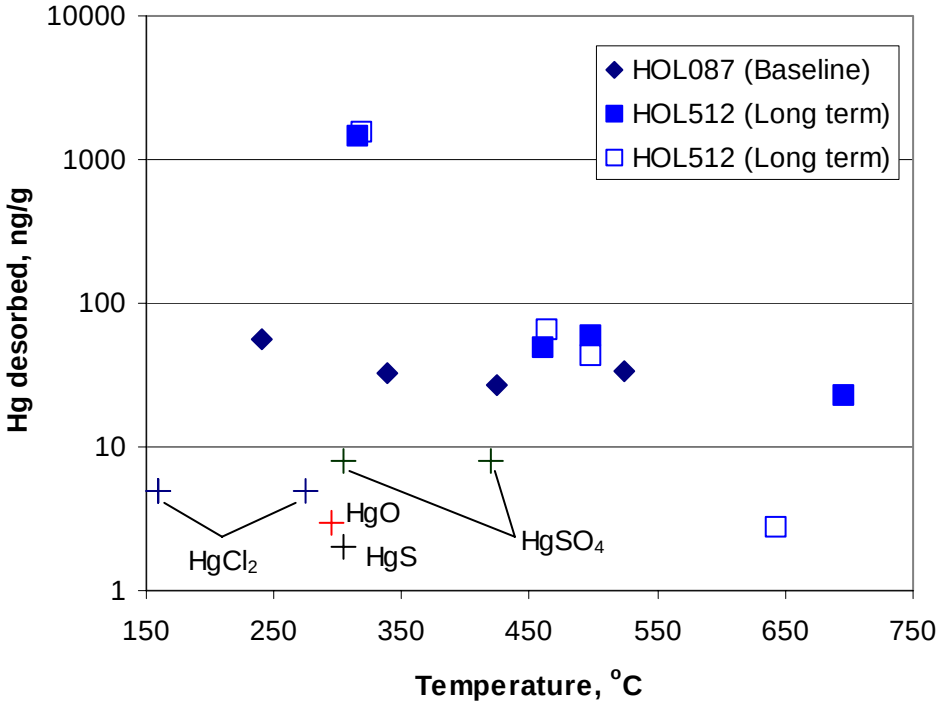


Figure 27. Mercury Desorption (ng/g) at Different Temperatures Compared to Thermal Desorption of Different Mercury Compounds in Argon.[8]

The thermal desorption of pure mercury compounds in argon[8] is shown below the ash results from Holcomb in Figure 27. The x-axes of the two graphs are aligned for data comparison. The primary desorption peak from the long-term sample appears closest to the peaks for HgO or HgS. $HgCl_2$ and $HgSO_4$ do not seem to be a significant component in the long-term sample, but may be responsible for some of the peaks observed in the baseline desorption data. The report from Reaction Engineering International discussing the thermal desorption in more detail is included in Appendix I.

The thermal stability of bromine in a sample of hopper ash collected during the long-term test period was also evaluated. The technique used for analysis consisted of measuring the bromine concentration in the baseline sample, heating portions of the sample to various temperatures from 150 to 400ºF, and subsequently measuring the bromine remaining on each heated sample. As shown in Figure 28, the amount of bromine retained on the sample after heating up to 400ºF remained relatively unchanged, indicating the bromine collected on the sample is thermally stable within this temperature range.

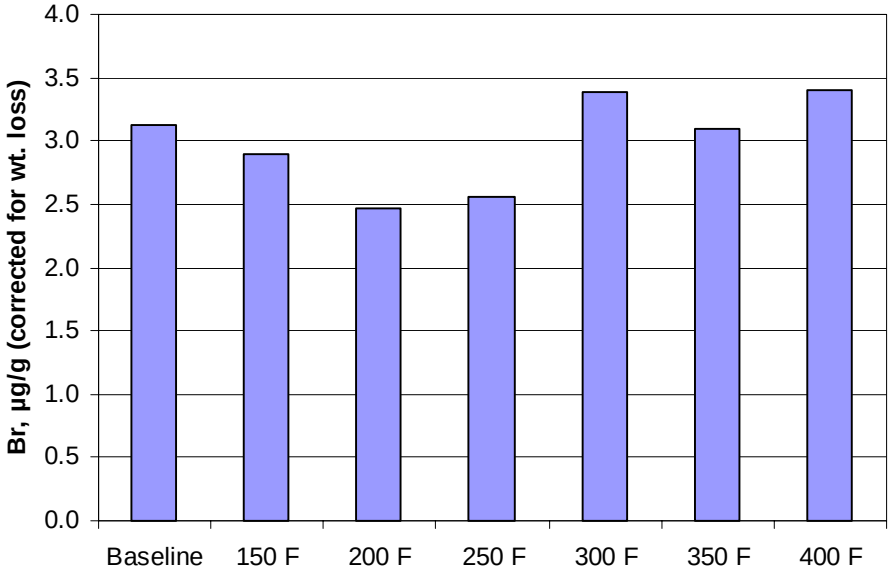


Figure 28. Thermal Desorption of Bromine from Long-Term Sample Collected at Holcomb.

Balance-of-Plant Impacts

An important part of the overall mercury control technology assessment is the impact of the technology on plant operation. At Holcomb, no balance-of-plant impacts were noted as a result of DARCO® Hg-LH injection during the 30-day long-term test. A time trend of the fabric filter pressure drop and stack opacity are compared to the sorbent injection concentration in Figure 29. As shown, neither the pressure drop nor the opacity is affected by the presence of sorbent in the system. The SDA operation in terms of lime milk (lime slurry) feed rate and SO_2 emissions is presented in Figure 30. There is an increase in lime milk feed and resulting decrease in SO_2 emissions near the onset of the long-term test, but this is unrelated to sorbent injection.

Other impacts evaluated included fabric filter bag strength. Although a 30-day test is too short for a full evaluation of the impacts of carbon injection on bag life, the results will indicate if a catastrophic failure is inevitable. A bag was removed from the baghouse, analyzed for strength, and visually inspected. The results indicated that no loss of strength was apparent and no unusual visual features were noted. The analysis report is included in Appendix H. The bag sample was also analyzed for mercury to determine if it might pose a handling concern. The mercury concentration of ash collected on the bag was 1.97 µg/g. This bag was removed approximately one month after the completion of testing and it is expected that the mercury concentration of the ash collected on a bag removed immediately after testing would be at least as high as the average ash concentration (nominally 1.45 µg/g).

A sample of fly ash from a ledge in the fabric filter compartment was analyzed for mercury to determine if the sample would have collected sufficient mercury from prolonged

exposure to become a handling concern for operators changing filter bags. The mercury concentration in the ash collected approximately one month after the completion of testing was 0.319 µg/g. This should not pose a health hazard if the operators practice good personnel protection for particulate matter.

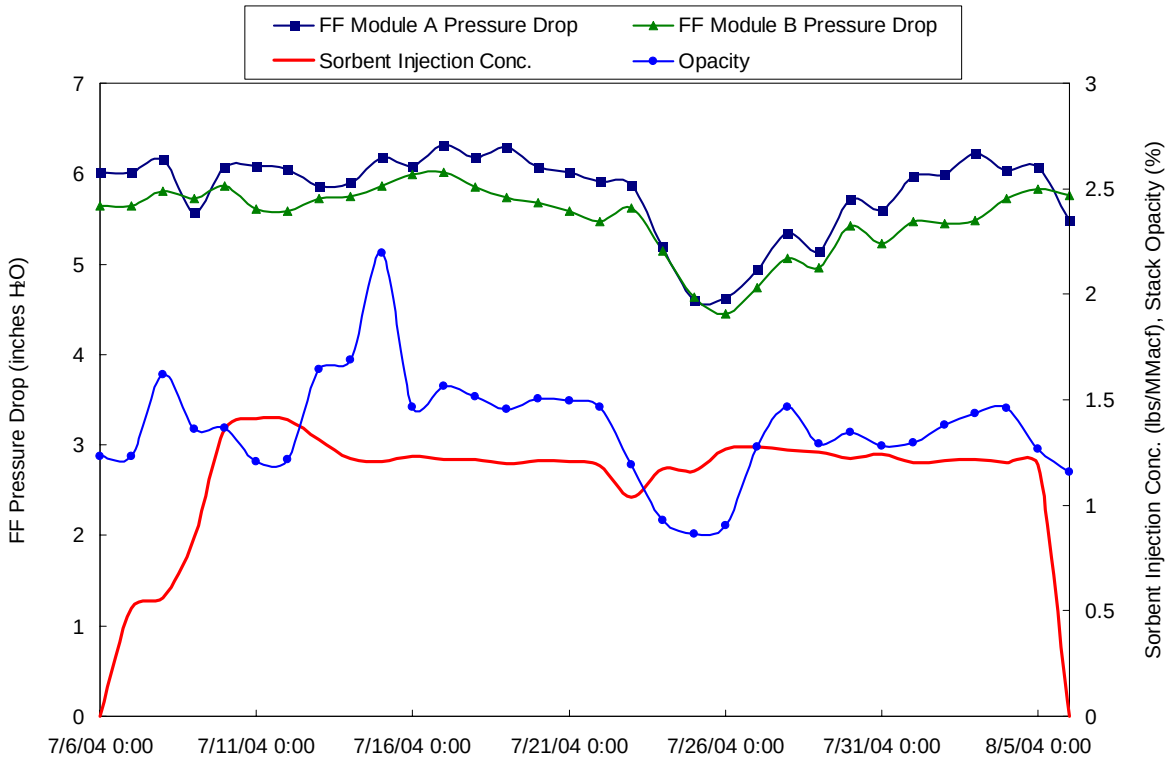


Figure 29. Fabric Filter Operational Trends during Long-Term Testing.

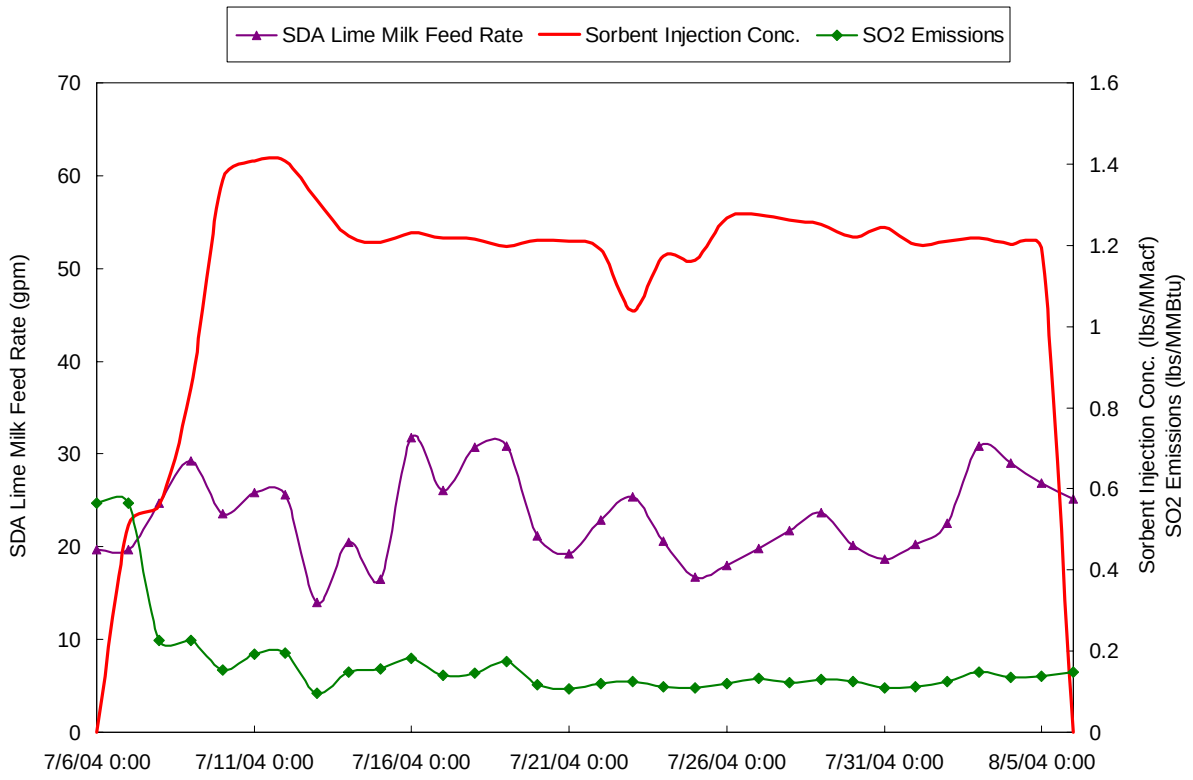


Figure 30. SDA Operational Trends during Long-Term Testing.

ECONOMIC ANALYSIS

After completion of testing and analysis of the data, the requirements and costs for full-scale, permanent commercial implementation of the necessary equipment for mercury control using sorbent injection technology at the 360-MW Holcomb Station Unit 1 were determined. A preliminary cost assessment was also conducted for the other two options: coal blending and the introduction of coal additives with sorbent injection.

Sorbent Injection: Cost Estimate

The cost of process equipment sized and designed based on the long-term test results for approximately 90% mercury control, and on the plant-specific requirements (sorbent storage capacity, plant arrangement, retrofit issues, winterization, controls interface, etc.) have been estimated. The system design was based on the criteria listed in Table 22.

The estimated uninstalled cost for a sorbent injection system and storage silo for the 360-MW Unit 1 is $710,000. Costs were estimated based on a long-term activated carbon injection concentration of 1.2 lb/MMacf. For Holcomb Unit 1, this would require an injection rate of nominally 86 lbs/hr. Assuming a unit capacity factor of 85% and a delivered cost for DARCO® Hg-LH sorbent of $0.73/lb, the annual sorbent cost for injecting sorbent into the existing SDA-FF would be about $467,000.

Results from the field tests conducted to date indicate different levels of mercury removal can be achieved depending on the air pollution control equipment and different flue gas conditions. Data collected from the DOE Phase I tests at Southern Company's Plant Gaston, a unit firing low-sulfur bituminous coal and with a hot-side ESP followed by a COHPAC® unit installed for particulate control, indicate mercury removal levels of up to 90% were obtained when DARCO® Hg was injected upstream of COHPAC®. At We Energies Pleasant Prairie Power Plant, a unit firing PRB coal with a cold-side ESP installed for particulate control, 50–70% mercury removal was achieved while injecting DARCO® Hg. At PG&E's Brayton Point, mercury removal levels of up to 90% were obtained with an ESP collecting bituminous ash with DARCO® Hg sorbent injection. Figure 31 presents a summary of the mercury removal trends measured at four full-scale evaluations and the projected annual sorbent costs of sorbent injection in $/kWh. The sorbent used at each site was DARCO® Hg, except Holcomb (SDA + FF, PRB) which was DARCO® Hg-LH.

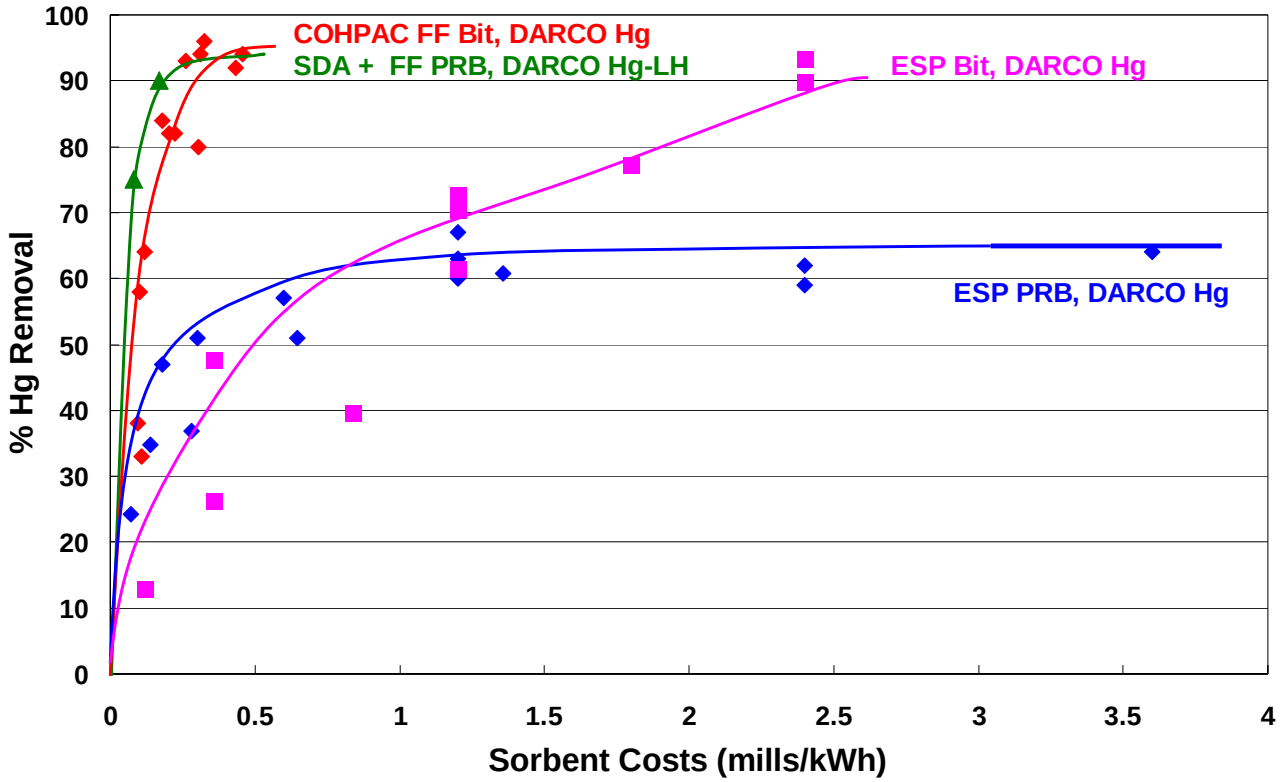


Figure 31. Comparison of Projected Annual Sorbent Costs for ESP, COHPAC® Fabric Filter, and SDA + FF Configurations based on Results from NETL Full-Scale Tests.

Table 22. System Design Criteria for Mercury Control System at Holcomb Unit 1. 1.2 lb/MMacf Injection, >90% Mercury Control.

Parameter	
Number of silos	1
Number of injection trains	2 operating, 1 spare
Design feed capacity/train (lb/hr)	600
Operating feed capacity/train (lb/hr)	43
Sorbent storage capacity (lbs)	70,000
Conveying distance (ft)	200
Sorbent	Powdered Activated Carbon
Aerated Density (lb/ft^3)	18
Settled Density (lb/ft^3)	28
Particle MMD (microns)	18

System Description

The permanent commercial activated carbon injection (ACI) system will consist of one bulk storage silo and three dilute-phase pneumatic conveying systems.

DARCO® Hg-LH sorbent will be received in 40,000-lb batches delivered by self-unloading pneumatic bulk tanker trucks. The silo is equipped with a pulse jet type bin vent filter to contain dusting during the loading process. The silo is a shop-built, dry-welded tank with three mass flow discharge cones equipped with air fluidizing pads and nozzles to promote sorbent flow. Point level probes and weigh cells monitor sorbent level and inventory. Silo sizing was based on the capacity to hold approximately two truckloads of DARCO® Hg-LH sorbent, sufficient for 38 days of operation at the design injection rate.

The sorbent is fed from the discharge cones by rotary valves into feeder hoppers. From the hoppers the sorbent is metered into the conveying lines by volumetric feeders. Conveying air supplied by regenerative blowers passes through a venturi eductor, which provides suction to draw the sorbent into the conveying piping and carry it to distribution manifolds, where it splits equally to multiple injection lances. The blowers and feeder trains are contained beneath the silo within the skirted enclosure.

A Programmable Logic Controller (PLC) is used to control all aspects of system operation. The PLC and other control components will be mounted in a NEMA 4 control panel. The control panel, MCCs, and disconnects will be housed in a pre-fabricated power and control building located adjacent to the silos.

Balance-of-Plant Requirements

Some modifications and upgrades to the existing plant equipment will be required to accommodate the activated carbon injection system. These include upgrades to the electrical supply at Holcomb to provide new service to the ACI system. Instrument air, intercom phones, and area lighting will also be required.

Cost and Economic Methodology

Costs for the sorbent storage and injection equipment were provided by ADA-ES with input from NORIT Americas based on the design requirements in Table 22. NORIT has built and installed dozens of similar systems at waste-to-energy and incineration plants and has provided quotes for several installations at coal-fired power plants for mercury control. ADA-ES provided costs for the distribution manifold, piping, and injection lances. ADA-ES, with input from NORIT, also provided an installation man-hour estimate and crane-hour estimate that were used to develop the installation costs for the NORIT equipment, along with an estimate for foundations including pilings.

EPRI Technical Assessment Guide (TAG) methodology was used to determine the indirect costs. A project contingency of 15% was used. Since the technology is relatively simple and well proven on similar scale, the process contingency was set at 5%. ACI equipment can be installed in a few months; therefore, no adjustment was made for interest during construction—a significant cost factor for large construction projects lasting several years.

Operating costs include sorbent costs, electric power, operating labor, maintenance (labor and materials), and spare parts. An average incremental operating labor requirement of one hour per day was estimated to cover the incremental labor to operate and monitor the ACI system. The annual maintenance costs were based on 5% of the uninstalled equipment cost. Levelized costs were developed based on a 20-year book life and are presented in constant dollars.

Capital Costs

The uninstalled ACI storage and feed equipment costs are estimated at $710,000. The estimated cost for a sorbent injection system and storage silo installed on the 360-MW Unit 1 is $1,309,000 and includes all process equipment, foundations, support steel, plant modifications utility interfaces, engineering, taxes, overhead, and contingencies. Table 23 briefly summarizes the capital and O&M costs.

Table 23. Capital and Operating and Maintenance Cost Estimate Summary for ACI System on Holcomb Unit 1. Annual Basis 2005.

Capital Costs Summary	
Equipment, FOB Holcomb	$710,000
Site Integration (materials and labor)	$53,000
Installation (ACI silo and process equipment, foundations)	$124,000
Taxes	$48,000
Indirects/Contingencies	$374,000
Total Capital Required	$1,309,000
$/kW	$3.64
Operating and Maintenance Costs Summary	
Sorbent @ $.73/lb	$467,000
Power, labor, maintenance	$86,000
Waste disposal	Insignificant
Annual O&M for 2005 ($/kW)	$1.54
Mills/kW-hr	0.21

Operating and Levelized Costs

The most significant operational cost of sorbent injection for mercury control is the DARCO® Hg-LH sorbent. Sorbent costs were estimated for nominally >90% mercury control based on the long-term sorbent injection concentration of 1.2 lb/MMacf. For Holcomb Unit 1, this would require an injection rate of nominally 86 lbs/hr at full load. Assuming a unit capacity factor of 85% and a delivered sorbent cost of $0.73/lb, the annual cost of injecting sorbent at the SDA inlet would be $467,000. Other annual operating costs including electric power, operating labor, and maintenance were estimated to be approximately $86,000.

Because the ash from Holcomb Unit 1 is already disposed of to a landfill, the additional waste disposal costs are insignificant. Assuming an injection rate at full load of 86 lbs/hr, and an 85% capacity factor, sorbent injection will increase the annual disposal costs by less than 1% of the current costs.

Based on these test program results and assuming that sorbent injection at the SDA inlet for mercury control is sustainable, >90% mercury control can be attained at Holcomb Unit 1 for an initial capital investment of $1,309,000 with levelized operating costs of $1.96/kW, or annual constant-dollar levelized costs of $2.38/kW. This information is summarized in Table 24.

Table 24. Levelized Costs Summary.

20-Year Levelized Costs Summary—$Constant	
Fixed Costs	$153,000
Variable O&M	$704,000
Total	$857,000
Total Levelized Costs $/kW	$2.38
Operating Levelized Costs $/kW	$1.96
Operating Levelized Costs mills/kW-hr	0.26
Total Levelized Costs mills/kW-hr	0.32

Preliminary Cost Estimate for Alternate Options

Two other mercury control technologies were also evaluated and showed potential for reducing >80% of the mercury emissions in the flue gas stream. These technologies were coal blending and coal additive coupled with sorbent injection. Blending western bituminous coal with PRB coal, the mercury removal across the system increased to almost 80% even without injecting another sorbent. KNX, a proprietary chemical developed by ALSTOM Power, was found to enhance the performance of a standard activated carbon. Mercury removal of 86% was measured at a carbon feed rate of just 1.0 lb/MMacf. Annual projected material costs for both technologies are included in Table 25. These costs are based upon current market prices and results from short-term parametric testing conditions. Capital and O&M costs for the KNX + DARCO® Hg would include the sorbent injection items included in the previous section and items related to the coal additive feeder. Additional costs for the coal blending option would require a blending facility or the added cost of having blended fuel delivered to the site. Estimating these items was outside the scope of this analysis.

Additional testing over a longer period should be conducted to evaluate balance-of-plant impacts and quantify long-term mercury removal performance for coal blending and coal additive injection.

Table 25. Projected Annual Material and Transportation Costs for Various Mercury Control Technologies Evaluated at Holcomb Station.

Mercury Control Technology	Projected Annual Material and Transportation Costs
Treated Sorbent Injection (DARCO® Hg-LH)	$467,000
Coal Additive + Sorbent Injection (KNX + DARCO® Hg)	$400,000
Coal Blending (western bituminous/PRB) Incremental cost above 100% PRB	$1,700,000

Another analysis was conducted to compare the costs of DARCO® Hg to DARCO® Hg-LH for 90% removal. Results from parametric testing indicate that nominally 5.7 lb/MMacf DARCO® Hg is required to achieve 90% mercury removal compared to 1.3 lb/MMacf for DARCO® Hg-LH. The projected annual material and transportation costs, presented in Table 25, indicate that the cost savings using DARCO® Hg-LH is 67% over using DARCO® Hg at Holcomb. The goals established by DOE/NETL for this program were to reduce the uncontrolled mercury emission by 50–70% at a cost savings of 25–50%. Results from Holcomb testing indicate that these goals were exceeded.

CONCLUSIONS

Power plants that burn PRB coal and have spray dryer absorbers and fabric filters for air pollution control systems represent a challenging application for controlling mercury emissions. Full-scale field tests have confirmed that the spray dryer removes halogens that are critical for the adsorption of vapor-phase mercury onto solid surfaces. The result is very low levels of native mercury removal, typically <20%, at plants with this configuration. In addition, the effectiveness of injecting standard activated carbon is also greatly diminished by the low halogen concentration in the flue gas.

The test program at Holcomb was designed to provide a full-scale evaluation of different technologies that can overcome the limited mercury removal achievable at similar sites. Each technology was based on supplementing certain halogens that are not available in sufficient quantities in these coals.

The program was very successful in that three different technologies were found that have the potential to produce high levels (>80%) of mercury removal in this difficult application. These technologies are:

1. Coal Blending: By blending western bituminous coal with PRB coal, the mercury removal across the system increased to almost 80% even without injecting another sorbent. It is highly likely that firing a blend of Black Thunder and West Elk coals with ACI could result in greater than 90% removal. Results with other coal blends must be evaluated.
2. Chemical Addition to the Coal: KNX, a proprietary chemical developed by ALSTOM Power, was found to enhance the performance of a standard activated carbon. Mercury removal of 86% was measured at a carbon feed rate of just 1.0 lb/MMacf.
3. Chemically Enhanced Sorbent: A proprietary product of NORIT Americas, DARCO®Hg-LH, produced mercury removal in excess of 90% during long-term tests at a carbon feed rate of 1.2 lb/MMacf. Throughout long-term testing, the average outlet mercury emission was less than 1 lb/TBtu.

It should be noted that the first two approaches were tested for very short periods and that ash collected during the coal blend tests indicated a maximum removal of 55% during the high blend test. However, the effects were verified using two different vapor-phase mercury measurement techniques and demonstrated the potential of these technologies. Additional longer-term tests need to be conducted to fully realize their capabilities.

The goals for the program established by DOE/NETL were to reduce the uncontrolled mercury emissions by 50–70% at a cost 25–50% lower than achievable with technologies demonstrated prior to the contract award. The goals of the program were exceeded by achieving 90% mercury removal at a cost savings of 67% over using standard activated carbon. The increase in mercury removal over baseline conditions is defined for this program as a comparison in the outlet emissions measured using the Ontario Hydro method during the baseline and long-term test periods. The increased removal over baseline was 96%.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACI	Activated carbon injection
CVAAS	Cold-vapor atomic absorption spectrometer
CVAFS	Cold-vapor atomic fluorescence spectroscopy
DARCO® Hg	Sorbent manufactured by NORIT Americas. Formerly known as DARCO® FGD
DARCO® Hg-LH	Sorbent manufactured by NORIT Americas. Formerly known as DARCO® FGD-E3
DOE	Department of Energy
EC	Equivalent sorbent injection concentration
ESP	Electrostatic precipitator
FF	Fabric filter
FGD	Flue gas desulfurization
GRE	Great River Energy
ICR	Information Collection Request
kacfm	Thousand actual cubic feet per minute
kW	Kilowatt
MW	Megawatt
NETL	National Energy Technology Laboratory
O&M	Operating and Maintenance
PAC	Powdered activated carbon
PLC	Programmable Logic Controller
PRB	Powder River Basin
SCA	Specific collection area
SCEM	Semi-continuous emission monitor
SDA	Spray dryer absorber
SGLP	Synthetic groundwater leaching procedure
SSD	Sorbent screening device
TAG	Technical Assessment Guide
TCLP	Toxicity characteristic leaching procedure

APPENDIX A

Holcomb Test Plan

DOE NATIONAL ENERGY TECHNOLOGY LABORATORY MERCURY FIELD EVALUATION

Evaluation of Sorbent Injection for Mercury Control at Sunflower Electric's Holcomb Station

Test Plan

Prepared for:
Sunflower Electric Power Corporation
DOE NETL
EPRI

Prepared by:
ADA Environmental Solutions
8100 SouthPark Way, Unit B
Littleton, CO 80120

March 12, 2004

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Project Objectives

The overall objective of this project is to determine the cost and effects of sorbent injection for control of mercury in stack emissions at Sunflower Electric's Holcomb Station, Garden City, Kansas. The project will evaluate the effects of sorbent injection into the spray dryer absorber (SDA) and fabric filter (FF) with two coal types: a subbituminous coal Powder River Basin (PRB) and a blend of PRB and bituminous coal. This evaluation will be conducted on the entire 360-MW flue gas stream when sorbents are injected upstream of the SDA and on one-half of the unit (180 MW) when sorbents are injected into the fabric filter.

Project Overview

This test is part of an overall program funded by the Department of Energy's National Energy Technology Laboratory (NETL) and industry partners to obtain the necessary information to assess the feasibility and costs of controlling mercury from coal-fired utility plants. Host sites that will be tested as part of this program are shown in Table 1. These host sites reflect a combination of coals and existing air pollution control configurations representing 78% of existing coal-fired generating plants (approximately 950 plants producing a combined 245,000 MW) and potentially a significant portion of new plants. These four host sites will allow documentation of sorbent performance on the following configurations:

Table 1. Host Sites Participating in the Sorbent Injection Demonstration Project

	Coal / Options	**APC**	**Capacity (MW) / Test Portion**	**Current Hg Removal (%)***
Sunflower Electric's **Holcomb Station**	PRB & Blend	SDA – Fabric Filter	360 / 180 and 360	0 to 13
Ontario Power Generation's **Nanticoke Station**	PRB & Blend	ESP	500/ 250 and 500	35
AmerenUE's **Meramec Station**	PRB	ESP	140 / 70	10–20 (est)
American Electric Power's (AEP) **Conesville Station**	Bituminous Blend	ESP + Wet FGD	400 / 400	56

* Based upon recent S-CEM and ASTM M6784-02 measurements, except Meramec

The SDA with FF is one of the most likely configurations to be considered for new units burning PRB coal. However, data available through EPA's Information Collection Request (ICR) database[1] and through other EPRI programs indicate that units burning low rank fuels and that are configured with SDAs followed by fabric filters demonstrate particularly low mercury removal[2]. Initial mercury measurements using the

ASTM M6784-02 (Ontario Hydro) at Holcomb indicate 13% mercury removal is achieved in the absence of mercury controls. Vapor-phase measurements using a semi-continuous mercury monitor indicated an average of 0% removal. These results are consistent with trends observed at other plants. Therefore, mercury control testing at Holcomb is critical as Sunflower Electric establishes plans to meet future regulations and for others who either have or are considering SDA with FFs for new installations.

Limited full-scale data are available from mercury control evaluations on units burning low-rank fuels with the SDA + FF configuration. EPRI conducted full-scale carbon injection tests at Great River Energy's Stanton Station Unit 10 in April 2002 and the results suggest that the mercury removal effectiveness of standard, non-chemically treated, activated carbon injected upstream of an SDA and FF was limited. Stanton burns a North Dakota lignite coal with similar calcium and chlorine concentrations to PRB coal. Test results indicated that 70% mercury removal was achieved during parametric testing across the SDA-FF at an injection concentration of 6.1 lb/MMacf of non-chemically treated activated carbon. This injection concentration is much higher than would likely be required for a plant without an SDA-FF (90% removal is expected at an injection concentration of 3 lb/MMacf for a unit without an SDA). It is probable that SDAs on units burning low-rank coals remove a component from the gas, such as HCl, that is critical to the effective removal of mercury with standard activated carbons, but is not necessary for carbon treated with halides such as iodine. For example, injection of 1 lb/MMacf of a carbon treated with iodine resulted in >90% removal at Stanton Station. This was significantly better than the performance of the untreated carbon. Both treated and untreated carbons will be tested at Holcomb.

Host Site Description

Holcomb Station is located near Garden City, Kansas. The unit is a load-following sub-critical 360-MW pulverized coal opposed-fired Babcock & Wilcox Carolina-type radiant boiler designed to burn PRB coal. The existing unit is equipped with three spray dry absorber modules followed by two very low air/cloth ratio reverse air fabric filters. A sketch of the Unit 1 gas path is shown in Figure 1 and a photograph is shown in Figure 2. For activated carbon injection testing with injection upstream of the SDA, the entire 360-MW unit will be evaluated. Tests will also be conducted to determine the mercury removal efficiency when injecting activated carbon between the SDA and fabric filter. If no removal difference is noted between injection upstream or downstream of the SDA, a single fabric filter module, or one-half of the unit, could then be evaluated. Key operating parameters for Holcomb Unit 1 are shown in Table 2. In addition, coal can be manually blended on-site to allow co-firing with 10 to 20% western bituminous coal.

The plant was originally equipped with "first generation" low-NO_x burners for NO_x control. During a recent upgrade, these burners were optimized, and coal flow controls and in-furnace sensors were installed to balance burners and optimize combustion. Installation of a separated over fire air (SOFA) system is scheduled for 2005. These modifications have been done in conjunction with DE-FC26-03NT41418 under DOE's Power Plant Improvement Initiative.

In 2002, Holcomb Unit 1 underwent substantial emissions testing, including the measurement of gaseous hazardous air pollutants and the measurement of mercury removal across the fabric filter. Mercury was measured by two methods: a semi-continuous mercury emission analyzer and ASTM M6784-02 (Ontario Hydro) samples. Results from ASTM M6784-02 measurements are presented in Table 3.

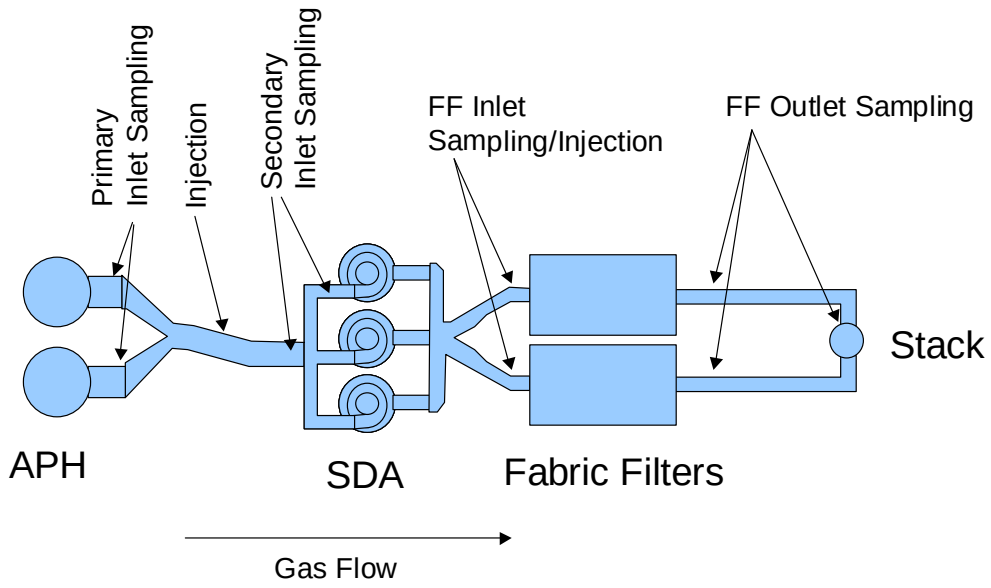

Figure 1. Sketch of Holcomb Unit 1 Spray Dryer Absorber and Fabric Filter Modules.

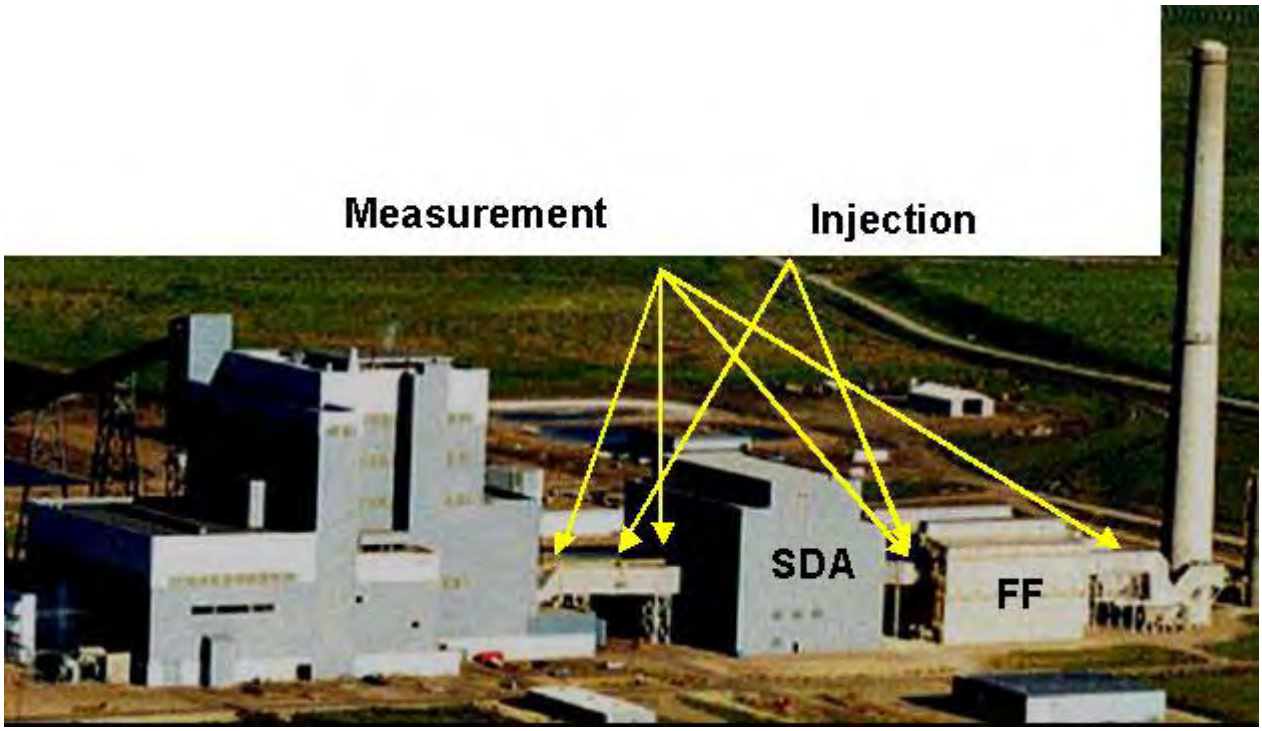

Figure 2. Photo of Holcomb Unit 1.

Table 2. Holcomb Key Operating Parameters

Unit	1
Size (MW)	360
Test Portion (MWe)	180 and 360
Coal	PRB
Heating Value (as received)	8,700
Sulfur (% by weight)	0.4
Chlorine (%)	~0.01
Mercury (μg/g)	0.056
Particulate Control	Fabric Filter (Joy Western)
Sulfur Control	SDA (Niro Joy Western)
Ash Reuse	Disposal

Table 3. Measured and Predicted Mercury Concentrations and Removal Holcomb Unit 1[a]

	Inlet	**Outlet**	**Removal Efficiency**
Particulate (μg/dncm)	1.21	0.01	99.2%
Oxidized (μg/dncm)	3.3	0.9	72.7%
Elemental (μg/dncm)	6.5	8.6	-32.3%
Total (μg/dncm)	10.9	9.5	12.8%

a. Ontario Hydro measurements November 2002. Mercury SCEM measurements made during this period indicate an average of 0% removal.

General Technical Approach

Activities at each test site in this program are divided into the seven tasks shown in Table 4. These tasks provide the outline for the test plan.

Table 4. Site-Specific Tasks

Task	Description
1	Host site kickoff meeting, test plan, and sorbent selection
2	Design and installation of site-specific equipment
3	Field Tests
3.1	Sorbent screening
3.2	Sample and data coordination
3.3	Baseline tests
3.4	Parametric tests
3.5	Long-term tests
4	Data analysis
5	Sample evaluation
6	Economic analysis
7	Site report

Task 1. Host Site Planning and Coordination

Efforts within this task include planning the site-specific tests with Sunflower Electric and Holcomb Station, DOE/NETL, and contributing team members. ADA-ES met with plant personnel on November 5, 2003, to discuss the overall scope of the program, the potential impact on plant equipment and operation, and to gather preliminary information necessary to develop a detailed draft test plan and scope of work. Teleconferences between ADA-ES and corporate personnel have been conducted to discuss the host site agreements and team member cost-sharing arrangements. These efforts will be finalized during this task. Other efforts include identifying any permit requirements, developing a quality assurance/quality control plan, finalizing the site-specific scope for each of the team members, and putting subcontracts in place for manual measurement services.

The host site will be responsible for preparing sampling and injection ports prior to testing. Only one sampling port must be installed for this program. The site will also be responsible for obtaining samples of coal, lime, ash, and SDA byproducts during the testing program. Coal and lime samples should be taken as close as possible to the feeders to represent “as-burned” or as-used samples. However, coal samples should not be collected downstream of the pulverizers because some mercury may be released as a results of heating during the grinding process. Ash samples may be required from several locations within the FF hoppers to reflect the changes in mercury content during the long-term test at different locations in the FF. The SDA byproducts should also be collected at a location that reflects a “real-time” sample during the tests.

Sorbent Selection

A key component of the planning process for these evaluations is identifying potential sorbents for testing. The test program allows for the evaluation of different sorbents including a lignite-derived activated carbon supplied by NORIT, referred to as DARCO FGD carbon, and other alternative sorbents. DARCO FGD is considered the benchmark for these tests because of its wide use in DOE/EPRI/EPA-sponsored testing. Because of the economic impact of sorbent cost on the overall cost of mercury control, it is desirable to find less expensive sorbents. In addition, sorbents that have the potential to capture mercury at the low HCl conditions that are typical of subbituminous units, especially units with SDAs such as Holcomb, will be evaluated. Sorbent vendors and developers that have contracted team members will be invited to submit proposals for inclusion of their sorbents in the program. Sorbents will be selected for screening based upon a review of the proposals by the project team to determine potential improvements over the benchmark sorbent and the relative sorbent costs. Sorbents will be chosen for parametric testing based upon results from screening tests.

Another option that will be considered is testing of on-line sorbent conditioning of the benchmark sorbent for the purpose of enhancing mercury capture and reducing sorbent costs. This option is described in the parametric testing subtask.

Task 2. Design, Fabricate, and Install Equipment

Site-specific equipment includes the sorbent distribution manifold and sorbent injectors. This must be designed and fabricated for each test site. Other equipment, such as the injection feeder/silo and mercury analyzers are used at all sites. Required site support at Holcomb includes installation of required platforms and scaffolding, supplying compressed air and electrical power, wiring plant signals including boiler load to the injection skid and control trailer, and balance of plant engineering. Table 5 presents a representative split of responsibilities on key equipment and activities between ADA-ES and the host plant. A foundation for the skid will also be required. ADA-ES engineers are working with plant engineers to develop an installation and contractor bid package for installation activities, and will work with the installation contractors.

Table 5. Scopes of Work for Sorbent Injection System

ADA-ES Transportable System	Provided by Host Site
Injection Silo and Feeder	Foundation and power
Sorbent Injection System	Injection ports
Sorbent Distribution Manifolds	Test ports
Conveying Hose (400 ft)	Access platforms
Sorbent Injectors	Installation labor/Materials
PLC Controls	Compressed air
Hg SCEMs	Power, Compressed Air
Office Trailer(s)	Signal Wiring / Telephones / Power

ADA-ES will oversee installation and system checkout of the mercury control equipment. If necessary, ADA-ES is capable of taking responsibility for all phases of the installation, except for final connections into plant utilities. ADA-ES will work with the host utility to assure that the equipment is installed in an efficient manner, within the resources available at the site.

ADA-ES will be responsible for the final checkout of all systems and for the general maintenance of the systems during testing. At least one engineer or technician who is solely dedicated to the operation of the equipment will be on-site or on-call for all tests. The actual equipment installation, not including preparation tasks, is estimated to take three weeks. This includes time for checkout and troubleshooting. ADA-ES will also install the mercury monitors at the host utility.

The host utility will be responsible for all permitting and any variance requirements.

Feeder and Analyzer Descriptions

The carbon injection system will consist of a bulk-storage silo and twin blower/feeder trains. PAC is delivered in bulk pneumatic trucks and loaded into the silo, which is equipped with a bin vent bag filter. From the discharge section of the silo, the sorbent is metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent to the injection point. Regenerative blowers provide the conveying air. A PLC system is used to control system operation and adjust injection rates. Figure 3 is a photograph of the sorbent silo and feeder trains designed to treat a 150-MW boiler on a unit with an ESP. The unit is approximately 50 feet high and 10 feet in diameter with an empty weight of 10 tons. The silo will hold 20 tons of sorbent. Flexible hose carries the sorbent from the feeders to distribution manifolds located on the flue gas ducts, feeding the injection probes. Each manifold supplies up to six injectors.

Figure 3. Carbon Injection Storage Silo and Feeder Trains for 150 MWe (Phase I System).

At least two mercury monitors will be used during this testing program to provide real-time feedback during baseline and sorbent injection testing. The mercury analyzer used during the Phase I program consisted of a cold vapor atomic absorption spectrometer (CVAAS) coupled with a gold amalgamation system (Au-CVAAS). The system is calibrated using vapor-phase elemental mercury. A sketch of the system is shown in Figure 4. An inertial separation probe is shown in the figure. This probe separates the particulate matter from the sample with minimal sampling artifacts from fly ash or injected sorbent.

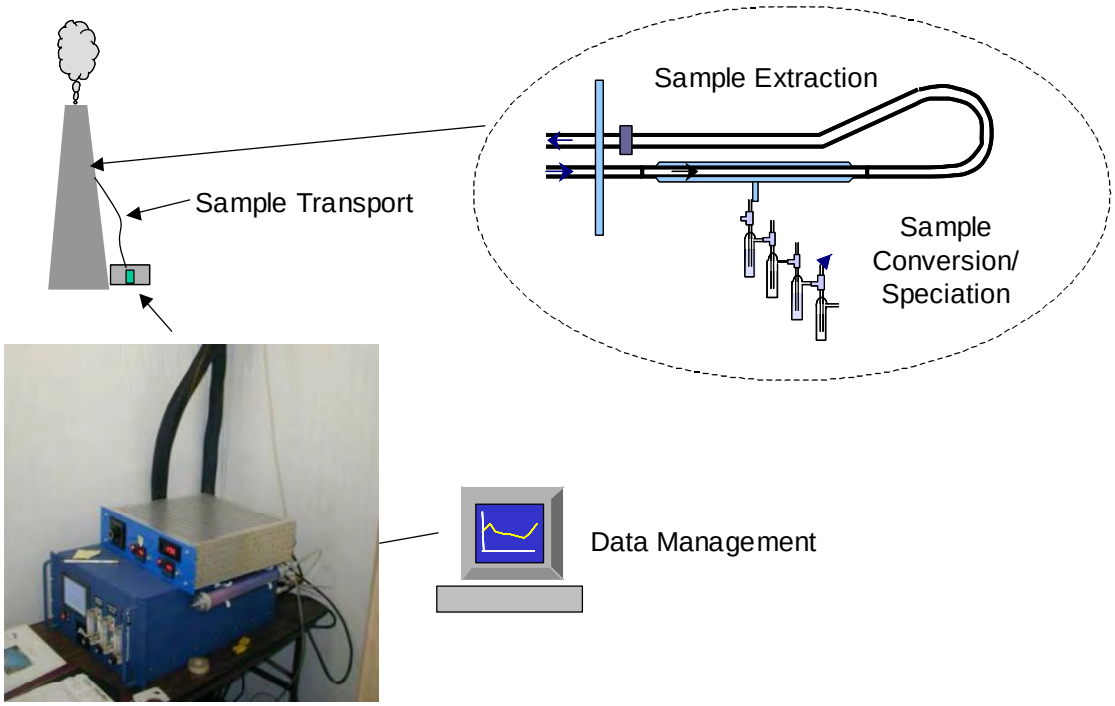

Figure 4. Sketch of Mercury Measurement System.

The analyzers are capable of measuring both total vapor-phase mercury and elemental vapor-phase mercury. The analyzer determines total vapor-phase mercury concentrations by reducing all of the oxidized mercury to the elemental form near the extraction location. To measure elemental mercury, the oxidized mercury is removed while allowing elemental mercury to pass through without being altered.

Task 3. Field Testing

The field tests will be accomplished through a series of five (5) subtasks. The subtasks are independent from each other in that they each have specific goals and tests associated with them. However, they are also interdependent, as the results from each task will influence the test parameters of subsequent tasks. A summary of each task is presented.

The various tests are described below in their corresponding subtask. Exact operating conditions are subject to change based on the results from baseline and sorbent screening tests.

Subtask 3.1 Sorbent Screening

The sorbent screening device is an extractive system designed to simulate the gas velocity, temperature, sorbent and ash loading of a full-scale fabric filter. Sorbent and ash is preloaded onto one of three standard, 3-inch EPA Method 5 filters to permit direct side-by-side comparison of three samples simultaneously. This device can be used in conjunction with an inertial separation probe to remove native fly ash from the sampled flue gas stream prior to the screening filter. The device is also capable of injecting small amounts of potential gas conditioning agents to determine the effect on mercury removal.

Flue gas will be extracted from between the SDA and FF at Holcomb. Ash will be separated at the point of extraction with an inertial filter. In addition to testing the performance of alternative sorbents, DARCO FGD will be evaluated for comparison. Several tests will also be conducted with and without conditioning agents. The tentative sorbent screening test matrix is presented in Table 6.

Total vapor-phase mercury concentration is measured at the inlet and three filter outlets of the device with a semi-continuous mercury analyzer. Typically, each run is conducted for at least 12 hours or terminated when the outlet mercury concentration equals the inlet mercury concentration (100% breakthrough).

At least six sorbents will be selected for screening in actual flue gas. Results of screening tests will be used to select two alternative sorbents for full-scale injection.

Table 6. Sorbent Screening Test Matrix

Sorbent	**Test Location**	**Temperature (°F)**	**Loading[a]** *(lb/Mmacf equivalent)*
Barnebey Sutcliffe Iodated	SDA out	200°F	1, 3
DARCO FGD	SDA out	200°F	3
Sorbent A-F +	SDA out	200°F	3

[a] Calculated based upon total sorbent collected on filter at injection concentration shown over 3-hour filtering time.

Subtask 3.2 Sample and Data Coordination

ADA-ES engineers will coordinate with plant personnel to retrieve the necessary plant operating data files. An example of the operating data is included in Table 7, along with other samples and measurements that will be collected. These data will be integrated into a sorbent injection and mercury control database. If possible, it is useful if plant operating data can be provided daily. In addition, ADA-ES site engineers will work closely with plant operators to monitor key plant operating parameters in real-time during testing. Key, system operating parameters include SDA pH and solids conveying parameters, fabric filter pressure drop, and cleaning frequency. If at any time the performance of the existing pollution control equipment or outlet emissions exceed acceptable operating limits, testing will be halted. Acceptable limits will be discussed and agreed upon prior to beginning injection.

The primary extraction locations for the mercury monitors will be across the entire air pollution control train (inlet to the SDA and downstream of the fabric filter). The extraction port and probe length will be identified after a full velocity and temperature traverse at the sampling locations are conducted to identify an appropriate, single-point position. The position will be at a duct average temperature and velocity. Experience has shown that this should be representative of the duct average mercury concentration. Additional extraction locations for periodic measurements will be located downstream of sorbent injection just upstream of the SDA to provide information on the in-flight mercury removal, and between the SDA and fabric filter to identify the mercury removal across the SDA.

Triplicate manual mercury samples using ASTM M6784-02 (Ontario Hydro) will be collected at the primary inlet and outlet locations (upstream of the SDA and downstream of the fabric filter). Because of the influence of HCl and HF on sorbent effectiveness, HCl and HF measurements will be made at the same time the ASTM M6784-02 samples are collected to better characterize the flue gas.

ADA-ES engineers will also develop a sample Chain-of-Custody and coordinate with host plant personnel to assure coal, ash, and other samples (such as the SDA product) are sampled and tracked properly. A tentative sample collection schedule is presented in Table 8. The final schedule will be agreed upon prior to beginning baseline testing.

Table 7. Data Collected During Field Testing

Parameter	**Sample/Signal /Test**	**Baseline**	**Parametric/ Long-Term**
Coal	Batch sample	Yes	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly ash	Batch sample	Yes	Yes
Feed lime, feed water	Batch samples of slaked lime milk, reactivator sludge and feed slurry	Yes	No/Yes
Unit operation	Plant signals: boiler load, etc.	Yes	Yes
Temperature	Plant signal at SDA inlet, FF inlet and outlet	Yes	Yes
Temperature	Full traverse at SDA inlet and FF outlet	Yes	No
Duct Gas Velocity	Full traverse at SDA inlet and FF outlet	Yes	No
Mercury (total and speciated)	Hg Monitors at SDA inlet/outlet and FF outlet	Yes	Yes
Mercury (total and speciated)	ASTM Method 6784-02 (Ontario Hydro) at SDA inlet and FF outlet	Yes (1 set)	No/Yes (2 sets)
Multi-Metals Emissions	Method 29 at SDA inlet and FF outlet	Yes, outlet	No/Yes, outlet
HCl, HF, Br	EPA Method 26 at SDA inlet and FF outlet	Yes	Yes
Sorbent Injection Rate	PLC, lbs/min	No	Yes
Plant CEM data (NO_x, O_2, SO_2, CO)	Plant data – stack	Yes	Yes
Stack Opacity	Plant data - Stack	Yes	Yes
Pollution control equipment	Plant data (fabric filter cleaning, pressure drop, etc.)	Yes	Yes

Table 8. Tentative Sample Collection Schedule

Test Condition	Type	Frequency	Quantity
Baseline	Coal	Daily	1 liter
	Slaked Lime Milk	2 samples/week	1 liter
	Reactivator Sludge	2 samples/week	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13 (test side) 2 Samples/Week: A8, A14, B1, B2, B4, B11, B6, B7 One Time: Hopper A11	1 liter 1 liter
	Bottom Ash	2 samples/week	1 liter
Parametric	Coal	Daily	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13 (test side)	1 liter
Long-Term	Coal	Daily	1 liter
	Slaked Lime Milk	2 samples/week	1 liter
	Reactivator Sludge	2 samples/week	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13 (test side) 2 Samples/Week: A8, A14, B1, B2, B4, B11, B6, B7 One Time: Hopper A11	1 liter 1 liter 5 gallon
	Bottom Ash	2 samples/week	1 liter

Grab samples of ash will be collected from the fabric filter hoppers each day of testing. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). The samples will be stored in 1-liter or 5-gallon sample containers for shipping to the analytical laboratories. The schedule indicates sampling from multiple rows in the fabric filter. These samples will be used to determine if stratification exists throughout the system. A sketch of one of the fabric filters with the row numbers as referenced in Table 8 is presented in Figure 5.

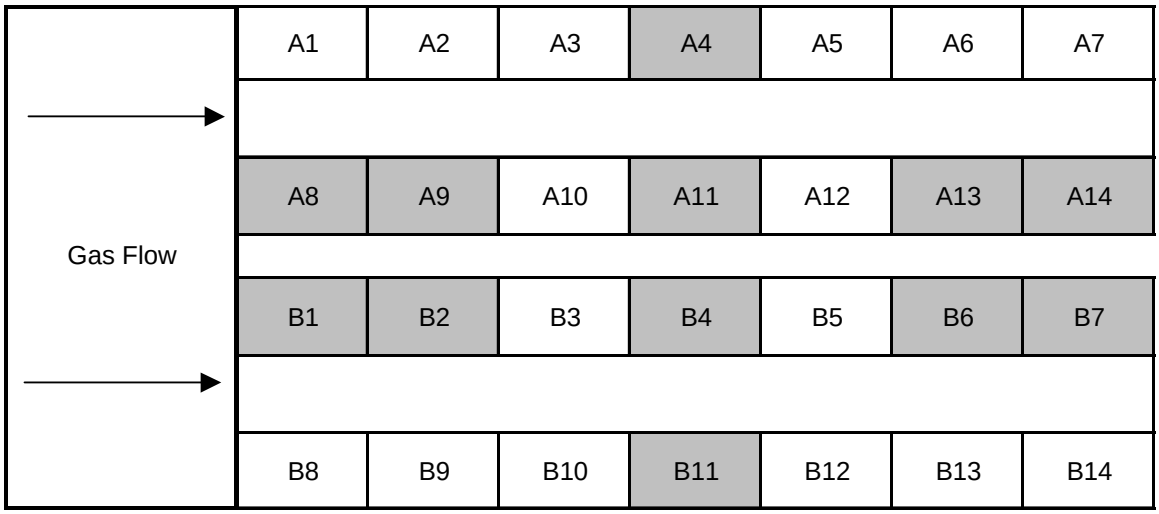

Figure 5. Sketch of Fabric Filter showing Module Numbering.

Subtask 3.3 Baseline Testing

Once the equipment is installed, two weeks of baseline testing are scheduled. Unit operation will be set at conditions expected during the parametric tests. It is anticipated that boiler load will be held constant at full-load and that the air pollution equipment will be operated under standard full-load conditions (standard soot blowing, fabric filter cleaning logic, SDA recycle, etc.). ASTM Method 6784-02 (Ontario Hydro) mercury measurements, M29 multi-metal measurements, and M26A, HCl and HF measurements will be conducted in conjunction with the mercury monitors during this subtask.

Additional tests will be conducted to measure the effect of partial co-firing with a western bituminous coal on both mercury removal and speciation across the system. Tests will be conducted with at least two blend ratios. A western bituminous coal will be used during the blend tests. The western Bituminous Coal is from the West Elk Mine near Somerset, Colorado. The baseline subbituminous Powder River Basin coal is expected to be from the Black Thunder mine near Wright, Wyoming. Mercury measurements will be made using only the mercury monitors during these tests.

Subtask 3.4 Parametric Testing

Following baseline testing, three weeks of parametric testing are planned as shown in the test matrix (Table 9).

The fabric filters at Holcomb typically operate in a continuous cleaning mode. There are 14 modules in each of the two fabric filters and cleaning takes approximately 10 minutes per module or 2.3 hours for an entire fabric filter. In addition, approximately 25 to 30% of the material collected in the fabric filter is recycled into the SDA. Therefore, at least 8 hours are scheduled during each parametric test condition to assure the system is at equilibrium conditions.

An option for improved sorbent performance in halogen-deficient flue gas, such as that present in a fabric filter downstream of an SDA on a unit burning PRB coal, is the addition of halogenated compounds into the system. During the second half of the first week of testing, an additive will be added to the coal. It is expected that this will result in two effects: 1) increase the fraction of oxidized mercury in the flue gas (which should be removed fairly well in the SDA), and 2) enhance the effectiveness of non-chemically treated activated carbon at Holcomb. Nominally 24 to 48 hours will be required to "condition" the system after introducing an additive onto the coal. Therefore, two days of additive addition will be completed before characterizing the combined effect of additive and activated carbon injection. The first three days of testing will be dedicated to characterizing the performance of DARCO FGD alone (no additive addition), as shown in Table 9.

During the second week of testing, the performance of DARCO FGD injected downstream of the SDA will be evaluated with and without co-injection of chemicals to enhance the performance of the FGD. During the final week of parametric testing, two alternate sorbents will be evaluated at two injection concentrations and the best option for long-term testing will be re-checked at the estimated optimized condition in preparation for long-term testing. The best option may be one of the alternate sorbents or may be a combination of an additive and DARCO FGD.

Subtask 3.5 Long-Term Testing

Long-term testing will be conducted at the "optimum" settings as determined in the parametric tests and approved by both DOE and Sunflower Electric/Holcomb. It is the intent of DOE that these settings represent the maximum mercury removal. The goal of this task is to obtain sufficient operational data on removal efficiency over a 4-week period, the effects on the particulate control device, the effects on the SDA equipment, effects on byproducts, and impacts to the balance of plant equipment to prove viability of the process and determine the economics. During this test, ASTM M6784-02, M29, and M26A measurements will be conducted at the inlet and outlet of the pollution control device(s) at least once, depending on results verifying mercury monitor measurements during the baseline tests. If a chemically treated sorbent or chemical addition for sorbent enhancement is chosen for the long-term tests, additional flue gas measurements may be added to monitor emissions of introduced species (e.g., iodine or bromine).

The standard operation for Holcomb Unit 1 is to recycle approximately 25 to 30% of the material collected in the fabric filter back into the SDA. Therefore, during continuous sorbent injection some injected sorbent will also be recycled into the SDA and may improve the overall mercury removal. Not all units configured with SDA and FFs use recycle and collecting information on the influence of recycle on overall mercury removal is valuable. Therefore, prior to beginning the long-term tests, the recycle surge silo at Holcomb will be filled with material collected in the FF hoppers (fly ash and SDA product). When sorbent injection begins, material will be recycled into the SDA from the surge silo. This procedure will allow approximately 5 to 6 hours of operation with sorbent injection before any sorbent is recycled into the SDA. The time lag of 5 to 6 hours will allow the fabric filter to cycle through two cleans, which should be adequate

time to establish the no-recycled sorbent baseline and provide an opportunity to observe the effect of recycled sorbent on overall mercury removal.

This task is the single most important step in gaining acceptance from the utility industry as to the practical implementation of mercury removal technologies on coal-fired power plants.

Table 9. Proposed Full-Scale Test Sequence for Holcomb Unit 1

Test Description	Start Date	Parameters/Comments	Boiler Load
Baseline Week 1 PRB/W. Bit blend	4/5/04	Day 1 - 100% PRB Day 2 - 90/10 PRB/W. Bit blend Day 3 – 80/20 PRB/W. Bit blend Day 4,5 - Contingency Measure Hg with monitors	Full Load 24 hours a day
	4/23-5/10/04	Plant Outage	
Baseline Week 2 (normal unit operating conditions)	5/17/04	Day 1 - Test crew set-up no restrictions on boiler load Day 2 - ASTM M6784-02, M26A & M29 Day 3 - ASTM M6784-02, M26A & M29 Day 4 - ASTM M6784-02, M26A & M29 Day 5 - No restrictions on boiler load	Full Load 24 hours a day on Days 2–4
Parametric Week 1 Benchmark Testing Chemical Injection (6-day week)	5/24/04	Start with injection lances at SDA Inlet Day 1 - DARCO FGD, 1 lb/MMacf Day 2 - DARCO FGD, 5 lb/MMacf Day 3 - DARCO FGD, 10 lb/MMacf Day 4 - No sorbent, coal additive Day 5 - No sorbent, coal additive, M26A Day 6 - Coal additive + DARCO FGD Rate C	Full Load 6AM–6PM
Parametric Week 2 FF Outlet, Enhancements	5/31/04	Day 1 – DARCO FGD, Rate A (TBD) Day 2 – DARCO FGD, Rate B (TBD) Day 3-5 - DARCO FGD, Enhancements	Full Load 6AM–6PM
Parametric Week 3 Alternative Sorbents	6/7/04	Day 1 - Sorbent 2, Rate A Day 2 - Sorbent 2, Rate B Day 3 - Sorbent 3, Rate A Day 4 - Sorbent 3, Rate B Day 5 – Optimized Conditions	Full Load 6AM–6PM
Long-term tests	7/7/04	Operate at consistent injection rate 24 hours a day, 4 weeks, while load following. Conduct ASTM M6784-02 during week 1 and week 4, and Method 29, M26A tests during week 4. Sorbent and rate TBD.	Full Load only during ASTM M6784-02

Task 4. Data Analysis

Data collection and analysis for this program is designed to measure the effect of sorbent injection on mercury control and the impact on the existing pollution control equipment. The mercury levels and plant operation will be characterized without sorbent injection, during coal blending, and with various injection rates as defined in the test matrix, and the long-term evaluation to identify effects that may not be immediate.

Many signals typically archived by the plant will be monitored to determine if any correlation exists between changes in mercury concentration with measured plant operation. A correlation is not unusual between temperature and load, for example.

Because of the apparent influence of HCl and HF on sorbent effectiveness, HCl and HF measurements will be conducted and samples analyzed to determine if a correlation exists between sorbent effectiveness and HCl and HF concentrations.

Task 5. Coal and Byproduct Evaluation

Coal and combustion byproduct samples collected throughout the field test will be analyzed in this task. During all test phases, samples of coal, fly ash, SDA solids, slaked lime, and SDA make-up water will be collected. Select samples will be chosen by the test team for analysis. Ultimate and proximate analyses will be performed and mercury, chlorine, and sulfur levels will be determined for the coal samples. The lime, make-up water, and SDA solids will be analyzed for mercury. The ash will be analyzed for mercury and LOI. Other potential tests include alkalinity, size distribution, chlorine, fluorine, and metals such as selenium and arsenic. A summary of the analyses to be performed is included in Table 10.

Although previous tests from this program and others have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash and SDA byproduct samples will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE.

Standard leaching test methods will include the Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311) and synthetic groundwater leaching procedure (SGLP). If a chemically treated sorbent is chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed.

The final series of tests are optional, based on whether a determination is made that additional analyses are needed for purposes of troubleshooting or for gaining additional insight into control options. For example, it may be desirable to determine the size and composition of the ash for certain applications. These analyses will provide information on the impacts of mercury control on ash properties. The properties have a significant impact on the performance of combustion and environmental control systems.

Table 10. Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
2	Environmental Stability – Leaching	EERC SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
3	Special Testing	Various	As needed for troubleshooting or site-specific information needs

Task 6. Design and Economics of Site-Specific Control System

After completion of testing and analysis of the data at each plant, the requirements and costs for full-scale permanent commercial implementation of the selected mercury control technology will be determined.

The ADA-ES program team will meet with the host utility plant and engineering personnel to develop plant-specific design criteria. Process equipment will be sized and designed based on test results and the plant-specific requirements (reagent storage capacity, plant arrangement, retrofit issues, winterization, controls interface, etc.). A conceptual design document will be developed. Sorbent type and sources will be evaluated to determine the most cost-effective reagent(s) for the site.

Modifications to existing plant equipment will be determined and a work scope document will be developed based on input from the plant. This may include modifications to the particulate collector, ash handling system, compressed air supply, electric power capacity, other plant auxiliary equipment, utilities, and other balance of plant engineering requirements.

Finally, a budget cost estimate will be developed to implement the control technology. This will include capital cost estimates for mercury control process equipment as well as projected annual operating costs. Where possible, order-of-magnitude estimates will be included for plant modifications and balance of plant items. ALSTOM will provide levelized economics for this evaluation.

Task 7. Prepare Site Report

A site report will be prepared documenting measurements, test procedures, analyses, and results obtained in Task 2. This report is intended to be a stand-alone document providing a comprehensive review of the testing that will be submitted to the host utility.

Schedule

The tentative schedule for activities at Holcomb Station is shown in Table 11.

Table 11. Tentative Schedule for Holcomb

	Start	End	11/3/03	11/17/03	12/1/03	12/15/03	12/29/03	1/12/04	1/26/04	2/9/04	2/23/04	3/8/04	3/22/04	4/5/04	4/19/04	5/3/04	5/17/04	5/31/04	6/14/04	6/28/04	7/12/04	7/26/04	8/9/04	8/23/04	9/6/04	9/20/04	10/4/04	10/18/04	11/1/04	11/15/04	11/29/04	12/13/04	12/27/04	1/10/05	1/24/05
Holcomb	11/1/03	1/15/05	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
Planning	11/1/03	1/31/04	====	====	====	====	====	====	====																										
Install Skid	4/12/04	4/23/04													====																				
Install Analyzers	3/22/04	3/29/04											====																						
Field Testing	2/23/04	7/26/04									====	====	====	====	====	====	====	====	====	====	====	====													
Sorbent Screening	2/23/04	2/27/04									====																								
Baseline Week 1 - Coal Blend	3/29/04	4/2/04											====																						
Baseline Week 2 - OH	4/5/04	4/9/04												====																					
Parametric Week 1	5/17/04	5/22/04															====																		
Parametric Week 2	5/31/04	6/5/04																====																	
Parametric Week 3	6/7/04	6/12/04																====																	
Long Term	6/28/04	7/26/04																		====	====	====													
Data Analysis	3/1/04	9/30/04										====	====	====	====	====	====	====	====	====	====	====	====	====	====	====									
Coal and Byproduct Evaluation	4/5/04	9/30/04												====	====	====	====	====	====	====	====	====	====	====	====	====									
Design and Economics	7/19/04	10/31/04																				====	====	====	====	====	====	====							
Site Report	10/15/04	1/15/05																										====	====	====	====	====	====	====	
Outage	4/23/04	5/10/04														====																			

Key Personnel

Key personnel for the Holcomb tests are identified in Table 12.

Table 12. Key Project Personnel for Holcomb Mercury Field Evaluation

NAME	COMPANY	ROLE	PHONE #	E-MAIL
Wayne Penrod	Sunflower Electric	Project Manager	620-272-5418	wepenrod@sunflower.net
Sharon Sjostrom	ADA-ES	Program Manager	303-734-1727	sharons@adaes.com
Travis Starns	ADA-ES	Site Project Manager	303-734-1727	traviss@adaes.com
Jerry Amrhein	ADA-ES	Hg Monitors	303-734-1727	jerrya@adaes.com
Cam Martin	ADA-ES	Equipment Design	303-734-1727	Camm@adaes.com
Richard Schlager	ADA-ES	Contracts	303-734-1727	Richards@adaes.com
Connie Senior	Reaction Engineering	Coal and Byproduct Issues	801-364-6925 ext 37	senior@reaction-eng.com
Michael Durham	ADA-ES	Technical Expert	303-734-1727	miked@adaes.com
Jean Bustard	ADA-ES	Technical Expert	303-734-1727	jeanb@adaes.com
Ramsay Chang	EPRI	Technical Expert	650-855-2535	Rchang@epri.com
Leif Lindau	ALSTOM	Technical Expert	865-560-1397	Leif.lindau@power.alstom.com
Victoria Evans	Tetra Tech EM Inc.	Project Support, Technical Expert	415-548-4880	victoria.evans@ttemi.com

APPENDIX B

Coal Reports

SGS

April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL068

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-507134

Date Received March 18, 2005

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	2.73	xxxxxx
% Ash	5.53	5.69
% Volatile	39.01	40.10
% Fixed Carbon	52.73	54.21
	100.00	100.00
Btu/lb	13415	13791
% Sulfur	0.46	0.47
MAF Btu/lb	14623	

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	2.73	xxxxxx
% Carbon	76.44	78.59
% Hydrogen	4.86	5.00
% Nitrogen	1.79	1.84
% Sulfur	0.46	0.47
% Ash	5.53	5.69
% Oxygen	8.19	8.41
	100.00	100.00

ANALYSIS OF ASH % Weight Ignited Basis

Silica, SiO_2	51.14
Alumina, Al_2O_3	24.97
Titania, TiO_2	0.96
Ferric Oxide, Fe_2O_3	6.57
Lime, CaO	6.30
Magnesia, MgO	1.79
Potassium Oxide, K_2O	0.36
Sodium Oxide, Na_2O	2.30
Sulfur Trioxide, SO_3	3.05
Phosphorous Pentoxide, P_2O_5	1.10
Strontium Oxide, SrO	0.85
Barium Oxide, BaO	0.58
Manganese Oxide, Mn_3O_4	0.03
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.14
Base:Acid Ratio	0.22
T250 Temperature	2674

Silica Value	77.72
Type of Ash	LIGNITIC
Fouling Index	2.30
Slagging Index	xxxxxxx
% MAF Fixed Carbon	57.48
% MAF Volatile	42.52
lb SO_2/mm Btu	0.69
lb Sulfur/mm Btu	0.34
% Air Dry Loss	0.28
As Received Net Sample Wt.	242.50 g

MEMBER ACIL

Respectfully submitted,
SGS NORTH AMERICA INC.

Kristi Bulls

Denver Laboratory

SGS North America Inc. | Minerals Services Division
4665 Paris Street, Suite B-200, Denver, CO 80239 t (303) 373-4772 f (303) 373-4791 www.sgs.com

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April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE #: HOL481

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-506194

Date Received March 7, 2005

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	20.27	xxxxxx
% Ash	6.41	8.04
% Volatile	34.41	43.16
% Fixed Carbon	38.91	48.80
	100.00	100.00
Btu/lb	9324	11695
% Sulfur	0.33	0.42
MAF Btu/lb	12717	

Chlorine = <100

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	20.27	xxxxxx
% Carbon	55.25	69.30
% Hydrogen	3.90	4.89
% Nitrogen	0.89	1.11
% Sulfur	0.33	0.42
% Ash	6.41	8.04
% Oxygen	12.95	16.24
	100.00	100.00

ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	35.11
Alumina, Al_2O_3	18.92
Titania, TiO_2	1.29
Ferric Oxide, Fe_2O_3	5.24
Lime, CaO	20.48
Magnesia, MgO	3.83
Potassium Oxide, K_2O	0.44
Sodium Oxide, Na_2O	1.36
Sulfur Trioxide, SO_3	11.23
Phosphorous Pentoxide, P_2O_5	1.15
Strontium Oxide, SrO	0.28
Barium Oxide, BaO	0.65
Manganese Oxide, Mn_3O_4	0.02
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.13
Base:Acid Ratio	0.57
T250 Temperature	2265

Silica Value	54.30
Type of Ash	LIGNITIC
Fouling Index	1.36
Slagging Index	xxxxxxx
% MAF Fixed Carbon	53.07
% MAF Volatile	46.93
lb SO_2/mm Btu	0.71
lb Sulfur/mm Btu	0.35
% Air Dry Loss	10.80
As Received Net Sample Wt.	95.30 g

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April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL558

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-507137

Date Received March 18, 2005

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	8.05	xxxxxx
% Ash	10.94	11.90
% Volatile	36.10	39.26
% Fixed Carbon	44.91	48.84
	100.00	100.00
Btu/lb	11387	12384
% Sulfur	0.57	0.62
MAF Btu/lb	14057	

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	8.05	xxxxxx
% Carbon	65.52	71.26
% Hydrogen	4.09	4.45
% Nitrogen	1.14	1.24
% Sulfur	0.57	0.62
% Ash	10.94	11.90
% Oxygen	9.69	10.53
	100.00	100.00

ANALYSIS OF ASH % Weight Ignited Basis

Silica, SiO_2	59.28
Alumina, Al_2O_3	12.87
Titania, TiO_2	1.23
Ferric Oxide, Fe_2O_3	3.86
Lime, CaO	9.49
Magnesia, MgO	1.37
Potassium Oxide, K_2O	0.15
Sodium Oxide, Na_2O	3.72
Sulfur Trioxide, SO_3	7.52
Phosphorous Pentoxide, P_2O_5	0.21
Strontium Oxide, SrO	0.12
Barium Oxide, BaO	0.15
Manganese Oxide, Mn_3O_4	0.03
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.45
Base:Acid Ratio	0.25
T250 Temperature	2651

Silica Value	80.11
Type of Ash	LIGNITIC
Fouling Index	3.72
Slagging Index	xxxxxxx
% MAF Fixed Carbon	55.44
% MAF Volatile	44.56
lb SO_2/mm Btu	1.00
lb Sulfur/mm Btu	0.50
% Air Dry Loss	3.22
As Received Net Sample Wt.	361.10 g

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April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL559

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-507135

Date Received March 18, 2005

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.44	xxxxxx
% Ash	10.88	11.88
% Volatile	34.47	37.65
% Fixed Carbon	46.21	50.47
	100.00	100.00
Btu/lb	11400	12451
% Sulfur	0.49	0.53
MAF Btu/lb	14130	

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.44	xxxxxx
% Carbon	65.06	71.06
% Hydrogen	4.18	4.57
% Nitrogen	1.70	1.86
% Sulfur	0.49	0.53
% Ash	10.88	11.88
% Oxygen	9.25	10.10
	100.00	100.00

Chlorine = xxxx

ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	56.25
Alumina, Al_2O_3	25.70
Titania, TiO_2	0.90
Ferric Oxide, Fe_2O_3	4.21
Lime, CaO	4.60
Magnesia, MgO	1.31
Potassium Oxide, K_2O	1.55
Sodium Oxide, Na_2O	1.01
Sulfur Trioxide, SO_3	3.01
Phosphorous Pentoxide, P_2O_5	0.79
Strontium Oxide, SrO	0.26
Barium Oxide, BaO	0.39
Manganese Oxide, Mn_3O_4	0.02
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.24
Base:Acid Ratio	0.15
T250 Temperature	2894

Silica Value	84.75
Type of Ash	LIGNITIC
Fouling Index	1.01
Slagging Index	xxxxxxx
% MAF Fixed Carbon	57.27
% MAF Volatile	42.73
lb SO_2/mm Btu	0.86
lb Sulfur/mm Btu	0.43
% Air Dry Loss	4.49
As Received Net Sample Wt.	211.60 g

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SGS NORTH AMERICA INC.

Kristi Bulls

Denver Laboratory

SGS North America Inc. | Minerals Services Division
4665 Paris Street, Suite B-200, Denver, CO 80239 t (303) 373-4772 f (303) 373-4791 www.sgs.com

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ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL560

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-507139

Date Received March 18, 2005

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.26	xxxxxx
% Ash	2.85	3.01
% Volatile	37.79	39.89
% Fixed Carbon	54.10	57.10
	100.00	100.00
Btu/lb	13479	14227
% Sulfur	0.47	0.50
MAF Btu/lb	14669	

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.26	xxxxxx
% Carbon	76.46	80.71
% Hydrogen	4.75	5.01
% Nitrogen	1.80	1.90
% Sulfur	0.47	0.50
% Ash	2.85	3.01
% Oxygen	8.41	8.87
	100.00	100.00

ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	48.70
Alumina, Al_2O_3	28.84
Titania, TiO_2	1.61
Ferric Oxide, Fe_2O_3	6.72
Lime, CaO	3.95
Magnesia, MgO	1.08
Potassium Oxide, K_2O	0.25
Sodium Oxide, Na_2O	4.83
Sulfur Trioxide, SO_3	2.71
Phosphorous Pentoxide, P_2O_5	0.20
Strontium Oxide, SrO	0.28
Barium Oxide, BaO	0.80
Manganese Oxide, Mn_3O_4	0.03
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.15
Base:Acid Ratio	0.21
T250 Temperature	2692

Silica Value	80.56
Type of Ash	BITUMINOUS
Fouling Index	1.01
Slagging Index	0.11
% MAF Fixed Carbon	58.87
% MAF Volatile	41.13
lb SO_2/mm Btu	0.70
lb Sulfur/mm Btu	0.35
% Air Dry Loss	2.47
As Received Net Sample Wt.	132.30 g

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Respectfully submitted,
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Kristi Bulls

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April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL561

Kind of Sample COAL
Date Sampled -----
Analysis report no. 72-507138

Date Received March 18, 2005

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	7.75	xxxxxx
% Ash	2.28	2.47
% Volatile	36.99	40.10
% Fixed Carbon	52.98	57.43
	100.00	100.00
Btu/lb	12731	13801
% Sulfur	0.46	0.50
MAF Btu/lb	14151	

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	7.75	xxxxxx
% Carbon	73.74	79.93
% Hydrogen	4.55	4.93
% Nitrogen	1.63	1.77
% Sulfur	0.46	0.50
% Ash	2.28	2.47
% Oxygen	9.59	10.40
	100.00	100.00

ANALYSIS OF ASH — % Weight Ignited Basis

Silica, SiO_2	35.01
Alumina, Al_2O_3	29.35
Titania, TiO_2	1.04
Ferric Oxide, Fe_2O_3	17.02
Lime, CaO	6.08
Magnesia, MgO	1.94
Potassium Oxide, K_2O	0.21
Sodium Oxide, Na_2O	3.03
Sulfur Trioxide, SO_3	4.84
Phosphorous Pentoxide, P_2O_5	0.22
Strontium Oxide, SrO	0.35
Barium Oxide, BaO	0.89
Manganese Oxide, Mn_3O_4	0.02
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.08
Base:Acid Ratio	0.43
T250 Temperature	2374

Silica Value	58.30
Type of Ash	BITUMINOUS
Fouling Index	1.30
Slagging Index	0.22
% MAF Fixed Carbon	58.88
% MAF Volatile	41.12
lb SO_2/mm Btu	0.72
lb Sulfur/mm Btu	0.36
% Air Dry Loss	3.54
As Received Net Sample Wt.	193.10 g

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Kristi Bills

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April 8, 2005

ADA ENVIRONMENTAL SOLUTIONS
8100 SOUTH PARK WAY
UNIT B
LITTLETON CO 80120

SAMPLE NO.: HOL562

Kind of Sample COAL
Date Sampled ------
Analysis report no. 72-507136

Date Received March 18, 2005

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	4.58	xxxxxx
% Ash	4.75	4.98
% Volatile	37.37	39.16
% Fixed Carbon	53.30	55.86
	100.00	100.00
Btu/lb	13369	14011
% Sulfur	0.53	0.56
MAF Btu/lb	14745	

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	4.58	xxxxxx
% Carbon	75.95	79.60
% Hydrogen	4.76	4.99
% Nitrogen	1.56	1.63
% Sulfur	0.53	0.56
% Ash	4.75	4.98
% Oxygen	7.87	8.24
	100.00	100.00

ANALYSIS OF ASH % Weight Ignited Basis

Silica, SiO_2	50.06
Alumina, Al_2O_3	18.61
Titania, TiO_2	0.86
Ferric Oxide, Fe_2O_3	4.54
Lime, CaO	11.25
Magnesia, MgO	2.05
Potassium Oxide, K_2O	0.27
Sodium Oxide, Na_2O	0.78
Sulfur Trioxide, SO_3	8.36
Phosphorous Pentoxide, P_2O_5	2.31
Strontium Oxide, SrO	0.50
Barium Oxide, BaO	0.38
Manganese Oxide, Mn_3O_4	0.03
Undetermined	0.00
Alks. as Na_2O, Dry Coal Basis	0.05
Base:Acid Ratio	0.27
T250 Temperature	2599

Silica Value	73.73
Type of Ash	LIGNITIC
Fouling Index	0.78
Slagging Index	xxxxxxx
% MAF Fixed Carbon	58.79
% MAF Volatile	41.21
lb SO_2/mm Btu	0.79
lb Sulfur/mm Btu	0.40
% Air Dry Loss	2.71
As Received Net Sample Wt.	315.70 g

MEMBER ACIL

Respectfully submitted,
SGS NORTH AMERICA INC.

Kristi Bells

Denver Laboratory

Minerals Services Division
4665 Paris Street, Suite B-200, Denver, CO 80239 t (303) 373-4772 f (303) 373-4791 www.sgs.com

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TERMS AND CONDITIONS ON REVERSE

Table A-B-1. Coal Delivered to Holcomb During Mercury Control Testing

Date	**7/2/04**	**7/5/04**	**7/7/04**	**7/9/04**	**7/11/04**	**7/15/04**	**7/16/04**	**7/19/04**	**7/20/04**	**7/23/04**	**7/29/04**	**8/2/04**	**8/4/04**
Mine	**J.R.**	**J.R.**	**J.R.**	**C.D.**	**J.R.**	**C.D.**	**J.R.**	**C.D.**	**J.R.**	**C.D.**	**C.D.**	**J.R.**	**C.R.**
AS RECEIVED QUALITY													
BTU/LB	8704	8701	8664	8460	8705	8496	8717	8448	8717	8534	8435	8810	8590
ASH (%)	5.3	5.44	5.2	5.4	5.07	5.08	5.06	5.87	5.15	4.75	5.08	5.95	5.34
SULFUR(%)	0.48	0.48	0.48	0.31	0.38	0.29	0.39	0.28	0.35	0.31	0.32	0.38	0.36
SULFUR (LBS/MMBTU)	0.55	0.55	0.55	0.37	0.43	0.34	0.45	0.33	0.4	0.37	0.38	0.43	0.42
SULFUR(LBS SO2/MMBTU)	1.09	1.1	1.09	0.74	0.87	0.68	0.89	0.66	0.8	0.73	0.76	0.86	0.84
MOISTURE(%)	27.74	27.8	28.29	29.7	27.62	29.86	27.94	28.69	27.57	29.77	30.03	26.57	28.72
SODIUM(% NA20 IN ASH)	1.67	1.65	1.7	1.44	1.46	1.52	1.66	1.02	1.62	1.5	1.32	1.44	1.34
SODIUM(LBS NA20/MMBTU)	0.1	0.1	0.1	0.09	0.09	0.09	0.1	0.07	0.1	0.08	0.08	0.1	0.08
DRY ASH FREE BTU/LB	13000	13035	13026	13036	12933	13059	13009	12910	12957	13031	12998	13056	13028
AIR DRY LOSS	12.59	13.23	12.97	13.43	12.34	12.84	13.59	15.36	13.32	10.9	11.16	10.79	11.72
DRY BASIS													
DRY BTU/LB	12046	12052	12082	12034	12027	12113	12096	11847	12036	12151	12055	11997	12051
DRY ASH(%)	7.34	7.53	7.24	7.68	7.01	7.24	7.02	8.23	7.11	6.76	7.26	8.11	7.49
DRY SULFUR (%)	0.66	0.66	0.66	0.44	0.52	0.41	0.54	0.39	0.48	0.44	0.46	0.52	0.51

J.R. Jacobs Ranch
C.D. Dordero
C.R. Caballo Rojo

1 CTN260NX
DATE: 07/02/04
- AEP/HOLCOMB
1 RIVERSIDE DRIVE
PO Box 16631
COLUMBUS , OH 43216-6631

JACOBS RANCH MINE
MINE SHIPPING NOTICE

PAGE: 1
TIME: 18:41:57.0

BILL OF LADING NUMBER
TRAIN NUMBER JRMHOH040
SHIPPING DATE 07/01/04

0
0

AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8704
ASH(%)	5.30
SULFUR(%)	0.48
SULFUR(LBS/MMBTU)	0.55
SULFUR(LBS SO2/MMBTU)	1.09
MOISTURE(%)	27.74
SODIUM(% NA2O IN ASH)	1.67
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	13000
AIR DRY LOSS	12.59

0

DRY BASIS

0 DRY BTU/LB	12046
DRY ASH(%)	7.34
DRY SULFUR(%)	0.66
0 SAMPLE ID	
SAMPLE DATE	
ANALYSIS DATE	
ANALYST	
SAMPLE BASIS TONNAGE	12133
WEIGHTING FACTOR	100.00

-

TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	WFAX079010		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15528.785		
TOTAL TARE TONS	3395.950	CARS LOADED	118
TOTAL NET TONS	12132.835	AVG NET TONS/CAR	102.821
0 TIME OUT	15:00	RELEASE TIME	15:00
TIME IN	11:55	SPOT TIME	13:52
TOTAL ON SITE TIME	03:05	TOTAL LOADING TIME	01:08
0 INBOUND TRAIN NUMBER	HOHCDM001		
TURNAROUND TIME	05 DAYS 08:28 HOURS		

RECEIVED
JUL 12 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260NX JACOBS RANCH MINE PAGE: 1
DATE: 07/05/04 MINE SHIPPING NOTICE TIME: 02:21:21.0
- AEP/HOLCOMB BILL OF LADING NUMBERSC-12-05-05
1 RIVERSIDE DRIVE TRAIN NUMBER JRMHOH041
PO Box 16631 SHIPPING DATE 07/03/04
COLUMBUS , OH 43216-6631
0 AS RECEIVED QUALITY
0

	WGTD AVG.
BTU/LB	8701
ASH(%)	5.44
SULFUR(%)	0.48
SULFUR(LBS/MMBTU)	0.55
SULFUR(LBS SO2/MMBTU)	1.10
MOISTURE(%)	27.80
SODIUM(% NA2O IN ASH)	1.65
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	13035
AIR DRY LOSS	13.23

0 DRY BASIS
0

DRY BTU/LB	12052
DRY ASH(%)	7.53
DRY SULFUR(%)	0.66

0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12140
WEIGHTING FACTOR 100.00
-
TRAIN LOADING DETAIL
0 INITIAL CAR NUMBER BN 535693
TRACK/SCALE SEQUENCE , ,
TOTAL GROSS TONS 15527.640
TOTAL TARE TONS 3387.550 CARS LOADED 118
TOTAL NET TONS 12140.090 AVG NET TONS/CAR 102.882
0 TIME OUT 01:29 RELEASE TIME 01:29
TIME IN 22:30 SPOT TIME 00:06
TOTAL ON SITE TIME 02:59 TOTAL LOADING TIME 01:23
0 INBOUND TRAIN NUMBER OKORWM030
TURNAROUND TIME

RECEIVED
JUL 12 2004
SEP! ... STATION
RECORDS DEPT.

1 CTN260NX
DATE: 07/07/04
- AEP/HOLCOMB
1 RIVERSIDE DRIVE
PO Box 16631
COLUMBUS , OH 43216-6631

JACOBS RANCH MINE
MINE SHIPPING NOTICE

PAGE: 1
TIME: 09:57:29.0

BILL OF LADING NUMBER
TRAIN NUMBER JRMHOH042
SHIPPING DATE 07/06/04

0
0

AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8664
ASH(%)	5.20
SULFUR(%)	0.48
SULFUR(LBS/MMBTU)	0.55
SULFUR(LBS SO2/MMBTU)	1.09
MOISTURE(%)	28.29
SODIUM(% NA2O IN ASH)	1.70
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	13026
AIR DRY LOSS	12.97

0
0 DRY BTU/LB 12082
DRY ASH(%) 7.24
DRY SULFUR(%) 0.66

DRY BASIS

0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12119
WEIGHTING FACTOR 100.00

-
TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER WFAX079010
TRACK/SCALE SEQUENCE , ,
TOTAL GROSS TONS 15522.415
TOTAL TARE TONS 3403.400 CARS LOADED 118
TOTAL NET TONS 12119.015 AVG NET TONS/CAR 102.704
0 TIME OUT 07:42 RELEASE TIME 07:42
TIME IN 01:50 SPOT TIME 06:47
TOTAL ON SITE TIME 05:52 TOTAL LOADING TIME 00:55
0 INBOUND TRAIN NUMBER HOHJRM040
TURNAROUND TIME 03 DAYS 16:42 HOURS

RECEIVED
JUL 12 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260N8 CORDERO MINING COMPANY PAGE: 1
DATE: 07/09/04 MINE SHIPPING NOTICE TIME: 02:08:59.0
- AEP/HOLCOMB BILL OF LADING NUMBER
1 RIVERSIDE DRIVE TRAIN NUMBER CDMHOH002
PO Box 16631 SHIPPING DATE 07/08/04
COLUMBUS , OH 43216-6631

PO# : CONTRACT 503
0 AS RECEIVED QUALITY
0

	WGTD AVG.
BTU/LB	8460
ASH(%)	5.40
SULFUR(%)	0.31
SULFUR(LBS/MMBTU)	0.37
SULFUR(LBS SO2/MMBTU)	0.74
MOISTURE(%)	29.70
SODIUM(% NA2O IN ASH)	1.44
SODIUM(LBS NA2O/MMBTU)	0.09
DRY ASH FREE BTU/LB	13036
AIR DRY LOSS	13.43

0 DRY BASIS
0 DRY BTU/LB 12034
DRY ASH(%) 7.68
DRY SULFUR(%) 0.44
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12097
WEIGHTING FACTOR 100.00
- TRAIN LOADING DETAIL
0 INITIAL CAR NUMBER WFAX086636
TRACK/SCALE SEQUENCE , ,
TOTAL GROSS TONS 15527.725
TOTAL TARE TONS 3430.950 CARS LOADED 118
TOTAL NET TONS 12096.775 AVG NET TONS/CAR 102.515
0 TIME OUT 02:47 RELEASE TIME 02:47
TIME IN 21:35 SPOT TIME 00:08
TOTAL ON SITE TIME 05:12 TOTAL LOADING TIME 02:39
0 INBOUND TRAIN NUMBER HOHJRM041
TURNAROUND TIME 04 DAYS 01:18 HOURS

RECEIVED
JUL 12 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260NX
DATE: 07/11/04
AEP/HOLCOMB
1 RIVERSIDE DRIVE
PO Box 16631
COLUMBUS , OH 43216-6631

JACOBS RANCH MINE
MINE SHIPPING NOTICE

PAGE: 1
TIME: 18:19:47.0

BILL OF LADING NUMBER
TRAIN NUMBER JRMHOH043
SHIPPING DATE 07/10/04

0
0

AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8705
ASH(%)	5.07
SULFUR(%)	0.38
SULFUR(LBS/MMBTU)	0.43
SULFUR(LBS SO2/MMBTU)	0.87
MOISTURE(%)	27.62
SODIUM(% NA2O IN ASH)	1.46
SODIUM(LBS NA2O/MMBTU)	0.09
DRY ASH FREE BTU/LB	12933
AIR DRY LOSS	12.34

0
0 DRY BTU/LB 12027 DRY BASIS
DRY ASH(%) 7.01
DRY SULFUR(%) 0.52
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12135
WEIGHTING FACTOR 100.00

TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER BN 535490
TRACK/SCALE SEQUENCE , ,
TOTAL GROSS TONS 15513.040
TOTAL TARE TONS 3378.450
TOTAL NET TONS 12134.590
0 TIME OUT 23:59
TIME IN 16:10
TOTAL ON SITE TIME 07:49
0 INBOUND TRAIN NUMBER HOHJRM042
TURNAROUND TIME 03 DAYS 16:17 HOURS

CARS LOADED 118
AVG NET TONS/CAR 102.836
RELEASE TIME 23:59
SPOT TIME 22:31
TOTAL LOADING TIME 01:28

RECEIVED
AUG 16 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260N8 CORDERO MINING COMPANY PAGE: 1
DATE: 07/15/04 MINE SHIPPING NOTICE TIME: 01:36:13.0
- AEP/HOLCOMB BILL OF LADING NUMBER
1 RIVERSIDE DRIVE TRAIN NUMBER CDMHOH003
PO Box 16631 SHIPPING DATE 07/13/04
COLUMBUS , OH 43216-6631

PO# : CONTRACT 503
0 AS RECEIVED QUALITY
0

	WGTD AVG.
BTU/LB	8496
ASH(%)	5.08
SULFUR(%)	0.29
SULFUR(LBS/MMBTU)	0.34
SULFUR(LBS SO2/MMBTU)	0.68
MOISTURE(%)	29.86
SODIUM(% NA2O IN ASH)	1.52
SODIUM(LBS NA2O/MMBTU)	0.09
DRY ASH FREE BTU/LB	13059
AIR DRY LOSS	12.84

RECEIVED
AUG 19 2004
SEP HOLCOMB STATION
RECORDS DEPT.

0 DRY BASIS
0 DRY BTU/LB 12113
DRY ASH(%) 7.24
DRY SULFUR(%) 0.41
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12102
WEIGHTING FACTOR 100.00
-
TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	WFAX086636		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15528.075		
TOTAL TARE TONS	3426.500	CARS LOADED	118
TOTAL NET TONS	12101.575	AVG NET TONS/CAR	102.556
0 TIME OUT	19:10	RELEASE TIME	19:10
TIME IN	16:58	SPOT TIME	17:32
TOTAL ON SITE TIME	02:12	TOTAL LOADING TIME	01:38
0 INBOUND TRAIN NUMBER	HOHCDM002		
TURNAROUND TIME	04 DAYS 16:23 HOURS		

1 CTN260NX JACOBS RANCH MINE PAGE: 1
DATE: 07/16/04 MINE SHIPPING NOTICE TIME: 07:41:03.0
- AEP/HOLCOMB BILL OF LADING NUMBER
1 RIVERSIDE DRIVE TRAIN NUMBER JRMHOH044
PO Box 16631 SHIPPING DATE 07/15/04
COLUMBUS , OH 43216-6631
0
0 AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8717
ASH(%)	5.06
SULFUR(%)	0.39
SULFUR(LBS/MMBTU)	0.45
SULFUR(LBS SO2/MMBTU)	0.89
MOISTURE(%)	27.94
SODIUM(% NA2O IN ASH)	1.66
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	13009
AIR DRY LOSS	13.59

RECEIVED
AUG 19 2004
SEP HOLCOMB STATION
RECORDS DEPT.

0 DRY BASIS
0 DRY BTU/LB 12096
DRY ASH(%) 7.02
DRY SULFUR(%) 0.54
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12140
WEIGHTING FACTOR 100.00
- TRAIN LOADING DETAIL
0 INITIAL CAR NUMBER BN 535490
TRACK/SCALE SEQUENCE , ,
TOTAL GROSS TONS 15516.975
TOTAL TARE TONS 3377.100 CARS LOADED 118
TOTAL NET TONS 12139.875 AVG NET TONS/CAR 102.880
0 TIME OUT 03:30 RELEASE TIME 03:30
TIME IN 00:15 SPOT TIME 02:30
TOTAL ON SITE TIME 03:15 TOTAL LOADING TIME 01:00
0 INBOUND TRAIN NUMBER HOHJRM043
TURNAROUND TIME 03 DAYS 03:31 HOURS

1 CTN260N8
DATE: 07/19/04
- AEP/HOLCOMB
1 RIVERSIDE DRIVE
PO Box 16631
COLUMBUS , OH 43216-6631

CORDERO MINING COMPANY
- -MINE SHIPPING NOTICE

PAGE: 1
TIME: 01:42:27.0

BILL OF LADING NUMBER
TRAIN NUMBER CDMHOH004
SHIPPING DATE 07/18/04

0
0

PO# : CONTRACT 503
AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8448
ASH(%)	5.87
SULFUR(%)	0.28
SULFUR(LBS/MMBTU)	0.33
SULFUR(LBS SO2/MMBTU)	0.66
MOISTURE(%)	28.69
SODIUM(% NA2O IN ASH)	1.02
SODIUM(LBS NA2O/MMBTU)	0.07
DRY ASH FREE BTU/LB	12910
AIR DRY LOSS	15.36

0
0 DRY BTU/LB 11847 DRY BASIS
DRY ASH(%) 8.23
DRY SULFUR(%) 0.39
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12093
WEIGHTING FACTOR 100.00

-
TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	WFAX086636		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15524.725		
TOTAL TARE TONS	3431.350	CARS LOADED	118
TOTAL NET TONS	12093.375	AVG NET TONS/CAR	102.486
0 TIME OUT	02:03	RELEASE TIME	02:03
TIME IN	23:44	SPOT TIME	00:30
TOTAL ON SITE TIME	02:19	TOTAL LOADING TIME	01:33
0 INBOUND TRAIN NUMBER	HOHCDM003		
TURNAROUND TIME	03 DAYS 06:53 HOURS		

RECEIVED
AUG 23 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260NX
DATE: 07/20/04
AEP/HOLCOMB
1 RIVERSIDE DRIVE
PO Box 16631
COLUMBUS , OH 43216-6631

JACOBS RANCH MINE
MINE SHIPPING NOTICE

PAGE: 1
TIME: 09:06:41.0
BILL OF LADING NUMBERSC-12-05-05
TRAIN NUMBER JRMHOH045
SHIPPING DATE 07/19/04

AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8717
ASH(%)	5.15
SULFUR(%)	0.35
SULFUR(LBS/MMBTU)	0.40
SULFUR(LBS SO2/MMBTU)	0.80
MOISTURE(%)	27.57
SODIUM(% NA2O IN ASH)	1.62
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	12957
AIR DRY LOSS	13.32

DRY BASIS

DRY BTU/LB	12036
DRY ASH(%)	7.11
DRY SULFUR(%)	0.48
SAMPLE ID	
SAMPLE DATE	
ANALYSIS DATE	
ANALYST	
SAMPLE BASIS TONNAGE	11914
WEIGHTING FACTOR	100.00

TRAIN LOADING DETAIL

INITIAL CAR NUMBER	BN 535490		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15256.525		
TOTAL TARE TONS	3342.400	CARS LOADED	116
TOTAL NET TONS	11914.125	AVG NET TONS/CAR	102.708
TIME OUT	13:19	RELEASE TIME	13:19
TIME IN	03:15	SPOT TIME	11:19
TOTAL ON SITE TIME	10:04	TOTAL LOADING TIME	02:00
INBOUND TRAIN NUMBER	HOHJRM044		
TURNAROUND TIME	03 DAYS 09:49 HOURS		

RECEIVED
JUL 26 2004
SEP HOLCOMB
RECORDS

1 CTN260N8 CORDERO MINING COMPANY PAGE: 1
DATE: 07/23/04 MINE SHIPPING NOTICE TIME: 10:00:56.0
- DYNEGY/HOLCOMB BILL OF LADING NUMBER
1000 LOUISANA ST TRAIN NUMBER CDMHOH005
Ste 5800 SHIPPING DATE 07/22/04
HOUSTON , TX 77002-5050
0 AS RECEIVED QUALITY

0		WGTD AVG.
	BTU/LB	8534
	ASH(%)	4.75
	SULFUR(%)	0.31
	SULFUR(LBS/MMBTU)	0.37
	SULFUR(LBS SO2/MMBTU)	0.73
	MOISTURE(%)	29.77
	SODIUM(% NA2O IN ASH)	1.50
	SODIUM(LBS NA2O/MMBTU)	0.08
	DRY ASH FREE BTU/LB	13031
	AIR DRY LOSS	10.90
0		DRY BASIS
0	DRY BTU/LB	12151
	DRY ASH(%)	6.76
	DRY SULFUR(%)	0.44
0	SAMPLE ID	
	SAMPLE DATE	
	ANALYSIS DATE	
	ANALYST	
	SAMPLE BASIS TONNAGE	12095
	WEIGHTING FACTOR	100.00

- TRAIN LOADING DETAIL

0	INITIAL CAR NUMBER	WFAX079198		
	TRACK/SCALE SEQUENCE	, ,		
	TOTAL GROSS TONS	15526.125		
	TOTAL TARE TONS	3430.850	CARS LOADED	118
	TOTAL NET TONS	12095.275	AVG NET TONS/CAR	102.502
0	TIME OUT	15:45	RELEASE TIME	15:45
	TIME IN	11:15	SPOT TIME	12:14
	TOTAL ON SITE TIME	04:30	TOTAL LOADING TIME	08:31
0	INBOUND TRAIN NUMBER	HOHCDM004		
	TURNAROUND TIME	03 DAYS 13:42 HOURS		

RECEIVED
AUG 4 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260N8 CORDERO MINING COMPANY PAGE: 1
DATE: 07/29/04 MINE SHIPPING NOTICE TIME: 13:53:12.0
- AEP/HOLCOMB BILL OF LADING NUMBER
1 RIVERSIDE DRIVE TRAIN NUMBER CDMHOH006
PO Box 16631 SHIPPING DATE 07/28/04
COLUMBUS , OH 43216-6631

PO# : CONTRACT #624
0 AS RECEIVED QUALITY
0

	WGTD AVG.
BTU/LB	8435
ASH(%)	5.08
SULFUR(%)	0.32
SULFUR(LBS/MMBTU)	0.38
SULFUR(LBS SO2/MMBTU)	0.76
MOISTURE(%)	30.03
SODIUM(% NA2O IN ASH)	1.32
SODIUM(LBS NA2O/MMBTU)	0.08
DRY ASH FREE BTU/LB	12998
AIR DRY LOSS	11.16

0 DRY BASIS
0 DRY BTU/LB 12055
DRY ASH(%) 7.26
DRY SULFUR(%) 0.46
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 12091
WEIGHTING FACTOR 100.00

- TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	WFAX079079		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15534.225		
TOTAL TARE TONS	3443.100	CARS LOADED	118
TOTAL NET TONS	12091.125	AVG NET TONS/CAR	102.467
0 TIME OUT	07:37	RELEASE TIME	07:37
TIME IN	00:20	SPOT TIME	05:48
TOTAL ON SITE TIME	07:17	TOTAL LOADING TIME	01:49
0 INBOUND TRAIN NUMBER	HOHJRM046		
TURNAROUND TIME	03 DAYS 05:04 HOURS		

RECEIVED
AUG 4 2004
SEP HOLCOMB STATION
RECORDS DEPT.

1 CTN260NX JACOBS RANCH MINE PAGE: 1
DATE: 08/02/04 MINE SHIPPING NOTICE TIME: 13:15:50.0
- AEP/HOLCOMB BILL OF LADING NUMBERSC-02-S-005
1 RIVERSIDE DRIVE TRAIN NUMBER JRMHOH047
PO Box 16631 SHIPPING DATE 08/01/04
COLUMBUS , OH 43216-6631
0
0 AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8810
ASH(%)	5.95
SULFUR(%)	0.38
SULFUR(LBS/MMBTU)	0.43
SULFUR(LBS SO2/MMBTU)	0.86
MOISTURE(%)	26.57
SODIUM(% NA2O IN ASH)	1.44
SODIUM(LBS NA2O/MMBTU)	0.10
DRY ASH FREE BTU/LB	13056
AIR DRY LOSS	10.79

0 DRY BASIS

0 DRY BTU/LB	11997
DRY ASH(%)	8.11
DRY SULFUR(%)	0.52
0 SAMPLE ID	
SAMPLE DATE	
ANALYSIS DATE	
ANALYST	
SAMPLE BASIS TONNAGE	12117
WEIGHTING FACTOR	100.00

- TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	WFAX079079		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	15520.740		
TOTAL TARE TONS	3403.800	CARS LOADED	118
TOTAL NET TONS	12116.940	AVG NET TONS/CAR	102.686
0 TIME OUT	05:49	RELEASE TIME	05:49
TIME IN	03:30	SPOT TIME	04:42
TOTAL ON SITE TIME	02:19	TOTAL LOADING TIME	01:07
0 INBOUND TRAIN NUMBER	HOHCDM006		
TURNAROUND TIME	02 DAYS 22:12 HOURS		

RECEIVED AUG 4 2004 ...ATION ...DEPT

1 CTN260N8 CABALLO ROJO INC. PAGE: 1
DATE: 08/04/04 MINE SHIPPING NOTICE TIME: 00:50:30.0
- AEP/HOLCOMB BILL OF LADING NUMBER
1 RIVERSIDE DRIVE TRAIN NUMBER CRMHOH003
PO Box 16631 SHIPPING DATE 08/02/04
COLUMBUS , OH 43216-6631

0 PO# : CONTRACT 503
0 AS RECEIVED QUALITY

	WGTD AVG.
BTU/LB	8590
ASH(%)	5.34
SULFUR(%)	0.36
SULFUR(LBS/MMBTU)	0.42
SULFUR(LBS SO2/MMBTU)	0.84
MOISTURE(%)	28.72
SODIUM(% NA2O IN ASH)	1.34
SODIUM(LBS NA2O/MMBTU)	0.08
DRY ASH FREE BTU/LB	13028
AIR DRY LOSS	11.72

0 DRY BASIS
0 DRY BTU/LB 12051
DRY ASH(%) 7.49
DRY SULFUR(%) 0.51
0 SAMPLE ID
SAMPLE DATE
ANALYSIS DATE
ANALYST
SAMPLE BASIS TONNAGE 13375
WEIGHTING FACTOR 100.00

- TRAIN LOADING DETAIL

0 INITIAL CAR NUMBER	BN 535560		
TRACK/SCALE SEQUENCE	, ,		
TOTAL GROSS TONS	16977.075		
TOTAL TARE TONS	3602.050	CARS LOADED	128
TOTAL NET TONS	13375.025	AVG NET TONS/CAR	104.492
0 TIME OUT	20:58	RELEASE TIME	20:58
TIME IN	18:31	SPOT TIME	19:26
TOTAL ON SITE TIME	02:27	TOTAL LOADING TIME	01:32
0 INBOUND TRAIN NUMBER	OKORWM042		
TURNAROUND TIME			

RECEIVED
AUG 6 2004
SEP HOLCOMB STATION
RECORDS DEPT.

APPENDIX C

Sorbent Selection Letter of Invitation

Date

[Name]
[Address]
[Address]
[Address]

RE: DOE/NETL Evaluation of Mercury Control at Holcomb Station: Sorbent Selection

Dear [Name]:

This letter is an invitation to [Company Name] to be considered for participation in the DOE/NETL Evaluation of Mercury Control at Sunflower Electric Power Corporation's 360 MWe Holcomb Station, Unit 1. Unit 1 fires a Powder River Basin coal and is equipped with a spray dryer absorber followed by a fabric filter. Sorbents are sought that have demonstrated effectiveness in HCl and HF deficient flue gas.

If [Company Name] would like to participate in this sorbent evaluation, please provide the following information, in writing, to ADA-ES:

- Advantages over standard activated carbon
  - Provide supporting data
- Pricing in $/lb, undelivered
  - Small quantity delivered in supersacs (~900 lbs)
  - Small quantity delivered in pneumatic truck (~10,000 lbs)
  - Long-term test quantity delivered in pneumatic truck (~75,000 lbs)
  - Estimate of commercial pricing for a 1,500 MW plant using 10 lb/MMacf (~18,000,000 lbs/year)
- Projection of available supply per year
- Preferred injection location. At Holcomb, the sorbent can be injected upstream or downstream of the spray dryer absorber (either 280 to 320ºF or 190 to 210ºF). No opportunities for hot-side injection are available during this program.
- Materials & Safety Data Sheet (MSDS)
- Physical properties
  - Adsorption Capacity ($\mu g_{Hg}/g_{Sorbent}$) Please provide actual capacity (not normalized) and inlet mercury concentration during test.
  - Bulk Density (lbs/ft^3)
  - Size Distribution Data

The test team including NETL, Sunflower Electric Power Corporation, EPRI, and ADA-ES, will evaluate the requests and determine which sorbents will be included in the testing matrix. Selection of the alternate sorbents will be based upon perceived benefits and specific interests of the host site. If the sorbent is chosen, a series of screening tests will be conducted at Holcomb to determine capacity at full-scale test conditions (temperature, sorbent loading, and face velocity through thin bed of sorbent). Two sorbents will be chosen for full-scale evaluation based upon capacity measured during the screening tests, sorbent costs, and availability. During full-scale testing, it is expected each sorbent will be tested for at least 6 – 10 hours, unless a problem is identified and the test has to be halted.

If chosen for full-scale testing, the manufacturer must package the material into standard industrial sized bulk-bags (supersac). This will help ensure a tight, dust-free connection to the sorbent dosing system. An MSDS must be included with the delivery of the material to evaluate any unusual safety or handling concerns. Please note any special injection process requirements or modifications needed to obtain maximum sorbent performance under normal plant operating conditions.

After the sorbent has been tested and test data passes the QA/QC process, an informal report documenting test procedures and results during this period will be issued to the supplier, NETL and project team members. Access to and distribution of these data are restricted without the proper authorization from NETL and ADA-ES. The supplier will be required to sign an acknowledgement and acceptance of the NETL data handling requirements.

We look forward to your participation in this important program. Please call or e-mail your intentions and/or questions to me at (303) 734-1727 or sharons@adaes.com. Additional information is available upon request.

Sincerely,

[Name]
[Title]

APPENDIX D

Sample and Data Management Plan

DOE NATIONAL ENERGY TECHNOLOGY LABORATORY MERCURY FIELD EVALUATION

Evaluation of Sorbent Injection for Mercury Control at Sunflower Electric's Holcomb Station

Sample and Data Management Plan

Prepared by:
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

March 3, 2004

ADA-ES, Inc., partnered with ALSTOM Power, is conducting an evaluation looking at sorbent injection for mercury control at Sunflower Electric Power Corporation's (SEPC) Holcomb Station. The overall objective of this project is to determine the cost and effects of sorbent injection for control of mercury in stack emissions.

During the evaluation, fuel samples and certain process byproducts will be collected for determinations of mercury content, stability, and other analytes. Process byproducts of interest include but are not limited to:

- Bottom Ash
- Slaked Lime Milk
- Reactivator Sludge
- Feed Slurry
- Baghouse Fly Ash

Sample and data management are needed for tracking approximately 500 samples from various solid and liquid process streams at SEPC's Holcomb Station. ADA-ES is developing a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

The SDMS will also store plant operational data and other test data during the evaluation. Pertinent plant operating parameters will be logged electronically and formatted into a common spreadsheet, which will be delivered to the test team daily. After all test data have gone through a QA/QC process, these data will be uploaded to the SDMS.

The SDMS will provide a centralized access to project information and other data sets. It will provide links to previous project publications, schedules, and memos. The SDMS will have the capabilities to query certain data sets and generate plots and other necessary documents.

For data control and security, full access will be limited to the project manager and site manager at ADA-ES and the sample manager. Operators collecting samples will be able to upload information to the database and print sample labels and Chain-of-Custody forms. ADA-ES will include results with regularly issued reports to the test team.

Sampling Locations

Samples of various gaseous, liquid, and solid process streams will be collected during the evaluation. Specific flue gas samples are not included in this document. Sampling locations for SEPC's Holcomb Station are shown in Figure 1.

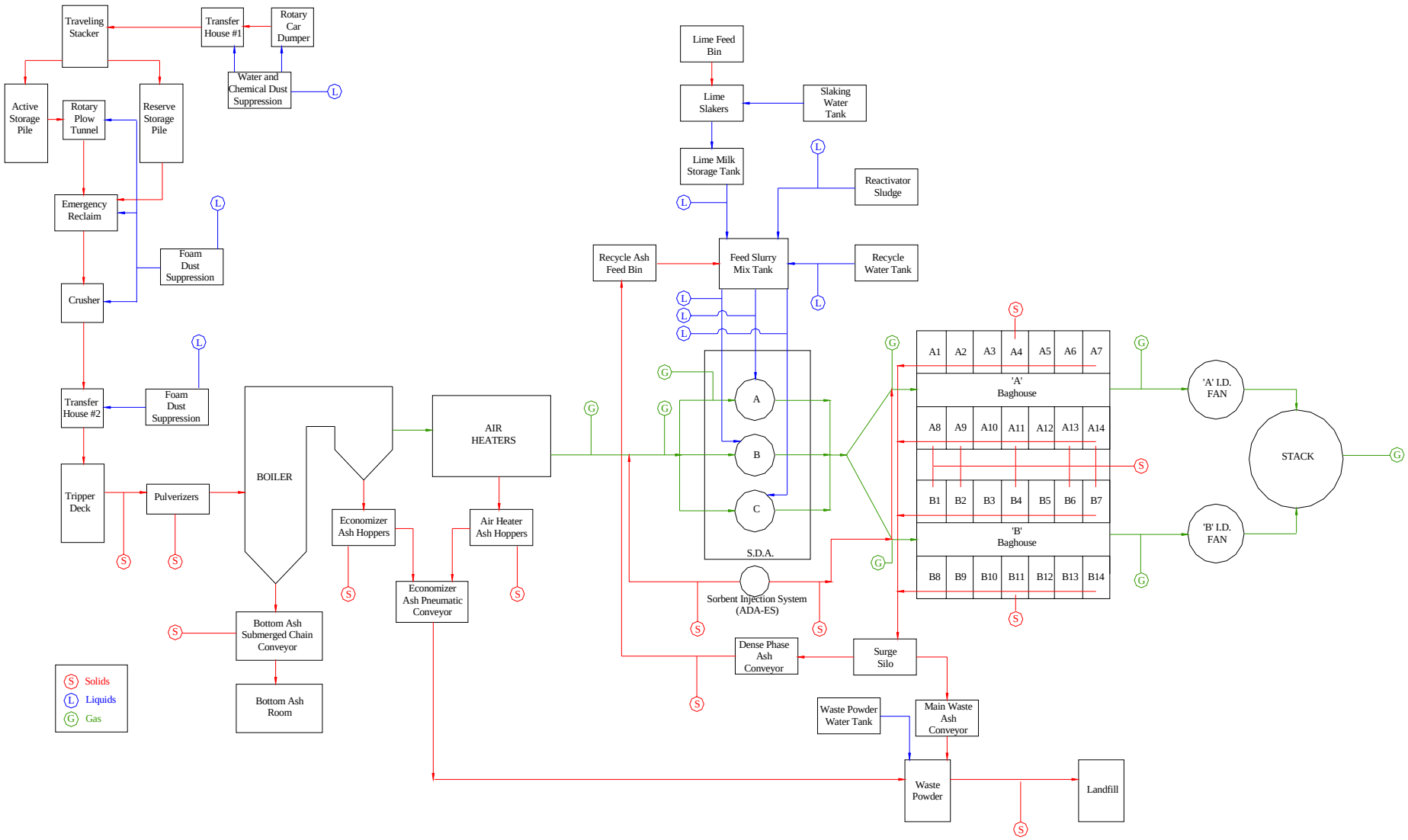

Figure 1. SEPC's Holcomb Configuration and Sampling Locations.

Sample Collection

Samples of various liquid and solid process streams will be collected during the mercury control evaluation. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). Collecting a representative sample is the primary objective of the sampling strategy. Representative samples will be collected only under stable and normal operating conditions unless otherwise directed by ADA-ES personnel.

Solid Sample Streams

Coal Samples – Daily grab samples (approximately one liter) from the coal sampling system will be collected during the baseline, parametric, and long-term testing periods. The as-fired coal sampling system is located in Transfer House #2. Location of Transfer House #2 is shown in Figure 1 above.

Pyrite Trap Samples – Solid samples taken from the pyrite traps will be collected during the long-term testing series. A liter sample will be collected from each pulverizer as directed by ADA-ES personnel. These samples should be collected before being mixed with the bottom ash. Date and time of collection will be determined at a later date.

Bottom Ash – Bottom ash samples should be collected prior to being mixed with the solid materials from the pyrite pits. Bottom ash samples will be collected two times a week during baseline and long-term testing from the bottom ash submerged chain conveyor.

Economizer Ash – Material samples will be collected from the economizer ash hoppers. These samples will be analyzed for mercury content and other analytes. Results from these analyses will be used to determine a mercury mass balance across the plant. At least one sample will be collected during long-term testing. ADA-ES personnel, once in the field, will determine sampling frequency and collection times.

Air Heater Ash – Ash from the air heater hoppers will be collected during the evaluation. These samples will be measured for mercury content and other species. A one-liter sample will be collected as directed by ADA-ES personnel.

SDA Recycle Ash – A liter sample taken from the recycle ash stream feeding into the feed slurry mix tank will be collected. A grab sample will be collected during the long-term testing series. ADA-ES will determine sampling frequency and schedule during the long-term testing series.

Fly Ash – Grab samples of ash will be collected from the fabric filter hoppers each day of testing. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). The samples will be stored in 1-liter or 5-gallon sample containers for shipping to the analytical laboratories. The schedule indicates sampling from multiple rows in the fabric filter. These samples will be used to determine if stratification exists throughout the system. A sketch showing the hoppers from the fabric filter is shown in Figure 2. The shaded hoppers indicate the hoppers from which fly ash samples will be collected.

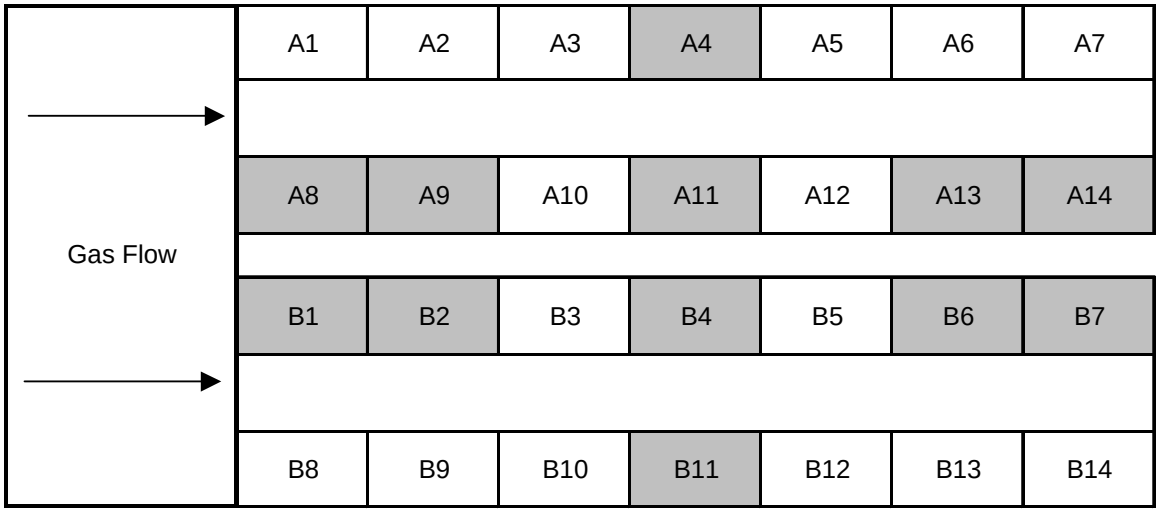

Figure 2. Fabric Filter Hopper Layout and Sampling Locations.

At the end of the long-term testing period, plant personnel will collect a fly ash sample inside one of the baghouse compartments. This sample should be collected from any surface structures (e.g., ledges, corners) that are capable of holding fly ash material in place for long periods of time. This sample should be exposed to coal-derived flue gas for long periods of time. This sample will be analyzed for metals content (e.g., Hg, As, Se) to help determine if these toxics accumulate over time and surpass any recommended exposure limits.

Upon completion of the mercury control evaluation, a filter bag from one of the baghouse compartments will be collected and sent to the laboratory for testing. This bag will be measured for metals content (e.g., Hg, As, Se) and subjected to a series of strength tests.

Landfill Sample – A liter sample of the material going to the landfill will be collected during the baseline and long-term testing periods. This sample will be collected after the material has left the waste powder process.

Liquid Sample Streams

Slaked Lime Milk – A liter sample will be collected from the lime milk storage tank.

Reactivator Sludge – Grab samples from this stream, which includes the wastewater sludge blowoff, will be taken from a sample tap inlet to the feed-slurry mixing tank. Reactivator sludge samples will be collected during the baseline and long-term testing periods.

Recycle Water – This liquid stream used in the feed slurry process will be sampled from the sample taps available inlet to the feed slurry mixing tank. A liter sample will be collected and analyzed for mercury content.

Feed Slurry – Grab samples will be taken from the feed slurry lines inlet to each absorber module: A, B, and C. Location of the feed slurry lines is shown in Figure 1.

Chemical Dust Suppression – A liter sample will be collected from the chemical dust suppression used at the rotary car dump station and transfer house #1. At least one sample will be collected during baseline and long-term testing periods.

Foam Dust Suppression – A liter sample will be collected from the foam dust suppression chemical system used at various locations along the coal conveying system. Location of the foam dust suppression system is shown in Figure 1. At least one sample will be collected during baseline and long-term testing periods.

Vapor Samples (Non-Flue Gas)

Vapor-phase mercury measurements will be made at the feed slurry mixing tank during the long-term testing period. These measurements will help the project team determine if vapor-phase mercury is being re-emitted into the ambient air after the four different process streams (e.g., recycle ash, reactivator sludge) are introduced into the feed slurry mixing tank. ADA-ES will use a solid sorbent trap as defined in draft M324 to monitor vapor-phase mercury above the mixing tank.

A tentative sample collection schedule showing solid and liquid sample collection is presented in Table 1. The final schedule will be agreed upon prior to beginning baseline testing. ADA-ES will provide Holcomb plant personnel with a daily sampling matrix, which shows which samples to collect and other pertinent information. If the project team attempts to perform a mercury mass balance across the plant, additional samples will need to be collected. ADA-ES will coordinate with Holcomb plant personnel for additional sampling requirements.

Flue Gas Samples

Flue gas measurements will be made at the locations indicated on Figure 1. Flue gas analyses include Ontario Hydros, Method 29, Method 26a, M202, and controlled condensate. Hg analyzers will also be used at selected locations measuring near-real-time vapor-phase mercury concentrations in the flue gas.

Table 1. Tentative Sampling Schedule.

Test Condition	Type	Frequency	Comments
Baseline	Coal	Daily	1 liter
	Slaked Lime Milk	2 samples per week	1 liter
	Reactivator Sludge	2 samples per week	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13 (test side) 2 samples per week: A8, A14, B1, B2, B4, B11, B6, B7 A11	1 liter 1 liter 5 gallons
	Bottom Ash	2 samples per week	1 liter
Parametric	Coal	Daily	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13	1 liter
Long-Term	Coal	Daily	1 liter/day
	Slaked Lime Milk	2 samples per week	1 liter
	Reactivator Sludge	2 samples per week	1 liter
	Feed Slurry	Daily	1 liter
	FF Ash	Daily: Hoppers A9, A11, A4, A13 (test side) 2 samples per week: A8, A14, B1, B2, B4, B11, B6, B7 A11	1 liter 1 liter 5 gallons
	Bottom Ash	2 samples per week	1 liter

Additional samples, as described in Figure 1, will be collected during long-term testing.

Sample Management Strategy

During the mercury control evaluation, Holcomb plant personnel, as directed by ADA-ES, will collect the solid samples. ADA-ES will deliver a sampling schedule, which shows the sampling frequency, volume, and specific samples to collect during each testing day. A sample management flow chart is shown in Figure 3.

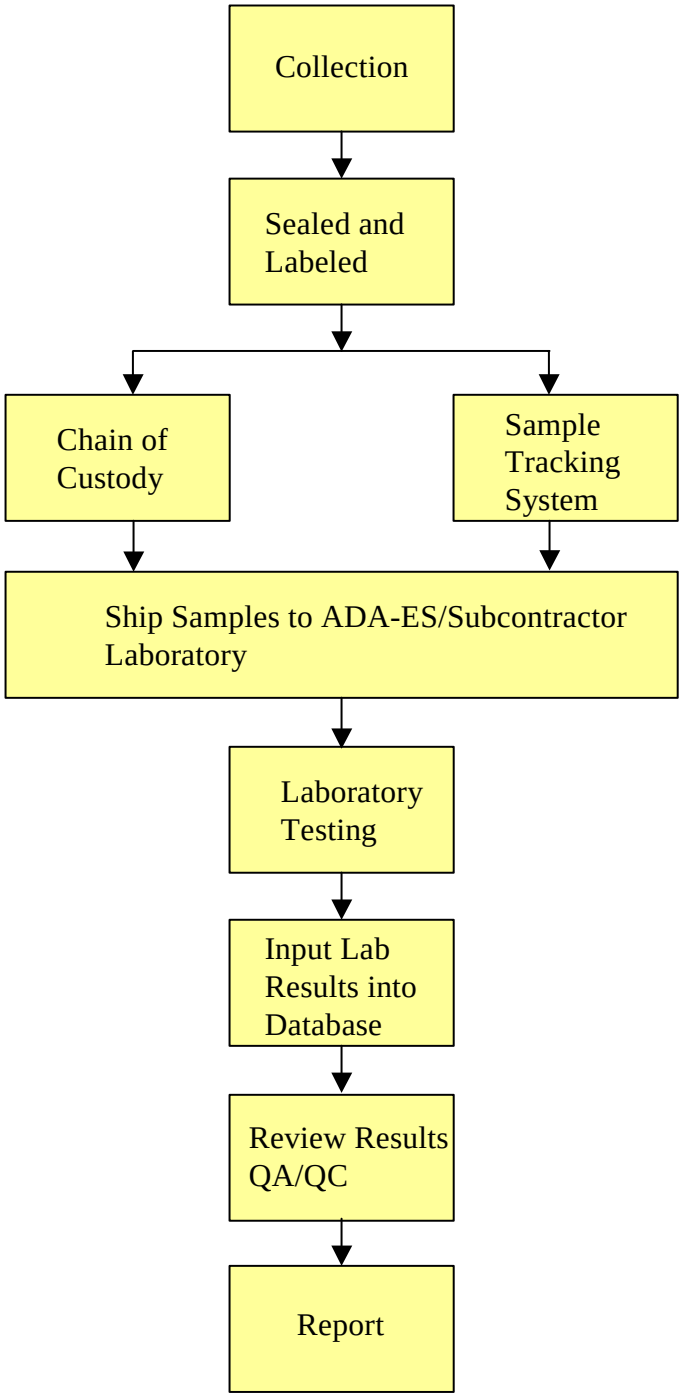

Figure 3. Sample Management Flowchart.

Once the samples have been collected, they will be delivered to ADA-ES personnel to be sealed and labeled. The samples will be logged into a database and given a sample identification number. Authorized project team members will have access to the database to see which samples have been collected and are available for testing.

Once the samples have been sealed and labeled, ADA-ES personnel will generate a Chain-of Custody (COC) form to be delivered with each shipment of samples. The COC will be used for sample tracking and identification. Although ADA-ES will not enforce the strict COC procedures (e.g., signatures to release sample custody, controlled access), all pertinent information will be recorded.

The samples, along with a COC, will be shipped to the ADA-ES laboratory for storage. Once received, ADA-ES will identify samples for mercury, and other, analyses. Other analyses will include ultimate and proximate analyses for coal, elemental analyses for coal and ash samples (including HCl and HF), and size distribution analyses for sorbent samples.

Although previous tests from this program and others have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash and SDA byproduct samples will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE. No samples will be shipped to outside firms without prior approval of Sunflower Electric and DOE.

Standard leaching test methods conducted on the fly ash samples will include the Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311) and the synthetic groundwater leaching procedure (SGLP). Solid and liquid samples will be collected and analyzed according to the methods as prescribed in Table 2. If a chemically treated sorbent is chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed.

Once the laboratory testing is complete, results will be logged into the SDMS. Authorized project team members will have access to the database to view the results. A report will be generated summarizing results from the sample analyses.

Sampling Location	Sample/Type	Sampling Method	Analytical Method
SDA Inlet	Speciated Mercury	Ontario Hydro	EPA SW 846 7470 cold vapor atomic absorption spectrometry (CVAAS)
	Multi-metals	M29	
	HCl, HF, Br_2	M26a	Ion chromatography per the promulgated EPA Method 26A
	SO_3	Controlled Condensate	
	Hg	M324	EPA Method 1631
	Total/Elemental Mercury	Semi-continuous	AF Analysis
SDA Inlet (downstream of sorbent injection)	Total/Elemental Mercury	Semi-continuous	AF Analysis
Fabric Filter Inlet	HCl, HF, Br_2	M26a	Ion chromatography per the promulgated EPA Method 26A
	SO_3	Controlled Condensate	
	Total/Elemental Mercury	Semi-continuous	AF Analysis
Fabric Filter Outlet	Total/Elemental Mercury	Semi-continuous	AF Analysis
Stack	Speciated Mercury	Ontario Hydro	EPA SW 846 7470 cold vapor atomic absorption spectrometry (CVAAS)
	Multi-metals	M29	TBD
	HCl, HF, Br_2	M26a	Ion chromatography per the promulgated EPA Method 26A
	Condensible Particulate Matter	M202	Organic and aqueous extraction with methylene chloride, gravimetric analysis
	SO_3	Controlled Condensate	
	Hg	M324	EPA Method 1631
	Total/Elemental Mercury	Semi-continuous	AF Analysis
Coal Fuel to Boiler	Hg, Cl	Grab sample	Hg - ASTM D6414-99 or 01/
			Cl - Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
Bottom Ash, Fly Ash	Hg, Cl, Leaching	Grab sample	Hg - ASTM D6414-99 or 01
			Cl - Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
			TCLP, SW846-1311, SGLP
Slaked Lime Milk, Feed Slurry	Hg	Grab sample	Hg - ASTM D6414-99 or 01

Table 2. Sampling and Analytical Matrix.

APPENDIX E

Baseline Source Test Results

GE Energy

Eric Ehlers
Project Manager

SDA SCRUBBER SPECIATED MERCURY, HCL/HF, Br+, AND TRACE METALS EMISSIONS BASELINE STUDY

Performed At
Sunflower Electric Power Corporation
Holcomb, Kansas Facility
Unit 1
Holcomb, Kansas

Test Dates
May 18 through 20, 2004

Report No.
GE Energy Management Services, Inc. Report M22E0517A

Report Submittal Date
August 10, 2004

GE Energy Management Services, Inc
888 Industrial Drive
Elmhurst, IL 60126
USA

T 630-530-6600
F 630-530-6630

GE Energy

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GE Energy

CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

GE ENERGY MANAGEMENT SERVICES, INC.

Jeffrey M. Crivlare
Senior Project Manager

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GE Energy

1.0 INTRODUCTION

GE Energy Management Services, Inc., ("GE Energy") performed a baseline speciated mercury, HCl, HF, Br+, and trace metals emission test program on Unit 1 at the Holcomb, Kansas Facility of Sunflower Electric Power Corporation in Holcomb, Kansas on May 18 through 20, 2004. The tests were authorized by Sunflower Electric Power Corporation and performed for ADA-ES, Inc. Target metals for the test program include: antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), and thallium (Tl).

The purpose of this test program was to establish baseline emissions for the above parameters during normal operating conditions.

1.1 Project Contact Information

Location	Address	Contact
Test Facility	Sunflower Electric Power Corporation Holcomb, Kansas Facility Holcomb, Kansas	Mr. Wayne Penrod Plant Manager wepenrod@sunflower.net
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Travis Starns Project Engineer 303-734-1727 (phone) 303-734-0330 (fax) traviss@adaes.com
Testing Company Representative	GE Energy Management Services, Inc. 888 Industrial Drive Elmhurst, Illinois 60126	Eric Ehlers Project Manager 630-530-6621 (phone) 630-530-6630 (fax) eric.ehlers@ps.ge.com

The tests were conducted by Messrs. B. Zimperman, N. Conroy, R. Campbell, R. Green, D. Ryan, J. May, F. Gonzalez, M. Ebner, W. Zoeteman, J. Wendell and Eric Ehlers of GE Energy.

2.0 SUMMARY OF RESULTS

The following table summarizes test results at each of the three test locations:

Parameter	Reference Method	Air Heater Outlet/SDA Inlet (Location 1)*	Baghouse Inlet/SDA Outlet (Location 2)*	Stack (Location 3)
Particle Bound Mercury (lbs/hr)	Ontario Hydro	0.00162***	N/A	0.00001
Oxidized Mercury (lbs/hr)	Ontario Hydro	0.00820***	N/A	0.00104
Elemental Mercury (lbs/hr)	Ontario Hydro	0.02663***	N/A	0.03119
Total Mercury (lbs/hr)	Ontario Hydro	0.03645***	N/A	0.03224
Antimony (lbs/hr)	Method 29	0.02527	N/A	0.00000
Arsenic (lbs/hr)	Method 29	0.09617	N/A	< 0.01797
Barium (lbs/hr)	Method 29	9.98749	N/A	0.04597
Beryllium (lbs/hr)	Method 29	< 0.00382	N/A	< 0.00300
Cadmium (lbs/hr)	Method 29	< 0.00419	N/A	< 0.00348
Chromium (lbs/hr)	Method 29	0.09999	N/A	0.00000
Cobalt (lbs/hr)	Method 29	0.09510	N/A	< 0.01078
Copper (lbs/hr)	Method 29	0.65473	N/A	0.01265
Lead (lbs/hr)	Method 29	0.01147	N/A	< 0.00289
Manganese (lbs/hr)	Method 29	0.52082	N/A	0.08629**
Mercury (lbs/hr)	Method 29	0.03369	N/A	0.03612
Nickel (lbs/hr)	Method 29	0.2848	N/A	< 0.01078
Selenium (lbs/hr)	Method 29	< 0.02848	N/A	0.00000
Silver (lbs/hr)	Method 29	< 0.06143	N/A	<0.03594
Thallium (lbs/hr)	Method 29	< 0.01909	N/A	< 0.01797
HCl (lbs/hr)	Method 26A	4.17110****	2.16200****	0.14250
HF (lbs/hr)	Method 26A	7.98690****	2.02490****	< 0.10590
Br+ (lbs/hr)	Method 26A	< 0.12820****	<0.14390****	<0.07060

*All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.
** Test #1 not included in average (statistical outlier).
*** Test #3 not included in average due to suspected leak in system.
****Based on the flow rate of the stack.

Complete test results for all test locations and parameters are appended in Section 6.0 of this report.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. The first Method 26A test was aborted at the Baghouse Inlet/SDA Outlet test location due to the failure of the sample train support system. During the second test day, two Method 26A tests were run at this location.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, *Code of Federal Regulations*, Part 60 (40CFR60), Appendix A, Methods 26A and 29 and the Ontario Hydro Method. Where applicable, the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/4-77-027b was used to determine the precise procedures.

4.1 Volumetric Flowrate Determination

In order to determine the emission rate on a lbs/hr basis, the gas velocities and volumetric flowrates were determined using Method 2, 40CFR60.

Velocity pressures were determined by traversing the test locations with S-type pitot tubes. An abbreviated traverse was performed at the Air Heater Outlet/SDA Inlet due to clearance restrictions of the particulate probe. Temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method collected samples in an integrated manner and analyzed the samples using a Hays Orsat gas analyzer. Several gas extractions were performed during each test run to ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Trace Metals Determination

The Method 29 trace metals sample train is one of the comprehensive sampling systems used to sample stack gas effluent. This system is based upon the design of units which are normally employed for sampling under Method 5, 40CFR60. The modified system consisted of a probe, a high-efficiency glass fiber filter stage, and five impingers.

The train consisted of the following components: a glass liner wrapped with heating wire and a stainless steel jacket. Samples were collected while the probe was heated to a gas temperature of 248°F ± 25°F. The filter holder was equipped with a Teflon® filter support and a tared glass fiber filter. The filter medium was a Pallflex 2500 QAT-UP filter exhibiting >99.99% efficiency on 0.3 micron DOP smoke particles. The filter holder was contained in an electrically heated enclosed box that was thermostatically maintained at a temperature of 248°F ± 25°F, which is sufficient to prevent water condensation in this portion of the train.

The first and second impingers were modified versions of the Greenburg-Smith design; initially, they were filled with 200 mls of 5% HNO_3/10% H_2O_2. The third and fourth impingers were also a Greenburg-Smith impinger. They were each filled with 100 mls of acidic $KMnO_4$. The fifth impinger was filled with silica gel to absorb any remaining moisture.

A total number of 8 points using 8 ports were utilized at the Air Heater Outlet/SDA Inlet test location, and a total of 12 points using 4 ports were utilized at the Stack test location. Point locations were selected in accordance with Methods 1 and 2, 40CFR60. Tests were performed for two hours.

All sample contact surfaces of the train were washed with 0.1 N nitric acid. The first two impingers were also washed with 0.1N nitric acid. The third and fourth impingers were rinsed with demineralized water and 8N HCl. The washes were placed in sealed and marked containers for analysis.

4.4 Mercury Determination

A total of 12 test points were sampled using four (4) ports at the stack test location. A total of 8 test points were sampled using eight (8) ports at the Air heater Outlet/SDA Inlet test location.

The mercury sample train was manufactured by Nutech Corporation of Durham, North Carolina and meets all specifications required by The Ontario Hydro Method. A teflon-lined probe was used at the Air Heater Outlet/SDA Inlet location and a glass-lined probe was used at the Stack location. Drawings depicting the sampling ports, test point locations, and sample trains are appended to this

report. Velocity pressures were determined simultaneously during sampling with a calibrated S-type pitot tube and inclined manometer. All temperatures were measured using K-type thermocouples with calibrated digital temperature indicators.

The outlet filter media were quartz filters exhibiting a ≥99.97% efficiency on 0.3 micron DOP smoke particles in accordance with ASTM Standard Method D-2986-71. The inlet test employed a quartz-thimble prefilter. All sample contact surfaces of the train were washed with 0.1 N Nitric Acid. These washes were placed in sealed and marked containers for analysis. All sample recovery of impinger solutions was performed on site.

4.5 Hydrogen Chloride (HCl) Hydrogen Flouride (HF) and Bromine (Br^+) Determination

Hydrogen chloride (HCl), hydrogen fluoride (HF), and Bromine (Br^+) concentrations were determined using Method 26A, 40CFR60. An integrated sample was extracted from the gas stream and passed through dilute (0.1 N) sulfuric acid. In the dilute acid, the HCl dissolved and formed chloride (Cl) ions. The chloride ions were then analyzed by ion chromatography. The sample train consisted of a heated glass probe liner, a heated optional filter, and four impingers. The first and second impingers contained the dilute sulfuric acid, the third impinger contained a 0.1 N sodium hydroxide (NaOH) scrubber solution to remove any remaining chlorine, and the fourth impinger contained silica gel to absorb any remaining moisture. The train was leak checked prior to and after each run. The sample was then extracted isokinetically. The samples were recovered by quantitatively transferring the contents of the first two impingers and deionized water rinses to a sample jar. The samples were mixed and labeled, and the level marked for transfer to the laboratory. The samples were then analyzed by ion chromatography.

The test trains were weighed before and after each test for moisture determination.

5.0 QUALITY ASSURANCE PROCEDURES

GE Energy recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the GE Energy laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, all reagent standardizations were performed daily by the same person performing the analysis.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

GE Energy

HCL, HF, AND BR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Unit: Stack

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/18/2004	5/19/2004	5/20/2004	
Start Time	9:37	8:10	8:45	
End Time	11:50	10:16	11:03	
HCl Emissions				
ppm:	0.011	0.049	0.030	0.030
ug/dscm	16.63	75.07	45.71	45.80
lb/hr	0.0512	0.2325	0.1438	0.1425
tons/yr	0.2243	1.0183	0.6299	0.6242
lb/mmBtu	0.00002	0.00007	0.00004	0.00004
lb/TBtu	15.71660	68.91764	42.26354	42.29926
HF Emissions*				
ppm:	0.040	0.042	0.041	0.041
ug/dscm	33.26	34.65	34.28	34.06
lb/hr	0.1024	0.1073	0.1079	0.1059
tons/yr	0.4486	0.4700	0.4724	0.4637
lb/mmBtu	0.00003	0.00003	0.00003	0.00003
lb/TBtu	31.43320	31.80814	31.69765	31.64633
Br Emissions*				
ppm:	0.007	0.007	0.007	0.007
ug/dscm	22.17	23.10	22.85	22.71
lb/hr	0.0683	0.0715	0.0719	0.0706
tons/yr	0.2991	0.3133	0.3150	0.3091
lb/mmBtu	0.00002	0.00002	0.00002	0.00002
lb/TBtu	20.95547	21.20543	21.13177	21.09755
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,331,069	1,342,169	1,358,706	1,343,981
Gas Volumetric Flow Rate, dscfm	822,296	826,784	840,015	829,698
Average Gas Temperature, °F	193.5	190.8	190.7	191.7
Average Gas Velocity, ft/sec	105.922	106.806	108.122	106.950
Flue Gas Moisture, percent by volume	15.1	14.8	14.9	14.9
Average Flue Pressure, in. Hg	26.94	26.65	26.79	
Barometric Pressure, in. Hg	26.98	26.77	26.91	
Average %CO_2 by volume, dry basis	12.2	12.3	12.4	12.3
Average %O_2 by volume, dry basis	7.4	7.0	7.1	7.2
Dry Molecular Wt. of Gas, lb/lb-mole	30.248	30.248	30.268	
Gas Sample Volume, dscf	63.716	61.153	61.811	
Isokinetic Variance	110.3	105.3	104.7	

*All HF and Br emissions are based on sample analysis that are below the detection limit.

GE Energy

HCL, HF, AND BR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Unit: Baghouse Inlet

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/19/2004	5/19/2004	5/20/2004	
Start Time	8:10	11:50	8:45	
End Time	10:40	14:06	11:04	
HCl Emissions				
ppm:	0.162	0.107	0.416	0.228
ug/dscm	245.78	162.24	630.44	346.15
lb/hr	0.7570	0.5024	1.9836	1.0810
tons/yr	3.3158	2.2006	8.6882	4.7349
lb/mmBtu	0.00023	0.00015	0.00052	0.00030
lb/TBtu	230.61062	148.93425	522.37705	300.64064
HF Emissions				
ppm:	0.096	0.121	0.947	0.388
ug/dscm	79.88	100.70	788.04	322.87
lb/hr	0.2460	0.3118	2.4795	1.0125
tons/yr	1.0776	1.3659	10.8603	4.4346
lb/mmBtu	0.00007	0.00009	0.00065	0.00027
lb/TBtu	74.94845	92.44195	652.97131	273.45390
Br Emissions *				
ppm:	0.007	0.007	0.007	0.007
ug/dscm	24.58	22.38	22.52	23.16
lb/hr	0.0757	0.0693	0.0708	0.0719
tons/yr	0.3316	0.3035	0.3103	0.3151
lb/mmBtu	0.00002	0.00002	0.00002	0.00002
lb/TBtu	23.06106	20.54266	18.65632	20.75335
Stack Parameters:				
Gas Volumetric Flow Rate, acfm**	1,331,069	1,342,169	1,358,706	1,343,981
Gas Volumetric Flow Rate, dscfm**	822,296	826,784	840,015	829,698
Average Gas Temperature, °F	178.8	177.0	172.0	175.9
Average Gas Velocity, ft/sec	94.564	99.059	99.581	97.735
Flue Gas Moisture, percent by volume	15.6	15.2	15.5	15.4
Average Flue Pressure, in. Hg	25.82	26.65	25.90	
Barometric Pressure, in. Hg	26.92	26.77	27.08	
Average %CO_2 by volume, dry basis	12.5	12.3	12.5	12.4
Average %O_2 by volume, dry basis	7.3	7.0	5.5	6.6
Dry Molecular Wt. of Gas, lb/lb-mole	30.292	30.248	30.220	
Gas Sample Volume, dscf	57.473	63.126	62.738	
Isokinetic Variance	104.3	105.2	106.6	

* All Br emissions are based on sample analysis that are below the detection limit.
**Flow rate used is the flow rate of the stack per client request.

GE Energy

HCL, HF, AND BR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Unit: Air Heater Outlet

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/18/2004	5/19/2004	5/20/2004	
Start Time	9:37	8:10	8:45	
End Time	12:15	10:28	10:56	
HCl Emissions				
ppm:	0.396	0.389	0.540	0.442
ug/dscm	600.81	590.71	818.93	670.15
lb/hr	1.8505	1.8294	2.5767	2.0855
tons/yr	8.1053	8.0126	11.2859	9.1346
lb/mmBtu	0.00048	0.00047	0.00066	0.00054
lb/Tbtu	482.17580	474.07206	657.22139	537.82309
HF Emissions				
ppm:	1.297	1.582	1.748	1.542
ug/dscm	1079.51	1317.00	1454.60	1283.70
lb/hr	3.3249	4.0786	4.5768	3.9934
tons/yr	14.5632	17.8642	20.0463	17.4912
lb/mmBtu	0.00087	0.00106	0.00117	0.00103
lb/Tbtu	866.34840	1056.94755	1167.37227	1030.22274
Br Emissions*				
ppm:	0.006	0.006	0.007	0.006
ug/dscm	19.54	19.37	22.91	20.60
lb/hr	0.0602	0.0600	0.0721	0.0641
tons/yr	0.2636	0.2627	0.3157	0.2807
lb/mmBtu	0.00002	0.00002	0.00002	0.00002
lb/Tbtu	15.68051	15.54335	18.38382	16.53589
Stack Parameters:				
Gas Volumetric Flow Rate, acfm***	1,331,069	1,342,169	1,358,706	1,343,981
Gas Volumetric Flow Rate, dscfm***	822,296	826,784	840,015	829,698
Average Gas Temperature, °F	285.8	290.9	278.0	284.9
Average Gas Velocity, ft/sec	53.440	52.950	43.124	49.838
Flue Gas Moisture, percent by volume	10.0	10.7	11.5	10.7
Average Flue Pressure, in. Hg	26.45	26.18	26.33	
Barometric Pressure, in. Hg	27.15	26.92	27.07	
Average %CO_2 by volume, dry basis	14.0	14.0	14.0	14.0
Average %O_2 by volume, dry basis	5.0	5.0	5.0	5.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.440	30.440	30.440	
Gas Sample Volume, dscf	72.297	72.935	61.666	
Isokinetic Variance	97.9	102.2	104.6	

* All Br emissions are based on sample analysis that are below the detection limit.
**Flow rate used is the flow rate of the stack per client request.

Sunflower Electric Power Corporation
Holcomb Station
Removal Efficiency Across Spray Dryer
May 18 through 20, 2004

HF Removal Efficiency			
Test No.	Air Heater Outlet HF Emissions, lbs/hr*	Baghouse Inlet HF Emissions, lbs/hr*	Efficiency, %
1	3.3249	0.2460	92.60
2	4.0786	0.3118	92.36
3	4.5768	2.4795	45.82
Average	3.9934	1.0124	76.93

HCL Removal Efficiency			
Test No.	Air Heater Outlet HCl Emissions, lbs/hr*	Baghouse Inlet HCl Emissions, lbs/hr*	Efficiency, %
1	1.8505	0.7570	59.09
2	1.8294	0.5024	72.54
3	2.5767	1.9836	23.02
Average	2.0855	1.0810	51.55

$$\text{Removal Efficiency (\%)} = \frac{\text{Air Heater Outlet (lbs/hr)} - \text{Baghouse Inlet (lbs/hr)}}{\text{Air Heater Outlet (lbs/hr)}} \times 100\%$$

*Emissions based on using stack flow rate at each location.

GE Energy

SPECIATED MERCURY TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Unit: Stack

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/18/2004	5/19/2004	5/20/2004	
Start Time	10:00	9:05	9:25	
End Time	12:30	11:30	11:35	
Particle Bound Mercury Emissions				
ppm	0.000001	0.000000	0.000000	0.000000
ug/dncm	0.01	0.00	0.00	0.00
lb/hr	0.00002	0.00000	0.00000	0.00001
tons/yr	0.000090	0.000000	0.000000	0.000030
lb/mmBtu	0.0000000	0.0000000	0.0000000	0.0000000
lb/Tbtu	0.00626	0.00000	0.00000	0.00209
Elemental Mercury Emissions				
ppm	0.001146	0.001255	0.001159	0.001187
ug/dncm	10.26	11.24	10.38	10.63
lb/hr	0.02995	0.03265	0.03097	0.03119
tons/yr	0.131201	0.143000	0.135634	0.136612
lb/mmBtu	0.0000091	0.0000096	0.0000096	0.0000094
lb/Tbtu	9.10434	9.61887	9.61887	9.44736
Oxidized Mercury Emissions				
ppm	0.000051	0.000032	0.000036	0.000040
ug/dncm	0.46	0.28	0.32	0.35
lb/hr	0.00133	0.00083	0.00097	0.00104
tons/yr	0.005822	0.003617	0.004239	0.004559
lb/mmBtu	0.0000004	0.0000002	0.0000002	0.0000003
lb/Tbtu	0.40400	0.24330	0.24330	0.29687
Total Mercury Emissions				
ppm	0.001197	0.001287	0.001196	0.001227
ug/dncm	10.72	11.53	10.71	10.99
lb/hr	0.03130	0.03347	0.03193	0.03224
tons/yr	0.137113	0.146618	0.139873	0.141201
lb/mmBtu	0.0000095	0.0000099	0.0000099	0.0000097
lb/Tbtu	9.51460	9.86217	9.86217	9.74631
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,361,081	1,371,609	1,390,305	1,374,332
Gas Volumetric Flow Rate, dscfm	836,459	831,876	854,335	840,890
Average Gas Temperature, °F	191.5	187.7	187.9	189.0
Average Gas Velocity, ft/sec	108.311	109.148	110.636	109.365
Flue Gas Moisture, percent by volume	15.8	16.5	15.9	16.1
Average Flue Pressure, in. Hg	26.94	26.65	26.84	
Barometric Pressure, in. Hg	26.98	26.77	26.91	
Average %CO_2 by volume, dry basis	12.5	12.0	12.4	12.3
Average %O_2 by volume, dry basis	7.5	7.0	7.1	7.2
Dry Molecular Wt. of Gas, lb/lb-mole	30.300	30.200	30.268	
Gas Sample Volume, dscf	59.100	57.297	58.390	
Isokinetic Variance	109.1	106.4	105.5	

GE Energy

SPECIATED MERCURY TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Unit: Air Heater Outlet

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/18/2004	5/19/2004	5/20/2004	
Start Time	10:00	9:05	9:25	
End Time	12:40	11:40	12:00	
Particle Bound Mercury Emissions				
ppm	0.000042	0.000062	0.000060	0.000052
ug/dncm	0.38	0.56	0.54	0.47
lb/hr*	0.00131	0.00193	0.00181	0.00162
tons/yr*	0.005730	0.008463	0.007914	0.007097
lb/mmBtu	0.0000003	0.0000004	0.0000004	0.0000004
lb/Tbtu	0.28387	0.41678	0.40249	0.35033
Elemental Mercury Emissions				
ppm	0.000815	0.000905	0.000469	0.000860
ug/dncm	7.30	8.11	4.20	7.70
lb/hr*	0.02516	0.02811	0.01409	0.02663
tons/yr*	0.110192	0.123103	0.061728	0.116648
lb/mmBtu	0.0000055	0.0000061	0.0000031	0.0000058
lb/Tbtu	5.45907	6.06232	3.13941	5.76069
Oxidized Mercury Emissions				
ppm	0.000292	0.000238	0.000114	0.000265
ug/dncm	2.62	2.13	1.02	2.37
lb/hr*	0.00901	0.00738	0.00343	0.00820
tons/yr*	0.039485	0.032315	0.015036	0.035900
lb/mmBtu	0.0000020	0.0000016	0.0000008	0.0000018
lb/Tbtu	1.95617	1.59136	0.76473	1.77376
Total Mercury Emissions				
ppm	0.001149	0.001205	0.000643	0.001177
ug/dncm	10.30	10.79	5.76	10.54
lb/hr*	0.03548	0.03742	0.01933	0.03645
tons/yr*	0.155407	0.163881	0.084678	0.159644
lb/mmBtu	0.0000077	0.0000081	0.0000043	0.0000079
lb/Tbtu	7.69910	8.07047	4.30662	7.88479
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	869,391	903,920	830,531	886,656
Gas Volumetric Flow Rate, dscfm	493,701	496,665	480,910	495,183
Average Gas Temperature, °F	280.8	284.8	289.9	282.8
Average Gas Velocity, ft/sec	49.965	51.949	47.732	50.957
Flue Gas Moisture, percent by volume	9.9	11.4	6.6	10.7
Average Flue Pressure, in. Hg	26.45	26.18	26.33	
Barometric Pressure, in. Hg	27.15	26.92	27.07	
Average %CO_2 by volume, dry basis	14.0	14.0	14.0	14.0
Average %O_2 by volume, dry basis	5.0	5.0	5.0	5.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.440	30.440	30.440	
Gas Sample Volume, dscf	62.300	74.800	70.416	
Isokinetic Variance	94.0	106.8	103.9	

* All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.

GE Energy

Sunflower Electric Power Corporation

Total Emissions

Stack

Trace Metals Summary

Tests 1 through 3 Averages

May 18 through 20, 2004

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)	Emissions Rate (tons/yr)	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Arsenic	< 10	< 3.6208E-10	< 0.001864	< 0.01797	< 0.07870	< 2.53E-06	< 1.56E-06	< 5.24E-06	< 5.2366	< 5.800
Barium	25.5	9.26E-10	0.002600	0.04597	0.20135	6.48E-06	3.99E-06	1.34E-05	13.3967	14.836
Beryllium	< 1.667	< 6.0632E-11	< 0.002595	< 0.00300	< 0.01316	< 4.24E-07	< 2.60E-07	< 8.74E-07	< 0.8740	< 0.971
Cadmium	< 1.933	< 7.006E-11	< 0.000240	< 0.00348	< 0.01522	< 4.90E-07	< 3.02E-07	< 1.01E-06	< 1.0127	< 1.122
Chromium	< 0	< 0	< 0.000000	< 0.00000	< 0.00000	< 0.00E+00	< 0.00E+00	< 0.00E+00	< 0.0000	< 0.000
Cobalt	< 6	< 2.1725E-10	< 0.001422	< 0.01078	< 0.04722	< 1.52E-06	< 9.37E-07	< 3.14E-06	< 3.1420	< 3.480
Copper	7.033	2.5516E-10	0.001548	0.01265	0.05539	1.79E-06	1.10E-06	3.68E-06	3.6812	4.087
Lead	< 1.6	< 5.8722E-11	< 0.000109	< 0.00289	< 0.01264	< 4.11E-07	< 2.51E-07	< 8.34E-07	< 0.8335	< 0.941
Manganese	47.65	1.75E-09	0.012252	0.08629	0.37795	5.61E-05	3.51E-05	1.17E-04	117.3831	128.323
Mercury	20.09	7.2827E-10	0.001400	0.03612	0.15819	5.10E-06	3.14E-06	1.05E-05	10.5183	11.666
Nickel	< 6	< 2.1725E-10	< 0.001427	< 0.01078	< 0.04722	< 1.52E-06	< 9.37E-07	< 3.14E-06	< 3.1420	< 3.480
Selenium	0	0	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Silver	< 20	< 7.2417E-10	< 0.002589	< 0.03594	< 0.15740	< 5.07E-06	< 3.12E-06	< 1.05E-05	< 10.4732	< 11.600
Thallium	< 10	< 3.6208E-10	< 0.000683	< 0.01797	< 0.07870	< 2.53E-06	< 1.56E-06	< 5.24E-06	< 5.2366	< 5.800

GE Energy

Sunflower Electric Power Corporation

Total Emissions
Air Heater Outlet
Trace Metals Summary
Tests 1 through 3 Averages
May 18 through 20, 2004

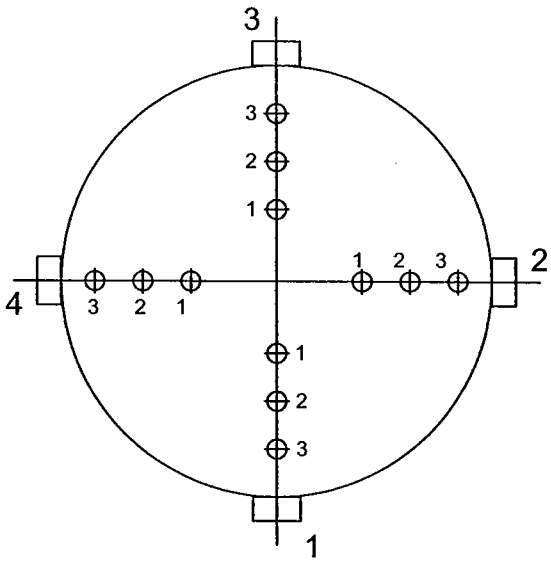
Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)*	Emissions Rate (tons/yr)*	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	13.33	4.2949E-10	0.001360	0.02527	0.11069	3.006E-06	1.729E-06	5.521E-06	5.5213	6.880
Arsenic	51.07	1.6314E-09	0.008396	0.09617	0.42124	1.142E-05	6.531E-06	2.097E-05	20.9719	26.132
Barium	5304	1.6715E-07	0.469294	9.98749	43.74519	1.17E-03	6.67E-04	2.15E-03	2148.8082	2677.506
Beryllium	< 2	< 6.295E-11	< 0.002694	< 0.00382	< 0.01672	< 4.407E-07	< 2.534E-07	< 8.092E-07	< 0.8092	< 1.008
Cadmium	< 2.167	< 7.0242E-11	< 0.000241	< 0.00419	< 0.01836	< 4.917E-07	< 2.865E-07	< 9.03E-07	< 0.9030	< 1.125
Chromium	52.2	1.7644E-09	0.013086	0.09999	0.43796	1.235E-05	7.206E-06	2.268E-05	22.6818	28.263
Cobalt	50.07	1.626E-09	0.010640	0.09510	0.41654	1.138E-05	6.563E-06	2.09E-05	20.9033	26.046
Copper	344.7	1.1226E-08	0.068115	0.65473	2.86773	7.858E-05	4.534E-05	1.44E-04	144.3148	179.822
Lead	5.967	1.8061E-10	0.000336	0.01147	0.05023	1.264E-06	7.249E-07	2.322E-06	2.3219	2.893
Manganese	273.4	8.9691E-09	0.062949	0.52082	2.28120	6.278E-05	3.633E-05	0.0001153	115.3014	143.670
Mercury	18.1	5.732E-10	0.001102	0.03369	0.14755	4.012E-06	2.274E-06	7.369E-06	7.3687	9.182
Nickel	121.3	3.9249E-09	0.025778	0.23050	1.00958	2.747E-05	1.583E-05	5.046E-05	50.4561	62.870
Selenium	< 15.13	< 4.6081E-10	< 0.002250	< 0.02848	< 0.12473	< 3.226E-06	< 1.827E-06	< 5.924E-06	< 5.9239	< 7.381
Silver	< 32.4	< 1.0331E-09	< 0.003693	< 0.06143	< 0.26904	< 7.232E-06	< 4.151E-06	< 1.328E-05	< 13.2814	< 16.549
Thallium	< 10	< 3.1475E-10	< 0.000594	< 0.01909	< 0.08360	< 2.203E-06	< 1.267E-06	< 4.046E-06	< 4.0462	< 5.042

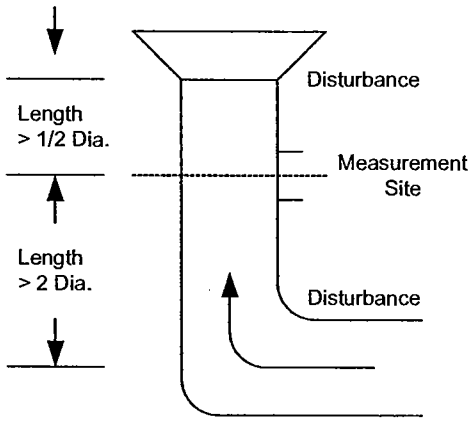
*All emissions rates are doubled assuming equal emissions on second "pant leg" of the system

GE Energy

APPENDIX

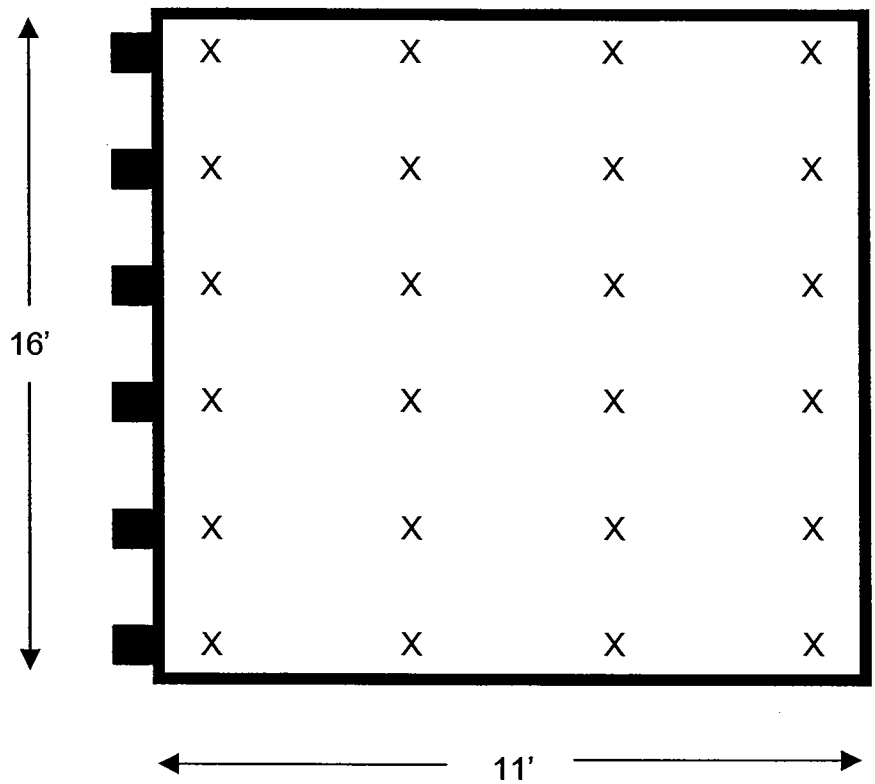
EQUAL AREA TRAVERSE FOR ROUND DUCTS





Job:	Sunflower Electric Power Corporation
Date:	May 18 through 20, 2004
Unit No:	1
Location:	Stack (Location 3)
Duct Diameter:	16.333 feet
Duct Area:	209.53 square feet
No. Sample Points:	12

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: Sunflower Electric Power Corporation
Holcomb, Kansas

Date: May 18 through 20, 2004

Area: 176 Square Feet

Test Location: Baghouse Inlet/SDA Outlet

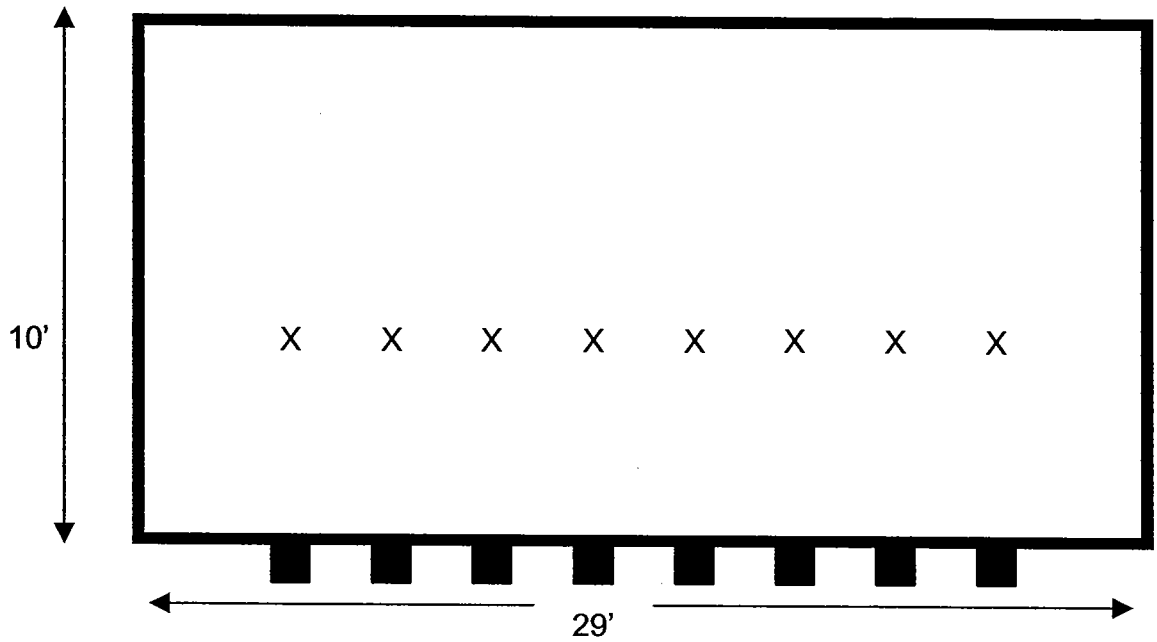
No. Test Ports: 6

Length: 11 Feet

Tests Points per Port: 4

Width: 16 Feet

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: Sunflower Electric Power Corporation
Holcomb, Kansas

Date: May 18 through 20, 2004

Test Location: Air Heater Outlet/SDA Inlet

Length: 10 Feet

Width: 29 Feet

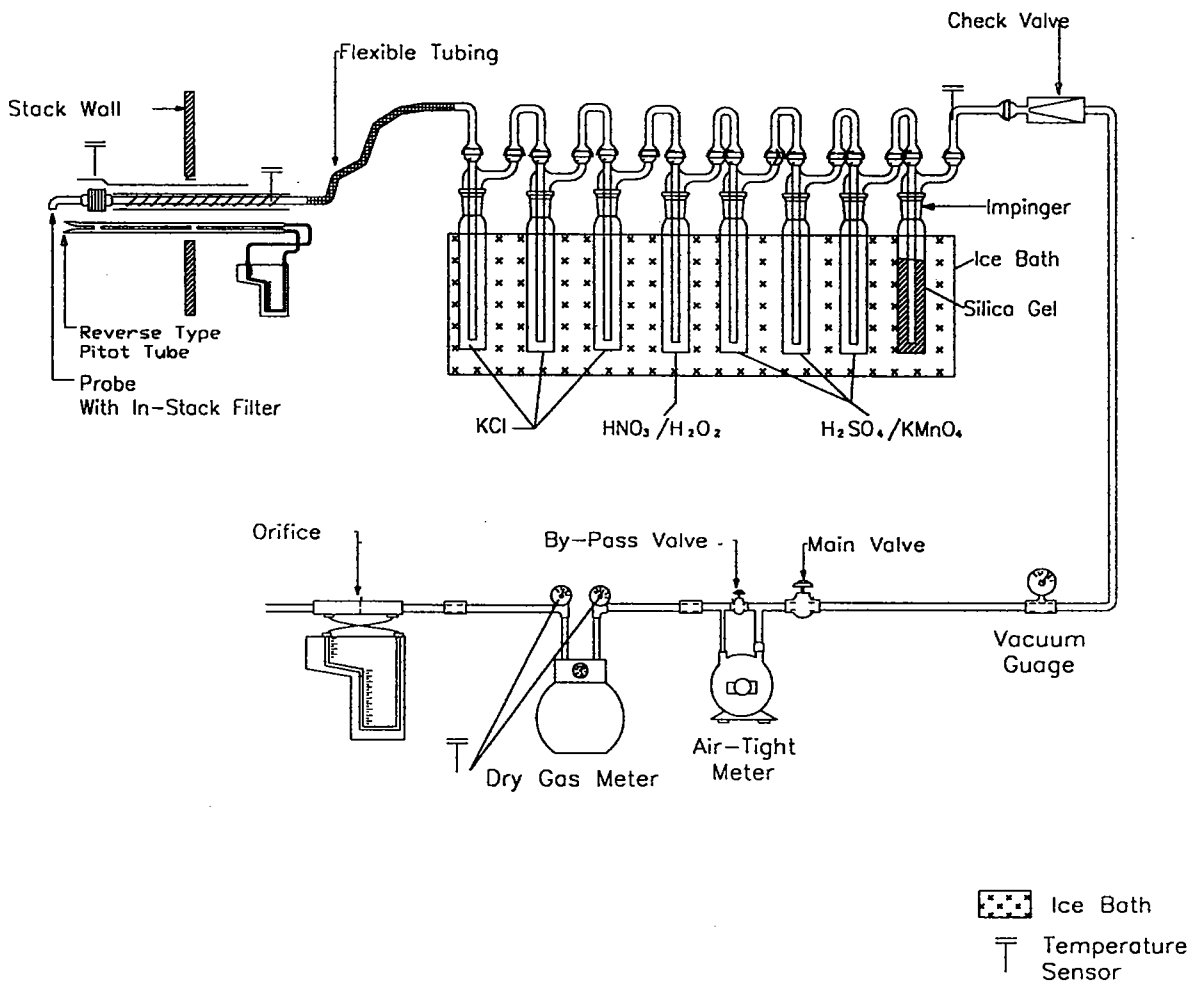
Area: 290 Square Feet

No. Test Ports: 8

Tests Points per Port: 1

Speciated Mercury Sampling Train Equipped with In-Stack Filter

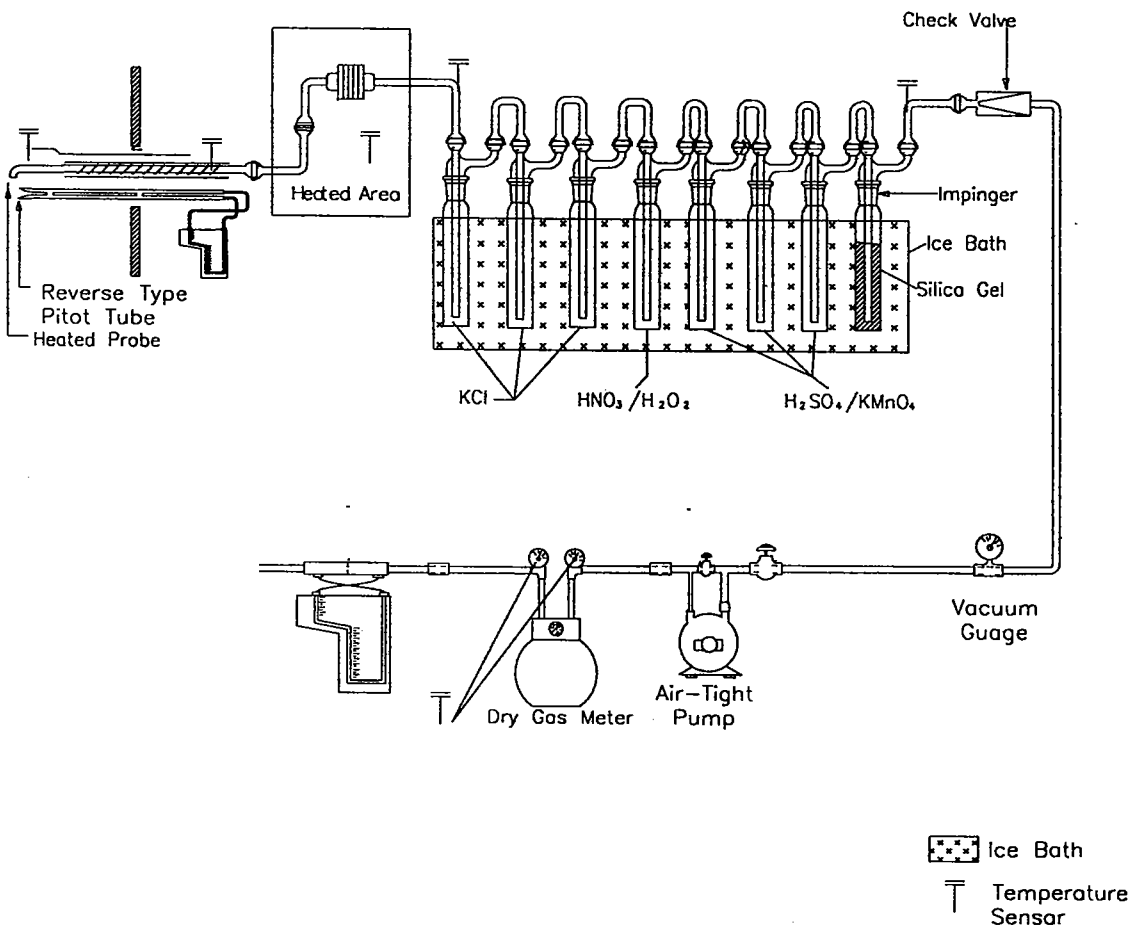
USEPA Ontario Hydro Method



Dwg – P1

Speciated Mercury Sampling Train Equipped With Out-of-Stack Filter

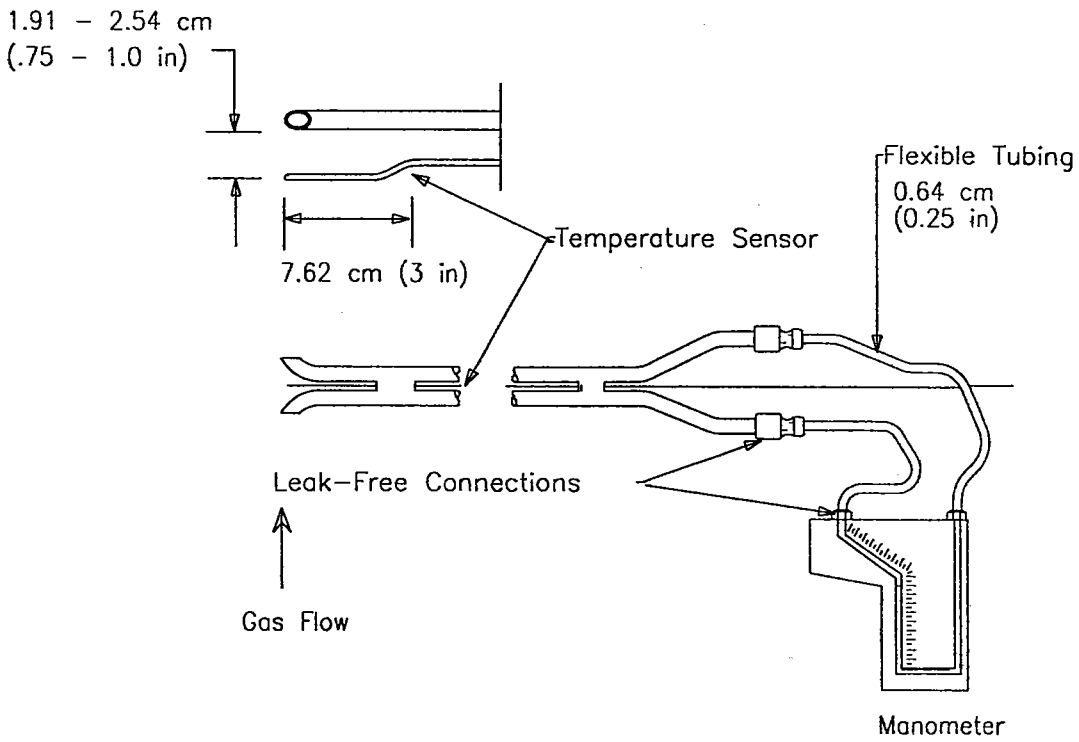
USEPA Ontario Hydro Method



Dwg – P2

S-Type Pitot Tube Manometer Assembly

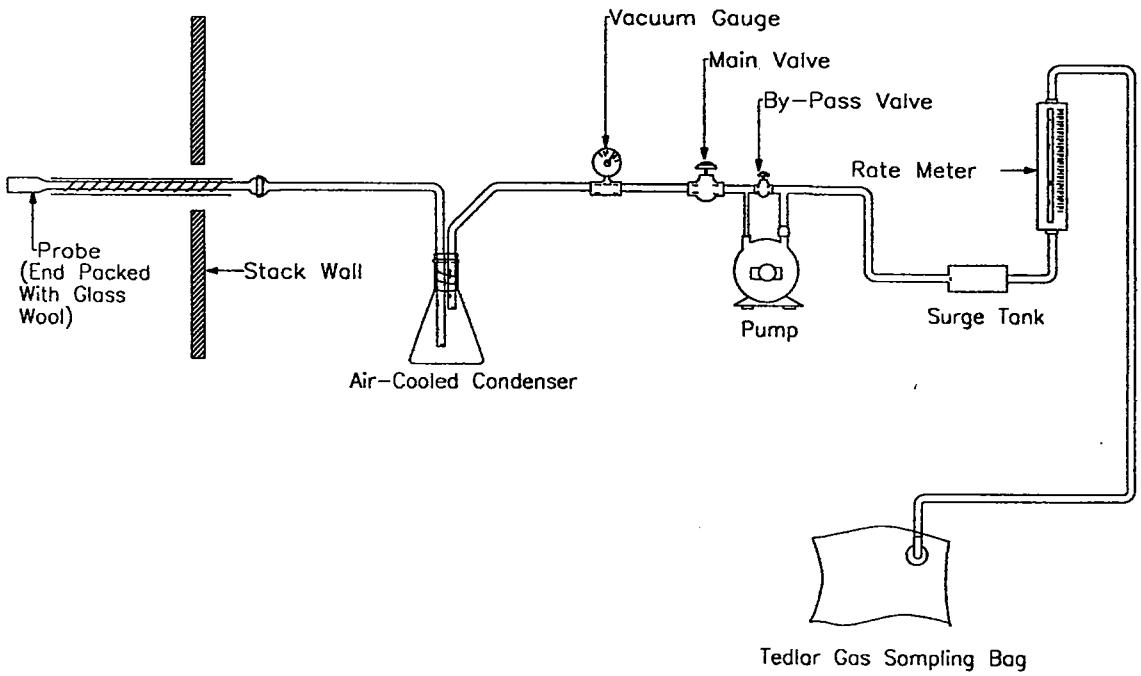
USEPA Method 2



Dwg - AD

Sampling Train for Integrated Gas Sampling

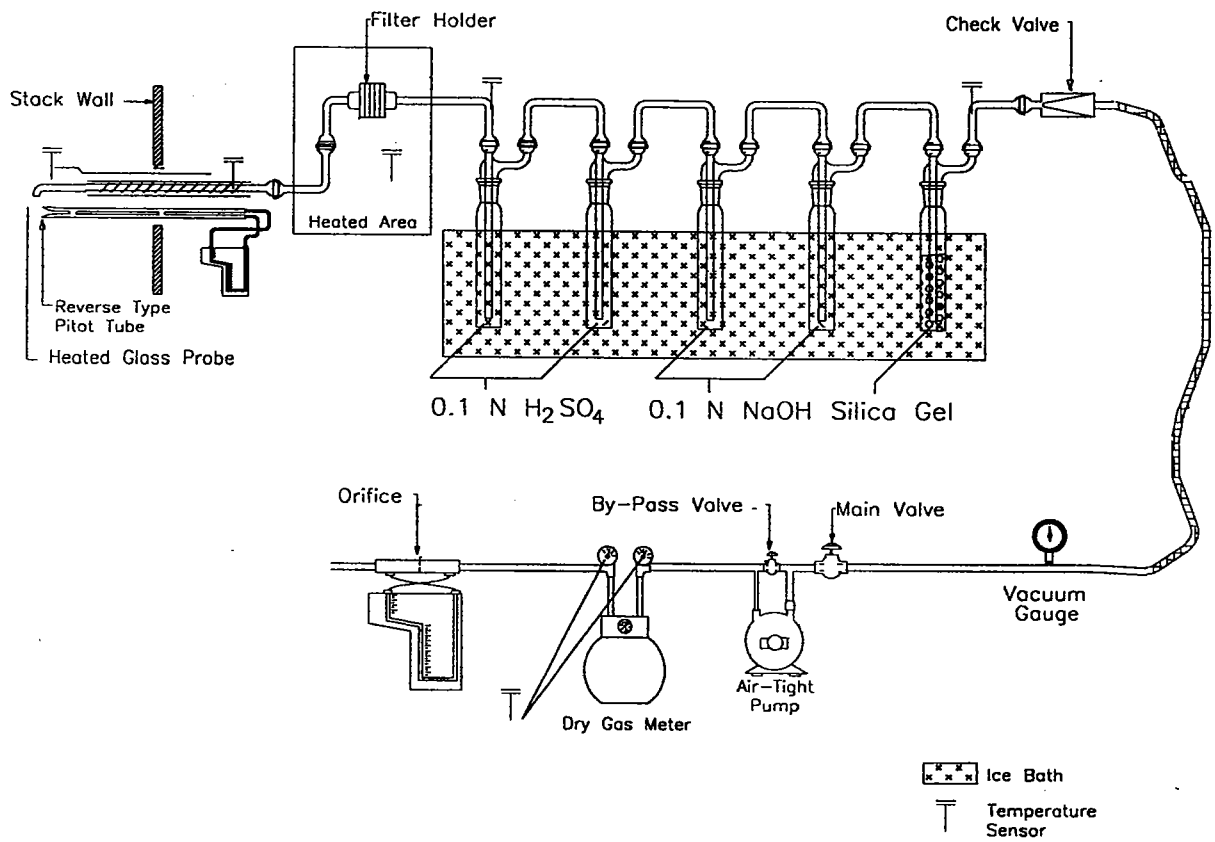
USEPA Method 3



Dwg - E

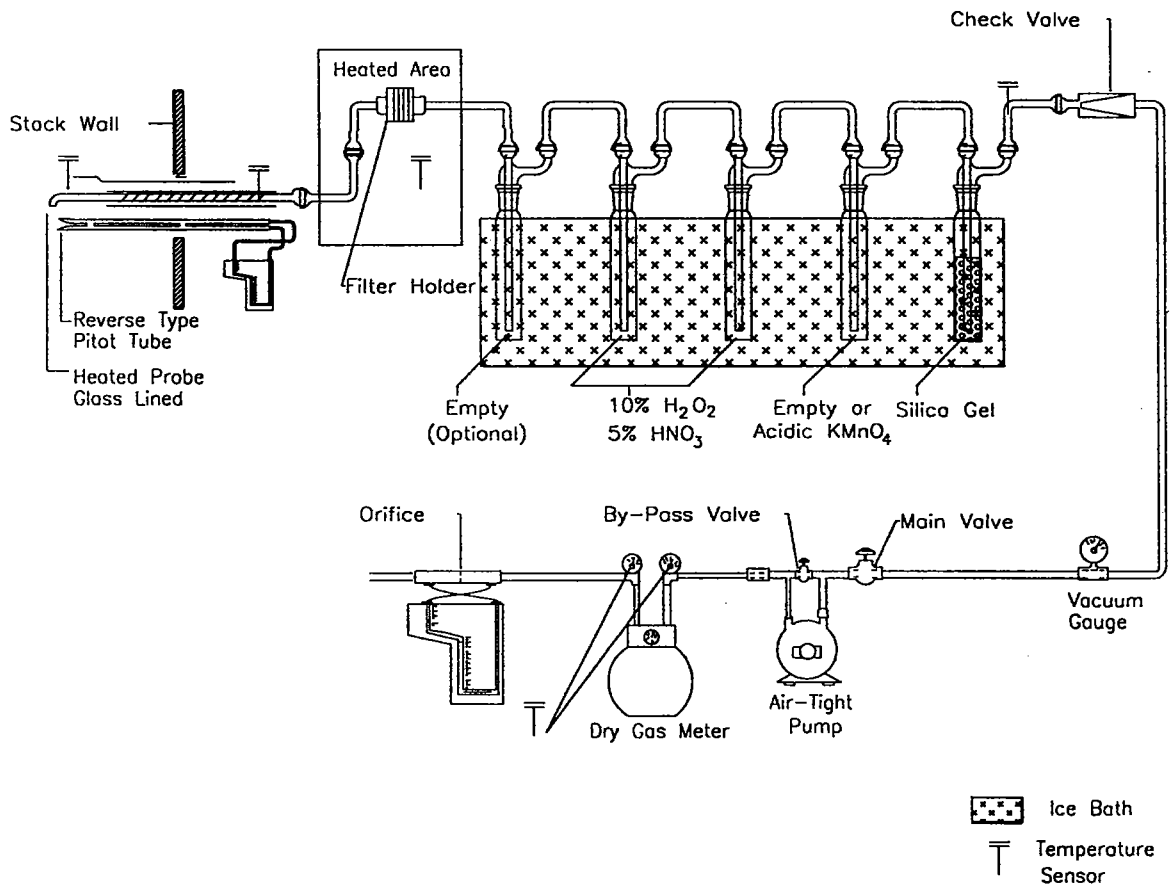
Determination of Hydrogen Chloride Emissions From Stationary Sources

USEPA Method 26A



Dwg - X

Determination of Trace Metal Concentrations in Emissions From Stationary Sources



Dwg - AQ

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714 4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64616 Sample: 050 Stack #1

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.18	mg	6/3/2004
HF (M26A)	<0.06	mg	6/3/2004

TEI Number: 64617 Sample: 051 Stack T 2

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.28	mg	6/2/2004
HF (M26A)	<0.06	mg	6/2/2004

TEI Number: 64618 Sample: 052 Stack T 3

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.23	mg	6/3/2004
HF (M26A)	<0.06	mg	6/3/2004

TEI Number: 64619 Sample: 053 AHO T 1

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	1.38	mg	6/2/2004
HF (M26A)	2.21	mg	6/2/2004

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Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

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TEI Number: 64620 Sample: 054 AHO T2

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	1.37	mg	6/3/2004
HF (M26A)	2.72	mg	6/3/2004

TEI Number: 64621 Sample: 055 AHO T3

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	1.58	mg	6/3/2004
HF (M26A)	2.54	mg	6/3/2004

TEI Number: 64622 Sample: 056 BHI T1

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.55	mg	6/3/2004
HF (M26A)	0.13	mg	6/3/2004

TEI Number: 64623 Sample: 057 BHI T2

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.44	mg	6/3/2004
HF (M26A)	0.18	mg	6/3/2004

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GE Energy Management Services, Inc.
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TEI Number: 64624 Sample: 058 BHI T3

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	1.27	mg	6/3/2004
HF (M26A)	1.40	mg	6/3/2004

TEI Number: 64625 Sample: 081 Blank

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.15	mg	6/3/2004
HF (M26A)	<0.06	mg	6/3/2004

TEI Number: 64626 Sample: 082

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64627 Sample: 083

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

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TEI Number: 64628 Sample: 084

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64629 Sample: 085

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64630 Sample: 086

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64631 Sample: 087

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64632 Sample: 088

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

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TEI Number: 64633 Sample: 089

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64634 Sample: 090

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

TEI Number: 64635 Sample: 091

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/4/2004

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GE Energy Management Services, Inc.
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TEI Number: 64636 Sample: 059

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	25.7	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	1.8	ug	6/4/2004
Chromium (6010)	3.5	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	4.1	ug	6/4/2004
Manganese (6010)	<3	ug	6/4/2004
Mercury (245.2)	<0.01	ug	6/8/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	5.3	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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GE Energy Management Services, Inc.
888 Industrial Dr.
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Report Date: 6/15/2004
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TEI Number: 64637 Sample: 060

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	26.8	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	8.8	ug	6/4/2004
Lead (6010)	6.7	ug	6/4/2004
Manganese (6010)	<3	ug	6/4/2004
Mercury (245.2)	<0.01	ug	6/8/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
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TEI Number: 64638 Sample: 061

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	38.2	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	<3	ug	6/4/2004
Mercury (245.2)	0.095	ug	6/8/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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GE Energy Management Services, Inc.
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Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
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TEI Number: 64639 Sample: 062

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	6.1	ug	6/4/2004
Arsenic (7060)	20.8	ug	6/11/2004
Barium (6010)	4240	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	57.2	ug	6/4/2004
Cobalt (6010)	19.6	ug	6/4/2004
Copper (6010)	120	ug	6/4/2004
Lead (6010)	13.5	ug	6/4/2004
Manganese (6010)	92.3	ug	6/4/2004
Mercury (245.2)	0.045	ug	6/8/2004
Nickel (6010)	48.3	ug	6/4/2004
Selenium (6010)	10.9	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Report Date: 6/15/2004
Sample Received:
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M22E0517-01

TEI Number: 64640 Sample: 063

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	12.4	ug	6/4/2004
Arsenic (7060)	57.9	ug	6/11/2004
Barium (6010)	7760	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	1.0	ug	6/4/2004
Chromium (6010)	89.3	ug	6/4/2004
Cobalt (6010)	40.6	ug	6/4/2004
Copper (6010)	270	ug	6/4/2004
Lead (6010)	13.5	ug	6/4/2004
Manganese (6010)	189	ug	6/4/2004
Mercury (245.2)	1.26	ug	6/8/2004
Nickel (6010)	94.8	ug	6/4/2004
Selenium (6010)	23.9	ug	6/11/2004
Silver (6010)	20.5	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64641 Sample: 064

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	21.5	ug	6/4/2004
Arsenic (7060)	74.5	ug	6/11/2004
Barium (6010)	7080	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	3.5	ug	6/4/2004
Chromium (6010)	207	ug	6/4/2004
Cobalt (6010)	90.0	ug	6/4/2004
Copper (6010)	647	ug	6/4/2004
Lead (6010)	6.5	ug	6/4/2004
Manganese (6010)	546	ug	6/4/2004
Mercury (245.2)	0.768	ug	6/8/2004
Nickel (6010)	186	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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GE Energy Management Services, Inc.
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Elmhurst, Il. 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64642 Sample: 065 Thimble

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	1090	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	85.1	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	3.2	ug	6/4/2004
Lead (6010)	6.3	ug	6/4/2004
Manganese (6010)	11.7	ug	6/4/2004
Mercury (245.2)	0.101	ug	6/8/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

Filter

TEI Number: 64643 Sample: 066

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	6.3	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	4.7	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	5.4	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	5.0	ug	6/4/2004
Manganese (6010)	<3	ug	6/4/2004
Mercury (245.2)	<0.01	ug	6/8/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	7.3	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Elmhurst, IL 60126

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5/26/04 16:02

M22E0517-01

TEI Number: 64644 Sample: 067

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	5.1	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	<3	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3<3	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	581	ug	6/4/2004
Mercury (245.2)	0.675	ug	6/7/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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GE Energy Management Services, Inc.
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TEI Number: 64645 Sample: 068

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	<3	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	3.1	ug	6/4/2004
Manganese (6010)	47.7	ug	6/4/2004
Mercury (245.2)	0.398	ug	6/7/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64646 Sample: 069

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	<3	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	6.3	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	47.6	ug	6/4/2004
Mercury (245.2)	0.114	ug	6/7/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64647 Sample: 070

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	48.8	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	9.4	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	3.6	ug	6/4/2004
Lead (6010)	3.3	ug	6/4/2004
Manganese (6010)	5.5	ug	6/4/2004
Mercury (245.2)	0.268	ug	6/7/2004
Nickel (6010)	7.0	ug	6/4/2004
Selenium (6010)	5.6	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Niles, IL 60714 4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64648 Sample: 071

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	12.4	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	9.5	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	3.0	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	3.8	ug	6/4/2004
Mercury (245.2)	2.64	ug	6/7/2004
Nickel (6010)	7.8	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	12.5	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64649 Sample: 072

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	<5	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	19.6	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	21.0	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	18.8	ug	6/4/2004
Mercury (245.2)	2.82	ug	6/7/2004
Nickel (6010)	20.1	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	44.2	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64650 Sample: 073

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Antimony (6010)	6.6	ug	6/4/2004
Arsenic (7060)	<5	ug	6/11/2004
Barium (6010)	<3	ug	6/4/2004
Beryllium (6010)	<1	ug	6/4/2004
Cadmium (6010)	<1	ug	6/4/2004
Chromium (6010)	<3	ug	6/4/2004
Cobalt (6010)	<3	ug	6/4/2004
Copper (6010)	<3	ug	6/4/2004
Lead (6010)	<3	ug	6/4/2004
Manganese (6010)	<3	ug	6/4/2004
Mercury (245.2)	<0.1	ug	6/7/2004
Nickel (6010)	<3	ug	6/4/2004
Selenium (6010)	<5	ug	6/11/2004
Silver (6010)	<10	ug	6/4/2004
Thallium (7841)	<5	ug	6/4/2004

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Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64651 Sample: 074

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	17.4	ug	6/7/2004

TEI Number: 64652 Sample: 075

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	22.2	ug	6/7/2004

TEI Number: 64653 Sample: 076

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	19.5	ug	6/7/2004

TEI Number: 64654 Sample: 077

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	3.73	ug	6/8/2004

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TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714 4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64616
Report Date: 6/15/2004
Sample Received:
5/26/04 16:02

M22E0517-01

TEI Number: 64655 Sample: 078

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	22.5	ug	6/8/2004

TEI Number: 64656 Sample: 079

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	20.7	ug	6/8/2004

TEI Number: 64657 Sample: 080

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			6/3/2004
Mercury (245.2)	0.04	ug	6/8/2004

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Certificate of Analysis

CLIENT INFORMATION

Attention:	Frank Jarke
Client Name:	GE Mostardi Platt
Project:	M22E0517-01
Project Desc:	Sunflower Electric
Address:	888 Industrial Drive Elmhurst, IL 60126
Fax Number:	630 530-6630
Phone Number:	630 530-6600

LABORATORY INFORMATION

Contact:	Ancy Sebastian
Project:	AN040738
Date Received:	28-May-2004
Date Reported:	11-Jun-2004
Submission No.:	4E1272
Sample No.:	031379-031390, 031671

NOTES: ***"-" = not analysed '<' = less than Method Detection Limit (MDL) 'NA' = no data available***
LOQ can by determined for all analytes by multiplying the appropriate MDL X 3.33
Solids data is based on dry weight except for biota analyses.
Organic analyses are not corrected for extraction recovery standards except for isotope dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
The enclosed copy of the Chain of Custody Record may contain information necessary for the interpretation of the data.

Methods used by PSC Analytical Services are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', Twentieth Edition. Other methods are based on the principles of MISA or EPA methodologies. New York State: ELAP Identification Number 10756.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at PSC Analytical Services for a period of three weeks from receipt of data or as per contract.

COMMENTS:

(1) MDL was raised due to sample dilution.
(2) Edges of filter frayed
(3) 5X dilution due to matrix interference
(4) Post digestion spike
(5) 2X dilution due to matrix interference

Certified by: _____

PASC - Certificate of Analysis

			Method Blank	Blank Spike #1	Blank Spike #1	Blank Spike #2	Blank Spike #2	OHHG-Reagent Blank	OHHG-Field Blank STK
	Client ID:								
	Lab No.:		031379 04	031379 04	031379 04	031379 04	031379 04	031380 04	031381 04
	Date Sampled:		-	-	-	-	-	19-May-2004	19-May-2004
Component	**MDL**	**Units**			% Recoveries		% Recoveries		
Final volume measured - bulk	0	ml	100	-	-	-	-	600	-
Final volume measured - bulk	0	"	100	-	-	-	-	100	-
Filter weight	1.0	mg	-	-	-	-	-	3000	-
Filter weight	1.0	"	-	-	-	-	-	730	-
Filter weight	1.0	"	-	-	-	-	-	3000	-
Impinger volume - hydroxylamine		ml	-	-	-	-	-	100	-
Impinger volume - KCl - combined		"	-	-	-	-	-	50	1000
Impinger volume - KMnO4 - combined		"	-	-	-	-	-	100	1000
								(1)	(1)
Mercury - filter	0.010	ug	<	0.11	100	0.11	110	<	-
Mercury - filter - bulk	0.010	"	<	0.10	100	0.11	100	<0.060	-
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	<0.10	-
Mercury - KCl	0.050	"	<	0.51	100	0.52	100	<	0.14
Mercury - KMnO4	0.050	"	<	0.52	100	0.54	110	<	<0.10
Mercury - H202	0.025	"	<	0.27	110	0.26	110	<0.050	<0.25

PASC - Certificate of Analysis

	Client ID:		OHHG-Field Blank IN	OHHG Stack-Test#1	OHHG Stack-Test#1	OHHG Stack-Test#1	OHHG Stack-Test#1	OHHG Stack-Test#1	OHHG Stack-Test#1
	Lab No.:		031382 04	031383 04	031383 04	031383 04	031383 04	031383 04	031383 04
	Date Sampled:		20-May-2004	18-May-2004	18-May-2004	18-May-2004	18-May-2004	18-May-2004	18-May-2004
Component	**MDL**	**Units**			Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.
				(2)					
Final volume measured - bulk	0	ml	-	-	-	-	-	-	-
Final volume measured - bulk	0	"	-	100	-	-	-	-	-
Filter weight	1.0	mg	-	-	-	-	-	-	-
Filter weight	1.0	"	-	740	-	-	-	-	-
Filter weight	1.0	"	-	-	-	-	-	-	-
Impinger volume - hydroxylamine		ml	-	-	-	-	-	-	-
Impinger volume - KCl - combined		"	1000	1000	-	-	-	-	-
Impinger volume - KMnO4 - combined		"	1000	1000	-	-	-	-	-
			(1)	(3)(4)(1)					
Mercury - filter	0.010	ug	-	0.011	0.010	0.12	100	0.12	100
Mercury - filter - bulk	0.010	"	-	-	-	-	-	-	-
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	-	-
Mercury - KCl	0.050	"	<0.10	0.85	0.86	1.9	100	1.9	110
Mercury - KMnO4	0.050	"	<0.10	16	16	21	100	21	100
Mercury - H202	0.025	"	<0.25	<0.25	<0.25	2.6	100	2.6	100

PASC - Certificate of Analysis

Component	MDL	Units	OHHG Stack-Test#2 031384 04 19-May-2004	OHHG Stack-Test#3 031385 04 20-May-2004	OHHG Inlet-Test#1 031386 04 18-May-2004	OHHG Inlet-Test#1 031386 04 18-May-2004 Duplicate	OHHG Inlet-Test#1 031386 04 18-May-2004 M. Spike	OHHG Inlet-Test#1 031386 04 18-May-2004 MS % Rec.	OHHG Inlet-Test#1 031386 04 18-May-2004 MS Dup
Final volume measured - bulk	0	ml	-	-	1200	-	-	-	-
Final volume measured - bulk	0	"	100	100	100	-	-	-	-
Filter weight	1.0	mg	-	-	5200	-	-	-	-
Filter weight	1.0	"	740	700	5200	-	-	-	-
Filter weight	1.0	"	-	-	5200	-	-	-	-
Impinger volume - hydroxylamine		ml	-	-	-	-	-	-	-
Impinger volume - KCl - combined		"	1000	1000	1000	-	-	-	-
Impinger volume - KMnO4 - combined		"	1000	1000	1000	-	-	-	-
			(5)(1)	(5)(1)	(1)				
Mercury - filter	0.010	ug	<	<	0.014	-	-	-	-
Mercury - filter - bulk	0.010	"	-	-	0.61	0.60	1.8	100	1.8
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	-	-
Mercury - KCl	0.050	"	0.57	0.64	4.3	-	-	-	-
Mercury - KMnO4	0.050	"	17	16	12	-	-	-	-
Mercury - H202	0.025	"	<0.25	<0.25	<0.25	-	-	-	-

PASC - Certificate of Analysis

	Client ID:		OHHG Inlet-Test#1	OHHG Inlet-Test#2	OHHG Inlet-Test#3	OHHG-KMNO4 Blk 05/20	OHHG-KMNO4 Blk 05/18
	Lab No.:		031386 04	031387 04	031388 04	031389 04	031671 04
	Date Sampled:		18-May-2004	19-May-2004	20-May-2004	20-May-2004	18-May-2004
Component	**MDL**	**Units**	MSD % Rec.				
Final volume measured - bulk	0	ml	-	1400	1600	-	-
Final volume measured - bulk	0	"	-	100	100	-	-
Filter weight	1.0	mg	-	6600	8000	-	-
Filter weight	1.0	"	-	6600	8000	-	-
Filter weight	1.0	"	-	6600	8000	-	-
Impinger volume - hydroxylamine		ml	-	-	-	-	-
Impinger volume - KCl - combined		"	-	1000	1000	-	-
Impinger volume - KMnO4 - combined		"	-	1000	1000	100	100
				(5)(1)	(1)		
Mercury - filter	0.010	ug	-	<	<	-	-
Mercury - filter - bulk	0.010	"	99	1.1	1.0	-	-
Mercury - hydroxylamine	0.010	"	-	-	-	-	-
Mercury - KCl	0.050	"	-	4.2	1.9	-	-
Mercury - KMnO4	0.050	"	-	16	7.8	<	<
Mercury - H202	0.025	"	-	<0.25	<0.25	-	-

PASC - Certificate of Analysis

	Client ID:		NIST 1633B	NIST Theorectical	NIST Theorectical
	Lab No.:		031390 04		
	Date Sampled:		20-May-2004		
Component	**MDL**	**Units**			% Recovery
Mercury	0.040	mg/kg	0.163	0.141	116

PASC - Summary of Analysis Pre. Dates

Batch Code:	**0609IRV1**
Final volume measured - bulk	031379 04
	031380 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/09
Date Prepared:	04/06/09
Batch Code:	**0607IRV1**
Final volume measured - bulk	031379 04
	031380 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/07
Date Prepared:	04/06/07
Batch Code:	**0602CPA1**
Filter weight	031380 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/02
Date Prepared:	04/06/02
Batch Code:	**0602CPA1**
Filter weight	031380 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/02
Date Prepared:	04/06/02
Batch Code:	**0602CPA1**
Filter weight	031380 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/02
Date Prepared:	04/06/02

Batch Code:	**0603CPV1**
Impinger volume - hydroxylamine	031380 04
Date Analysed:	04/06/03
Date Prepared:	04/06/03
Batch Code:	**0607CPV1**
Impinger volume - KCl - combined	031380 04
	031381 04
	031382 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/07
Date Prepared:	04/06/07
Batch Code:	**0608CPV1**
Impinger volume - KMnO4 - combined	031380 04
	031381 04
	031382 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
	031389 04
	031671 04
Date Analysed:	04/06/08
Date Prepared:	04/06/08
Batch Code:	**06082MHF**
Mercury	031390 04
Date Analysed:	04/06/08
Date Prepared:	04/06/08
Batch Code:	**06082MHF**
Mercury - filter	031379 04
	031380 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/08
Date Prepared:	04/06/08

PASC - Summary of Analysis Pre. Dates

Batch Code:	**06093MFB**
Mercury - filter - bulk	031379 04
	031380 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/10
Date Prepared:	04/06/09

Batch Code:	**06041MOX**
Mercury - hydroxylamine	031380 04
Date Analysed:	04/06/04
Date Prepared:	04/06/04

Batch Code:	**06081MCL**
Mercury - KCl	031379 04
	031380 04
	031381 04
	031382 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/08
Date Prepared:	04/06/08

Batch Code:	**06084MN4**
Mercury - KMnO4	031379 04
	031380 04
	031381 04
	031382 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
	031389 04
	031671 04
Date Analysed:	04/06/08
Date Prepared:	04/06/08

Batch Code:	**06041MOX**
Mercury - H202	031379 04
	031380 04
	031381 04
	031382 04
	031383 04
	031384 04
	031385 04
	031386 04
	031387 04
	031388 04
Date Analysed:	04/06/04
Date Prepared:	04/06/04

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M22E0517 - 01	Date Results Required:
Client: ~~Sunf~~ ADA ES	TAT Required:
Plant/Location: Sunflower Electric / Holcomb, Kansas	PO Number: M86001093-PSC M86001065 - TEI
Project Supervisor: EJE	LIMS Entry: E.V.

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
001	5/18/04	Test #1 Stack Filter	1		Hg by Oxi. Hydro	
002	5/19/04	2				
003	5/20/04	3				
004	5/18/04	1 Front ½ Nitric Rinse				
005	5/19/04	2				
006	5/20/04	3				
007	5/18/04	1 KCl Imps 1-3				
008	5/19/04	2				
009	5/20/04	3				
010	5/18/04	1 HNO_3/H_2O_2 Imp 4				
011	5/19/04	2				
012	5/20/04	3				
013	5/18/04	1 $H_2SO_4/KMnO_4$ Imps 5-7				
014	5/19/04	2				
015	5/20/04	3				
016	5/18/04	Test #1 Alto/SDA Inlet Thimble	1			

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:
EJE 5/24/04		J.W 05/24 E.V. 05/25		

Special Instructions:

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY REPORT

Project Number:	M22E0517-01	Date Results Required:	
Client:	ADA	TAT Required:	
Plant/Location:	Sunflower Electric	PO Number:	
Project Supervisor:		LIMS Entry:	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
017	5/19/04	Test #2 AHO/SDA Inlet Thimble	1		Hg. by Ont. Hydro	
018	5/20/04	3 1				
019	5/19/04	1 Front 1/2 Nitric Rinse				
020	5/19/04	2				
021	5/20/04	3				
022	5/18/04	1 KCl Imps 1-3				
023	5/19/04	2				
024	5/20/04	3				
025	5/18/04	1 HNO_3/H_2O_2 Imp 4				
026	5/19/04	2				
027	5/20/04	3				
028	5/18/04	1 $H_2SO_4/KMnO_4$ Imps 5-7				
029	5/19/04	2				
030	5/20/04	3				
031	5/18/04	$H_2SO_4/KMnO_4$ Blank	1			
032	5/19/04		1			

Field Blanks

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

GE Energy

-3-

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M 22E0517-01	Date Results Required:
Client: ADA	TAT Required:
Plant/Location: Sunflower Electric	LAB USE ONLY — PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
033	5/20/04	$H_2SO_4/KMnO_4$ Blank	1		Ag by Ont. Hydra	
034	5/19/04	Filter Blank #1				
035		#2				
036		#3				
037		0.1 N Nitric Blank				
038		Hydroxamalyne Blank				
039		KCl Blank				
040		HNO_3/H_2O_2 Blank				
041		Thimble Blank #1				
042		#2				
043		#3				
044	5/20/04	Field Blank Stack KCl				
045		HNO_3/H_2O_2				
046		$H_2SO_4/KMnO_4$				
047		Field Blank AHO/SDA Inlet KCl				
048		HNO_3/H_2O_2				

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY REPORT

Project Number: M22E 0517-01	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
049	5/20/04	Field Blank $H_2SO_4/KMnO_4$	1		Hg b, Ont. Hydro	
050	5/18/04	Test #1 (26A) Stack	4		HCl, HF, → (26A)	
051	5/19/04	2				
052	5/20/04	3				
053	5/18/04	Test #1 (26A) AHO/SDA Inlet	5			
054	5/19/04	2				
055	5/20/04	3				
056	5/19/04	1 BHI/SDA outlet	5			
057	5/19/04	2				
058	5/20/04	3				
059	5/18/04	1 (29) Stack	5		M29 Antimony, Arsenic, Barium,	
060	5/19/04	2			Beryllium, Cadmium, Chromium,	
061	5/20/04	3			Cobalt, Copper, Lead, Manganese,	
062	5/18/04	1 AHO/SDA Inlet	6		Mercury, Nickel, Selenium,	
063	5/19/04	2			Silver, Thallium	
064	5/20/04	3				

H_2SO_4 fraction

Filter + HNO_3 probe wash

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

⊛ M29 Metals: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium.

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M22E 0517-01	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
065	05/20	BLANK, M5 H/pur. filt. & HNO3		p.w.	M29 (BLANK for front 1/2 S.S. 059-061)	
066	05/20	BLANK, Quartz thimble & HNO3		p.w.	↓ (BLANK for front 1/2 S.S. 062-064)	
067	05/18	Stack, Test 1		HNO3/H2O2 react.	M29 - metals (*)	
068	05/19	↓ Test 2			↓	
069	05/20	↓ Test 3				
070	05/18	Air Heat. Outl/SDA Inl. Test 1				
071	05/19	↓ Test 2				
072	05/20	↓ Test 3				
073	05/20	BLANK: HNO3/H2O2 react.			↓	
074	05/18	Stack Test 1		KMnO4 Imp.	M29 - Hg	
075	05/19	↓ Test 2			↓	
076	05/20	↓ Test 3				
077	05/18	Air Heat. Out/SDA Inl. Test 1				
078	05/19	↓ Test 2				
079	05/20	↓ Test 3				
080	05/20	BLANK: KMnO4 + HCl			↓	

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M22E0517-01	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
081	05/20	BLANK - 0.1 N H_2SO_4			HCl, HF - M26A	
082	05/18	Stack, Test 1		Fraction	Br_2 - M26A	
083	05/19	↓ Test 2			↓	
084	05/20	↓ Test 3			↓	
085	05/18	Air Heat. Out/SDA Inl. Test 1			Br_2 - M26A	
086	05/19	↓ ↓ Test 2			↓	
087	05/20	↓ ↓ Test 3			↓	
088	05/19	Baghouse Inl/SDA Out. Test 1		NaOH	Br_2 - M26A	
089	↓	↓ ↓ Test 2			↓	
090	05/20	↓ ↓ Test 3			↓	
091	05/20	BLANK, 0.1 N NaOH			↓	
092	05/18	Stack Test 1			M 5/202	
093	05/19	↓ Test 2			↓	
094	05/20	↓ Test 3			↓	
095	05/18	Stack, Test 1			Contr. Condens. - SO_3	
096	05/19	↓ Test 2			↓	

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M22E0517-01	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
097	05/20	Stack Test 3			Contr. Condensate, SO_3	
098	05/18	Air Heat out/SDA Inl. Test 1			↓	
099	05/19	↓ Test 2			↓	
100	05/20	↓ Test 3			↓	
101	05/18	Baghouse Inl/SDA Out. Test 1			↓	
102	05/19	↓ Test 2			↓	
103	05/20	↓ Test 3			↓	

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

CALCULATIONS FOR HCl
METHOD 26A

$$M = \frac{(S - B)}{4.53592 \times 10^8}$$

Where: Total

M = Mass of HCl in sample, lbs

S = Concentration of sample, micrograms HCl

B = Blank concentration micrograms HCl

4.53592×10^8 = Micrograms per Pound

C = M/Vmstd

Where:

C = Concentration of HCl in flue gas lbs/dscf
M = Mass of HCl in Sample, lbs.
Vmstd = Sample volume measured by dry gas meter, corrected to standard conditions.

E = C × dscfm × 60 min/hr

Where:

E = Emission rate HCl in lbs/hr

C = Concentration of HCl in lbs/DSCF

dscfm = Volumetric flow rate of stack gas, dry standard cubic feet per minute.

CALCULATIONS FOR CHLORINE (HCl)

Concentration of Chlorine:

$$\frac{\text{lbs HCl}}{\text{dscf}} = \frac{\mu\text{g HCl in sample}}{4.536 \times 10^8 \times \text{dscf}}$$

where:

$4.536 \times 10^8 = \mu\text{g/lb}$

dscf = Volume of gas sampled

$$\mu\text{g/lb HCl} = \mu\text{g Cl} \times \frac{36.453}{35.453}$$

Parts Per Million v/v- Hydrogen Chloride

$$\text{ppm HCl} = \frac{\text{lbs HCl}}{\text{dscf}} \div \frac{36.453}{385 \times 10^6}$$

where:

385 = Volume of 1 lb mole of gas at 68F and 29.92 in. Hg

10^6 = Conversion of ppm v/v

METAL SAMPLE CALCULATION

Concentration

$$\frac{\mu g}{m^3} = \frac{\mu g \text{ of sample}}{\text{dscf volume sampled} \times 0.02832 \frac{m^3}{ft^3}}$$

Emission Rate

$$\frac{\mu g \text{ of sample} \times \frac{1 \times 10^{-6} \text{ grams}}{\mu g}}{453.6 \text{ gr/lb}} = \text{lbs of sample}$$

$$\frac{\text{lbs/sample}}{\text{Vm (std) sample}} \times \text{dscfm} \times 60 \frac{\text{min}}{\text{hr}} = \text{lbs/hr}$$

EMISSION RATE CALCULATIONS

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

1. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
   c_s = pollutant concentration, grains/dscf

2. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd}C}{\text{fuel flow rate (lb / hr) GCV}} \times 10^6$$

where, E = lbs per million Btu
GCV = gross calorific value, Btu / lb
Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

3. If an integrated gas sample is taken during the test and analyzed for $\%CO_2$ or $\%O_2$, dry basis by volume, with an Orsat gas analyzer, then

$$E = C\,F_c \frac{100}{(\%CO_2)} \text{ or, } E = C\,F \frac{20.9}{(20.9 - \%O_2)} \quad \text{where,}$$

$\%CO_2$ and $\%O_2$ are expressed as percent; and, for example, for subbituminous and bituminous coals:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO_2/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

4. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \quad \text{where, } \%C = \text{carbon content by weight expressed as percent}$$

$$F = \frac{[3.64\,(\%H) + 1.53\,(\%C) + 0.57\,(\%S) + 0.14\,(\%N) - 0.46\,(\%O_2)]}{GVC} \times 10^6$$

where, H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively.

5. If fuels other than subbituminous and bituminous coals are fired, other F-factors than those above will apply; and, if combinations of different fuels are fired, the F-factors must be prorated according to the fraction of the total heat input derived from each type of fuel.

VOLUMETRIC AIR FLOW CALCULATIONS

$$Vm\,(std) = 17.647 \times Vm \times \left[\frac{P_{bar} + \frac{DH}{13.6}}{(460 + Tm)}\right] \times Y$$

$$Vw\,(std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\,(std)}{Vw\,(std) + Vm\,(std)}\right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\ (of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right] \times (1 - Bws)$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

NOMENCLATURE

A = Cross-sectional area of stack or duct, ft^2
A_n = Cross-sectional area of nozzle, ft^2
B_{ws} = Water vapor in gas stream, proportion by volume
C_a = Acetone blank residue concentration, g/g
C_{acf} = Concentration of particulate matter in gas stream at actual conditions, gr/acf
C_p = Pitot tube coefficient, dimensionless
C_s = Concentration of particulate matter in gas stream, dry basis, corrected to standard conditions, gr/dscf
IKV = Isokinetic sampling variance, must be $.90 \leq IKV \leq 1.10$
M_d = Dry molecular weight of gas, lb/lb-mole
m_n = Total amount of particulate matter collected, grams
M_s = Molecular weight of gas, wet basis, lb/lb-mole
M_w = Molecular weight of water, 18.0 lb/lb-mole
m_a = Mass of residue of acetone after evaporation, grams
P_{bar} = Barometric pressure at testing site, in. Hg
P_g = Static pressure of gas, in. Hg (in. H_2O/13.6)
P_s = Absolute pressure of gas, in. Hg = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 in. Hg
Q_{acfm} = Actual volumetric gas flow rate, acfm
Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, dscf/hr
R = Ideal gas constant, 21.85 in. Hg-ft^3/°R-lb-mole
T_m = Absolute dry gas meter temperature, °R
T_s = Absolute gas temperature, °R
T_{std} = Standard absolute temperature, 528°R
V_a = Volume of acetone blank, ml
V_{aw} = Volume of acetone used in wash, ml
V_{lc} = Total volume of liquid collected in impingers and silica gel, ml
V_m = Volume of gas sample as measured by dry gas meter, dcf
$V_{m(std)}$ = Volume of gas sample measured by dry gas meter, corrected to standard conditions, dscf
v_s = Gas velocity, ft/sec
$V_{w(std)}$ = Volume of water vapor in gas sample, corrected to standard conditions, scf
W_a = Weight of residue in acetone wash, grams
Y = Dry gas meter calibration factor
ΔH = Average pressure differential across the orifice meter, in. H_2O
Δp = Velocity head of gas, in. H_2O
ρ_a = Density of acetone, 0.7855 g/ml (average)
ρ_w = Density of water, 0.002201 lb/ml
θ = Total sampling time, minutes
K_1 = 17.64 °R/in. Hg
K_2 = 0.04707 ft^3/ml
K_4 = 0.09450/100 = 0.000945
K_p = Pitot tube constant, $85.49 \frac{ft}{sec}\left[\frac{(lb/lb-mole)(in.Hg)}{(°R)(in.H_2O)}\right]^{1/2}$
%EA = Percent excess air
$\%CO_2$ = Percent carbon dioxide by volume, dry basis
$\%O_2$ = Percent oxygen by volume, dry basis
%CO = Percent carbon monoxide by volume, dry basis
$\%N_2$ = Percent nitrogen by volume, dry basis
0.264 = Ratio of O_2 to N_2 in air, v/v
0.28 = Molecular weight of N_2 or CO, divided by 100
0.32 = Molecular weight of O_2 divided by 100
0.44 = Molecular weight of CO_2 divided by 100
13.6 = Specific gravity of mercury (Hg)

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E05517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-51		**Sample Plane:**	Horizontal	
Meter ID:	E-51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**		
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.98	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-0.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.94	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	2700.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	2940.00	**grams**
@	13/6	**in. Hg.**	**Difference:**	240.00	
Carbon Dioxide:	12.2	**%**	**Total Water Gain:**	240.00	
Oxygen:	7.4	**%**			
Nitrogen:	80.4	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.88	**Inches H_2O**	**Gas Weight dry, Md:**	30.248	**lb/lb mole**
Meter Temperature, Tm:	88.1	**°F**	**Gas Weight wet, Ms:**	28.402	**lb/lb mole**
Sqrt ΔP:	1.604	**Inches H_2O**	**Excess Air:**	53.524	**%**
Stack Temperature, Ts:	193.5	**°F**	**Gas Velocity, Vs:**	105.922	
Meter Volume, Vm:	72.953	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,331,069	
Meter Volume, Vmstd:	63.716	**dscf**	**Volumetric Flow, DSCFM:**	822,296	
Meter Volume, Vwstd:	11.304	**wscf**	**Volumetric Flow, SCFM:**	968,182	
Moisture, Bws:	0.151		**Isokinetic Variance, %I:**	110.3	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.18	---	
ppm:	0.07	---	
ug/dscm:	99.77	---	
lb/hr:	0.3073	---	
lb/mmBtu (based on Fd):	0.00009	---	
HF			
mg (net) collected:	0.06		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 9:37
End Time: 11:50

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:37:00	2.80	0.98	21.18	1.673	195	92	90	4.0	3.082	110.66
1	9:42:00	2.80	0.98	24.26	1.673	194	93	90	4.0	3.370	110.57
2	9:47:00	2.70	0.92	27.63	1.643	194	90	89	3.0	2.990	108.58
2	9:52:00	2.70	0.92	30.62	1.643	194	86	89	3.0	3.110	108.58
3	9:57:00	2.40	0.82	33.73	1.549	193	88	88	2.0	2.950	102.29
3	10:02:00	2.40	0.82	36.68	1.549	193	88	88	2.0	2.957	102.29
	10:07:00			39.64							
1	10:10:00	2.80	0.95	39.64	1.673	193	89	86	4.0	3.203	110.49
1	10:15:00	2.80	0.95	42.84	1.673	194	89	86	4.0	3.030	110.57
2	10:20:00	2.70	0.92	45.87	1.643	194	90	85	3.0	3.060	108.58
2	10:25:00	2.70	0.92	48.93	1.643	194	90	86	3.0	3.190	108.58
3	10:30:00	2.30	0.78	52.12	1.517	194	90	85	3.0	2.850	100.21
3	10:35:00	2.30	0.78	54.97	1.517	194	90	85	3.0	2.863	100.21
	10:40:00			57.83							
1	10:45:00	2.80	0.95	57.84	1.673	194	87	84	4.0	3.334	110.57
1	10:50:00	2.80	0.95	61.17	1.673	194	88	85	4.0	3.170	110.57
2	10:55:00	2.60	0.92	64.34	1.612	193	89	84	3.0	3.080	106.47
2	11:00:00	2.60	0.92	67.42	1.612	193	90	84	3.0	3.020	106.47
3	11:05:00	2.30	0.78	70.44	1.517	192	91	84	3.0	2.880	100.06
3	11:10:00	2.30	0.78	73.32	1.517	192	91	85	3.0	2.873	100.06
	11:15:00			76.19							
1	11:20:00	2.60	0.88	76.19	1.612	193	89	86	4.0	3.040	106.47
1	11:25:00	2.60	0.88	79.23	1.612	193	90	85	4.0	3.040	106.47
2	11:30:00	2.60	0.88	82.27	1.612	194	90	86	4.0	3.070	106.55
2	11:35:00	2.60	0.88	85.34	1.612	194	91	87	4.0	2.998	106.55
3	11:40:00	2.30	0.78	88.34	1.517	193	93	87	4.0	2.892	100.17
3	11:45:00	2.30	0.78	91.23	1.517	193	93	87	4.0	2.901	100.14
	11:50:00			94.13							
			0.88	72.953	1.604	194	90	86		72.953	
							88.08				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-51		**Sample Plane:**	Horizontal	
Meter ID:	E-51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**		
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.77	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.65	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	2725.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	2950.00	**grams**
@	13/6	**in. Hg.**	**Difference:**	225.00	
Carbon Dioxide:	12.3	**%**	**Total Water Gain:**	225.00	
Oxygen:	7.0	**%**			
Nitrogen:	80.7	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.85	**Inches H_2O**	**Gas Weight dry, Md:**	30.248	**lb/lb mole**
Meter Temperature, Tm:	95.1	**°F**	**Gas Weight wet, Ms:**	28.439	**lb/lb mole**
Sqrt ΔP:	1.605	**Inches H_2O**	**Excess Air:**	48.935	**%**
Stack Temperature, Ts:	190.8	**°F**	**Gas Velocity, Vs:**	106.806	
Meter Volume, Vm:	71.478	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,342,169	
Meter Volume, Vmstd:	61.153	**dscf**	**Volumetric Flow, DSCFM:**	826,784	
Meter Volume, Vwstd:	10.598	**wscf**	**Volumetric Flow, SCFM:**	970,062	
Moisture, Bws:	0.148		**Isokinetic Variance, %I:**	105.3	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		

	Filterable	**Condensible**
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
HCl, HF, and Br		
mg (net) collected:	0.28	---
ppm:	0.11	---
ug/dscm:	161.69	---
lb/hr:	0.5007	---
lb/mmBtu (based on Fd):	0.00015	---
HF		
mg (net) collected:	0.06	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 8:10
End Time: 10:16

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	8:10:00	2.90	0.96	84.75	1.703	194	92	91	3.0	3.131	112.53
1	8:15:00	2.90	0.96	87.88	1.703	193	91	91	3.0	3.150	112.44
2	8:20:00	2.70	0.89	91.03	1.643	193	92	91	3.0	3.040	108.50
2	8:25:00	2.70	0.89	94.07	1.643	192	94	91	3.0	3.040	108.41
3	8:30:00	2.20	0.73	97.11	1.483	191	95	91	3.0	2.790	97.79
3	8:35:00	2.20	0.73	99.90	1.483	190	97	91	3.0	2.724	97.71
	8:40:00			102.62							
1	8:42:00	2.80	0.92	102.62	1.673	190	97	92	3.0	3.086	110.23
1	8:47:00	2.80	0.92	105.71	1.673	190	97	91	3.0	3.110	110.23
2	8:52:00	2.70	0.89	108.82	1.643	191	98	92	3.0	3.050	108.33
2	8:57:00	2.70	0.89	111.87	1.643	191	99	93	3.0	3.060	108.33
3	9:02:00	2.20	0.73	114.93	1.483	190	99	93	3.0	2.780	97.71
3	9:07:00	2.20	0.73	117.71	1.483	190	99	94	3.0	2.753	97.71
	9:12:00			120.46							
1	9:13:00	2.80	0.92	120.46	1.673	190	98	94	3.0	3.047	110.23
1	9:18:00	2.80	0.92	123.51	1.673	191	99	94	3.0	3.080	110.32
2	9:23:00	2.80	0.92	126.59	1.673	191	99	94	3.0	3.200	110.32
2	9:28:00	2.80	0.92	129.79	1.673	191	99	94	3.0	3.130	110.32
3	9:33:00	2.30	0.76	132.92	1.517	191	99	94	3.0	2.810	99.98
3	9:38:00	2.30	0.76	135.73	1.517	190	100	94	3.0	2.806	99.91
	9:43:00			138.54							
1	9:46:00	2.70	0.89	138.54	1.643	190	100	94	3.0	3.134	108.25
1	9:51:00	2.70	0.89	141.67	1.643	190	100	94	3.0	2.970	108.25
2	9:56:00	2.70	0.89	144.64	1.643	190	99	94	3.0	3.040	108.25
2	10:01:00	2.70	0.89	147.68	1.643	190	98	94	3.0	3.050	108.25
3	10:06:00	2.20	0.73	150.73	1.483	190	98	94	3.0	2.750	97.71
3	10:11:00	2.20	0.73	153.48	1.483	189	98	94	3.0	2.747	97.64
	10:16:00			156.23							
			0.85	71.478	1.605	191	97	93		71.478	
							95.13				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-51		**Sample Plane:**	Horizontal	
Meter ID:	E-51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**	flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.91	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.79	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.002		**Silica Initial Wt.**	2740.00	**grams**
Leak Check Post:	0.001		**Silica Final Wt.**	2970.00	**grams**
@	9	**in. Hg.**	**Difference:**	230.00	
Carbon Dioxide:	12.4	**%**	**Total Water Gain:**	230.00	
Oxygen:	7.1	**%**			
Nitrogen:	80.5	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.88	**Inches H_2O**	**Gas Weight dry, Md:**	30.268	**lb/lb mole**
Meter Temperature, Tm:	101.4	**°F**	**Gas Weight wet, Ms:**	28.439	**lb/lb mole**
Sqrt ΔP:	1.637	**Inches H_2O**	**Excess Air:**	50.170	**%**
Stack Temperature, Ts:	190.7	**°F**	**Gas Velocity, Vs:**	108.122	
Meter Volume, Vm:	72.675	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,358,706	
Meter Volume, Vmstd:	61.811	**dscf**	**Volumetric Flow, DSCFM:**	840,015	
Meter Volume, Vwstd:	10.833	**wscf**	**Volumetric Flow, SCFM:**	987,236	
Moisture, Bws:	0.149		**Isokinetic Variance, %I:**	104.7	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.23	---	
ppm:	0.09	---	
ug/dscm:	131.41	---	
lb/hr:	0.4135	---	
lb/mmBtu (based on Fd):	0.00012	---	
HF			
mg (net) collected:	0.06		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 8:45
End Time: 11:03

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	8:45:00	2.80	0.92	46.70	1.673	192	99	99	4.0	3.033	110.40
1	8:50:00	2.80	0.92	49.73	1.673	192	99	100	4.0	3.080	110.40
2	8:55:00	2.90	0.96	52.81	1.703	191	102	99	3.0	3.210	112.27
2	9:00:00	2.90	0.96	56.02	1.703	191	103	99	4.0	3.120	112.27
3	9:05:00	2.40	0.79	59.14	1.549	191	103	99	4.0	2.780	102.13
3	9:10:00	2.40	0.79	61.92	1.549	191	103	99	4.0	2.910	102.13
	9:15:00			64.83							
1	9:17:00	2.90	0.96	64.83	1.703	191	102	99	4.0	3.190	112.27
1	9:22:00	2.90	0.96	68.02	1.703	192	103	99	4.0	3.180	112.36
2	9:27:00	2.80	0.92	71.20	1.673	192	103	99	4.0	3.060	110.40
2	9:32:00	2.80	0.92	74.26	1.673	192	103	99	4.0	3.080	110.40
3	9:37:00	2.50	0.82	77.34	1.581	191	102	98	4.0	2.960	104.24
3	9:42:00	2.50	0.82	80.30	1.581	191	103	98	4.0	2.906	104.24
	9:47:00			83.21							
1	9:57:00	2.80	0.92	83.21	1.673	190	101	98	4.0	2.794	110.23
1	10:02:00	2.80	0.92	86.00	1.673	191	101	99	4.0	3.390	110.32
2	10:07:00	2.80	0.92	89.39	1.673	190	103	99	4.0	3.120	110.23
2	10:12:00	2.80	0.92	92.51	1.673	189	104	99	4.0	3.060	110.15
3	10:17:00	2.40	0.79	95.57	1.549	189	105	100	4.0	3.000	101.98
3	10:22:00	2.40	0.79	98.57	1.549	189	106	100	4.0	2.791	101.98
	10:27:00			101.36							
1	10:33:00	2.80	0.92	101.36	1.673	190	103	100	4.0	3.119	110.23
1	10:38:00	2.80	0.92	104.48	1.673	190	104	100	4.0	3.140	110.23
2	10:43:00	2.70	0.89	107.62	1.643	191	106	100	4.0	2.990	108.33
2	10:48:00	2.70	0.89	110.61	1.643	191	107	101	4.0	3.080	108.33
3	10:53:00	2.40	0.79	113.69	1.549	190	107	102	4.0	2.830	102.06
3	10:58:00	2.40	0.79	116.52	1.549	190	107	102	4.0	2.852	102.06
	11:03:00			119.37							
			0.88	72.675	1.637	191	103	99		72.675	
							101.38				

Field Notes/Comments:

TEST DATA	- Method 26A	Run No.: 1

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E-22		**Sample Plane:**	Horizontal	
Meter ID:	E-22		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.013		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	11.0	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.92	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-15.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	25.82	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	2730.00	**grams**
Leak Check Post:	0.009		**Silica Final Wt.**	2955.00	**grams**
@	10/16	**in. Hg.**	**Difference:**	225.00	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	225.00	
Oxygen:	7.3	**%**			
Nitrogen:	80.2	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.95	**Inches H_2O**	**Gas Weight dry, Md:**	30.292	**lb/lb mole**
Meter Temperature, Tm:	76.5	**°F**	**Gas Weight wet, Ms:**	28.378	**lb/lb mole**
Sqrt ΔP:	1.410	**Inches H_2O**	**Excess Air:**	52.621	**%**
Stack Temperature, Ts:	178.8	**°F**	**Gas Velocity, Vs:**	94.564	
Meter Volume, Vm:	63.903	**Cubic Feet**	**Volumetric Flow, ACFM:**	998,594	
Meter Volume, Vmstd:	57.473	**dscf**	**Volumetric Flow, DSCFM:**	601,368	
Meter Volume, Vwstd:	10.598	**wscf**	**Volumetric Flow, SCFM:**	712,256	
Moisture, Bws:	0.156		**Isokinetic Variance, %I:**	104.3	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.55	---	
ppm:	0.22	---	
ug/dscm:	337.95	---	
lb/hr:	0.7613	---	
lb/mmBtu (based on Fd):	0.00032	---	
HCl, HF, and Br			

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 1 **Test Date:** 5/19/2004
Start Time: 8:10
End Time: 10:40

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:10:00	3.50	1.70	3.30	1.871	181	72	70	6.0	3.750	125.66
1-2	8:15:00	3.50	1.70	7.05	1.871	181	72	70	8.0	3.650	125.66
1-3	8:20:00	2.70	1.30	10.70	1.643	176	73	70	7.0	3.230	109.94
1-4	8:25:00	1.40	0.70	13.93	1.183	176	73	70	5.0	2.293	79.17
	8:30:00			16.22							
2-1	8:34:00	1.00	0.50	16.65	1.000	179	75	72	3.0	2.035	67.07
2-2	8:39:00	1.50	0.70	18.68	1.225	179	75	72	4.0	2.320	82.14
2-3	8:44:00	2.10	1.00	21.00	1.449	179	78	73	6.0	2.900	97.19
2-4	8:49:00	2.10	1.00	23.90	1.449	181	80	74	7.0	2.813	97.34
	8:54:00			26.71							
3-1	8:57:00	2.00	0.94	28.14	1.414	176	80	74	10.0	2.360	94.62
3-2	9:02:00	2.10	1.00	30.50	1.449	176	80	74	11.0	2.810	96.96
3-3	9:07:00	2.40	1.10	33.31	1.549	178	80	74	11.0	3.090	103.82
3-4	9:12:00	2.40	1.10	36.40	1.549	178	80	74	12.0	2.962	103.82
	9:17:00			39.36							
4-1	9:20:00	2.40	1.10	40.14	1.549	179	80	75	11.0	3.063	103.90
4-2	9:25:00	2.00	0.94	43.20	1.414	179	81	76	12.0	2.360	94.84
4-3	9:30:00	2.00	0.94	45.56	1.414	178	80	76	13.0	2.350	94.77
4-4	9:35:00	2.00	0.94	47.91	1.414	178	80	76	13.0	2.263	94.77
	9:40:00			50.17							
5-1	9:57:00	1.00	0.50	53.35	1.000	178	80	76	3.0	2.048	67.01
5-2	10:02:00	1.50	0.70	55.40	1.225	179	80	76	3.0	2.350	82.14
5-3	10:07:00	1.50	0.70	57.75	1.225	181	80	76	3.0	2.390	82.27
5-4	10:12:00	2.00	0.94	60.14	1.414	182	81	76	7.0	2.570	95.07
	10:17:00			62.71							
6-1	10:20:00	1.50	0.70	63.23	1.517	178	82	77	4.0	2.400	101.66
6-2	10:25:00	1.70	0.80	65.63	1.304	178	82	77	6.0	0.000	87.37
6-3	10:30:00	1.70	0.80	65.63	1.304	179	82	77	6.0	5.100	87.44
6-4	10:35:00	2.00	0.90	70.73	1.414	181	82	77	6.0	2.796	94.99
	10:40:00			73.53							
			0.95	63.903	1.410	179	79	74		63.903	
							76.46				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E-22		**Sample Plane:**	Horizontal	
Meter ID:	E-22		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.013		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	11.0	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.77	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-15.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	25.67	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5615.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5855.00	**grams**
@	13/6	**in. Hg.**	**Difference:**	240.00	
Carbon Dioxide:	12.3	**%**	**Total Water Gain:**	240.00	
Oxygen:	7.0	**%**			
Nitrogen:	80.7	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.08	**Inches H_2O**	**Gas Weight dry, Md:**	30.248	**lb/lb mole**
Meter Temperature, Tm:	84.5	**°F**	**Gas Weight wet, Ms:**	28.388	**lb/lb mole**
Sqrt ΔP:	1.503	**Inches H_2O**	**Excess Air:**	48.935	**%**
Stack Temperature, Ts:	177.0	**°F**	**Gas Velocity, Vs:**	100.943	
Meter Volume, Vm:	71.610	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,065,953	
Meter Volume, Vmstd:	63.126	**dscf**	**Volumetric Flow, DSCFM:**	642,844	
Meter Volume, Vwstd:	11.304	**wscf**	**Volumetric Flow, SCFM:**	757,959	
Moisture, Bws:	0.152		**Isokinetic Variance, %I:**	107.2	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.44	---	
ppm:	0.16	---	
ug/dscm:	246.15	---	
lb/hr:	0.5927	---	
lb/mmBtu (based on Fd):	0.00017	---	
HCl, HF, and Br			
mg (net) collected:	0.18		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 11:50
End Time: 14:06

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:50:00	2.50	1.20	79.00	1.581	178	80	79	5.0	3.090	105.96
1-2	11:55:00	2.50	1.20	82.09	1.581	178	80	79	5.0	3.120	105.96
1-3	12:00:00	2.30	1.10	85.21	1.517	177	82	78	6.0	3.020	101.55
1-4	12:05:00	2.30	1.10	88.23	1.517	176	85	79	7.0	2.967	101.47
	12:10:00			91.20							
2-1	12:13:00	2.10	1.00	92.64	1.449	177	85	79	8.0	2.807	97.03
2-2	12:18:00	2.00	0.94	95.45	1.414	178	86	80	8.0	2.800	94.77
2-3	12:23:00	1.90	0.90	98.25	1.378	177	86	80	9.0	2.750	92.30
2-4	12:28:00	1.50	0.71	101.00	1.225	174	86	81	9.0	2.414	81.82
	12:33:00			103.41							
3-1	12:36:00	2.50	1.20	104.64	1.581	178	85	81	11.0	3.124	105.96
3-2	12:41:00	2.10	1.00	107.76	1.449	176	85	81	11.0	2.870	96.96
3-3	12:46:00	2.50	1.20	110.63	1.581	177	85	81	12.0	3.030	105.87
3-4	12:51:00	2.00	1.00	113.66	1.414	177	85	81	11.0	2.943	94.70
	12:56:00			116.60							
4-1	13:00:00	2.30	1.10	121.00	1.517	178	85	81	3.0	3.000	101.63
4-2	13:05:00	2.60	1.20	124.00	1.612	177	87	82	4.0	3.140	107.97
4-3	13:10:00	2.50	1.20	127.14	1.581	178	88	83	5.0	3.080	105.96
4-4	13:15:00	2.00	0.94	130.22	1.414	176	89	83	6.0	2.693	94.62
	13:20:00			132.91							
5-1	13:23:00	2.50	1.20	133.84	1.581	177	88	84	7.0	3.159	105.87
5-2	13:28:00	2.50	1.20	137.00	1.581	177	88	84	9.0	3.400	105.87
5-3	13:33:00	2.00	0.94	140.40	1.414	178	89	84	9.0	2.430	94.77
5-4	13:38:00	1.40	0.70	142.83	1.183	174	89	84	9.0	2.337	79.04
	13:43:00			145.17							
6-1	13:46:00	3.20	1.50	145.50	1.789	177	91	87	11.0	3.340	119.78
6-2	13:51:00	3.10	1.50	148.84	1.761	178	91	87	12.0	3.550	117.99
6-3	13:56:00	2.50	1.00	152.39	1.581	177	92	88	12.0	3.160	105.87
6-4	14:01:00	1.90	0.90	155.55	1.378	178	93	89	12.0	3.386	92.37
	14:06:00			158.94							
			1.08	71.610	1.503	177	87	82		71.610	
							84.48				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E-22		**Sample Plane:**	Horizontal	
Meter ID:	E-22		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.013		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	11.0	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.08	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-16.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	25.90	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.003		**Silica Initial Wt.**	2740.00	**grams**
Leak Check Post:	0.009		**Silica Final Wt.**	2985.00	**grams**
@	15	**in. Hg.**	**Difference:**	245.00	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	245.00	
Oxygen:	5.5	**%**			
Nitrogen:	82.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.06	**Inches H_2O**	**Gas Weight dry, Md:**	30.220	**lb/lb mole**
Meter Temperature, Tm:	79.8	**°F**	**Gas Weight wet, Ms:**	28.322	**lb/lb mole**
Sqrt ΔP:	1.494	**Inches H_2O**	**Excess Air:**	34.060	**%**
Stack Temperature, Ts:	172.0	**°F**	**Gas Velocity, Vs:**	99.581	
Meter Volume, Vm:	69.753	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,051,579	
Meter Volume, Vmstd:	62.738	**dscf**	**Volumetric Flow, DSCFM:**	642,434	
Meter Volume, Vwstd:	11.540	**wscf**	**Volumetric Flow, SCFM:**	760,597	
Moisture, Bws:	0.155		**Isokinetic Variance, %I:**	106.6	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	1.27	---	
ppm:	0.47	---	
ug/dscm:	714.87	---	
lb/hr:	1.7202	---	
lb/mmBtu (based on Fd):	0.00059	---	
HCl, HF, and Br			
mg (net) collected:	1.40		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 8:45
End Time: 11:04

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:45:00	2.50	1.20	162.25	1.581	173	76	73	6.0	2.979	105.54
1-2	8:50:00	2.50	1.20	165.23	1.581	173	76	73	6.0	3.030	105.54
1-3	8:55:00	2.20	1.00	168.26	1.483	172	75	73	6.0	3.010	98.93
1-4	9:00:00	2.00	0.94	171.27	1.414	171	75	73	6.0	2.673	94.25
	9:05:00			173.94							
2-1	9:08:00	2.30	1.10	174.37	1.517	172	76	74	7.0	2.942	101.15
2-2	9:13:00	2.30	1.10	177.31	1.517	172	77	75	7.0	2.930	101.15
2-3	9:18:00	2.50	1.20	180.24	1.581	171	77	75	7.0	3.050	105.37
2-4	9:23:00	2.20	1.00	183.29	1.483	171	77	75	7.0	2.924	98.85
	9:28:00			186.21							
3-1	9:36:00	2.40	1.10	188.64	1.549	173	78	75	4.0	3.037	103.41
3-2	9:41:00	2.30	1.10	191.68	1.517	173	78	75	5.0	2.950	101.23
3-3	9:46:00	2.30	1.10	194.63	1.517	173	79	75	6.0	3.000	101.23
3-4	9:51:00	2.10	1.00	197.63	1.449	171	79	76	7.0	2.696	96.58
	9:56:00			200.33							
4-1	9:58:00	1.90	0.90	201.14	1.378	171	81	78	7.0	2.704	91.86
4-2	10:03:00	2.10	1.00	203.84	1.449	172	83	79	8.0	2.770	96.65
4-3	10:08:00	2.10	1.00	206.61	1.449	171	82	78	11.0	2.890	96.58
4-4	10:13:00	1.90	0.90	209.50	1.378	170	83	79	13.0	2.624	91.79
	10:18:00			212.12							
5-1	10:22:00	2.50	1.20	215.21	1.581	171	86	82	4.0	3.076	105.37
5-2	10:27:00	2.30	1.10	218.29	1.517	173	86	80	5.0	3.070	101.23
5-3	10:32:00	2.30	1.10	221.36	1.517	173	86	81	7.0	2.780	101.23
5-4	10:37:00	1.90	0.90	224.14	1.378	173	87	83	7.0	2.803	92.01
	10:42:00			226.94							
6-1	10:44:00	2.50	1.20	227.68	1.581	173	89	83	9.0	3.138	105.54
6-2	10:49:00	2.30	1.10	230.82	1.517	173	90	84	10.0	2.924	101.23
6-3	10:52:00	2.50	1.20	233.74	1.581	173	91	85	13.0	2.950	105.54
6-4	10:59:00	1.80	0.84	236.69	1.342	170	92	86	13.0	2.803	89.34
	11:04:00			239.49							
			1.06	69.753	1.494	172	82	78		69.753	
							79.77				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E05517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E28		**Sample Plane:**	Vertical	
Meter ID:	E28		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.993		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	248A		**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.15	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-9.50	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.45	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.010		**Silica Initial Wt.**	2845.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	3015.00	**grams**
@	12/12	**in. Hg.**	**Difference:**	170.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	170.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.14	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	83.8	**°F**	**Gas Weight wet, Ms:**	29.200	**lb/lb mole**
Sqrt ΔP:	0.757	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	285.8	**°F**	**Gas Velocity, Vs:**	53.440	
Meter Volume, Vm:	82.382	**Cubic Feet**	**Volumetric Flow, ACFM:**	929,855	
Meter Volume, Vmstd:	72.297	**dscf**	**Volumetric Flow, DSCFM:**	523,964	
Meter Volume, Vwstd:	8.007	**wscf**	**Volumetric Flow, SCFM:**	581,994	
Moisture, Bws:	0.100		**Isokinetic Variance, %I:**	97.9	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	1.38	---	
ppm:	0.44	---	
ug/dscm:	674.08	---	
lb/hr:	1.3230	---	
lb/mmBtu (based on Fd):	0.00054	---	
HF			
mg (net) collected:	2.21	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 9:37
End Time: 12:15

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:37:00	0.52	1.10	95.19	0.721	289	81	81	3.0	3.520	50.99
2	9:42:00	0.44	0.95	98.71	0.663	291	92	82	3.0	3.054	46.97
3	9:47:00	0.59	1.30	101.76	0.768	289	82	82	3.0	3.661	54.32
	9:52:00			105.43							
1	9:57:00	0.65	1.40	105.43	0.806	295	80	88	4.0	3.830	57.24
2	10:02:00	0.69	1.50	109.26	0.831	297	88	79	4.0	3.863	59.05
3	10:07:00	0.49	1.00	113.12	0.700	293		79	4.0	3.326	49.63
	10:12:00			116.45							
1	10:15:00	0.33	0.71	116.45	0.574	284	81	81	4.0	2.686	40.49
2	10:20:00	0.42	0.90	119.14	0.648	281	81	81	4.0	3.065	45.58
3	10:25:00	0.39	0.84	122.20	0.624	278	81	81	4.0	3.000	43.84
	10:30:00			125.20							
1	10:35:00	0.40	0.86	125.20	0.632	292	82	82	5.0	3.020	44.81
2	10:40:00	0.51	1.10	128.22	0.714	290	82	82	5.0	3.040	50.54
3	10:45:00	0.46	0.99	131.26	0.678	295	82	82	5.0	3.559	48.15
	10:50:00			134.82							
1	10:55:00	0.43	0.92	134.82	0.656	286	83	83	4.0	3.184	46.28
2	11:00:00	0.55	1.20	138.00	0.742	284	83	83	4.0	3.437	52.27
3	11:05:00	0.51	1.10	141.44	0.714	282	83	83	4.0	3.407	50.27
	11:10:00			144.85							
1	11:20:00	0.65	1.40	144.85	0.806	279	85	85	4.0	3.822	56.63
2	11:25:00	0.59	1.30	148.67	0.768	275	85	85	4.0	3.656	53.81
3	11:30:00	0.68	1.50	152.33	0.825	282	85	85	4.0	3.908	58.04
	11:35:00			156.23							
1	11:40:00	0.70	1.50	156.23	0.837	283	86	86	4.0	3.989	58.93
2	11:45:00	0.48	1.00	160.22	1.517	282	86	86	4.0	3.289	106.77
3	11:50:00	0.55	1.20	163.51	0.742	287	86	86	4.0	3.528	52.37
	11:55:00			167.04							
1	12:00:00	0.47	1.00	167.04	0.686	281	87	87	4.0	3.244	48.22
2	12:05:00	0.56	1.20	170.28	0.748	281	87	87	4.0	3.563	52.64
3	12:10:00	0.60	1.30	173.85	0.775	283	87	87	4.0	3.731	54.56
	12:15:00			177.58							
			1.14	82.382	0.757	286	84	83		82.382	
							83.79				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	RG				
Temp ID:	E-28		**Sample Plane:**	Vertical	
Meter ID:	E-28		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.993		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.92	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.18	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	2880.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	3065.00	**grams**
@	9/12	**in. Hg.**	**Difference:**	185.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	185.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.22	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	93.9	**°F**	**Gas Weight wet, Ms:**	29.112	**lb/lb mole**
Sqrt ΔP:	0.743	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	290.9	**°F**	**Gas Velocity, Vs:**	52.950	
Meter Volume, Vm:	85.354	**Cubic Feet**	**Volumetric Flow, ACFM:**	921,339	
Meter Volume, Vmstd:	72.935	**dscf**	**Volumetric Flow, DSCFM:**	506,447	
Meter Volume, Vwstd:	8.714	**wscf**	**Volumetric Flow, SCFM:**	566,952	
Moisture, Bws:	0.107		**Isokinetic Variance, %I:**	102.2	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**0**	**0**	
PM, grams (net) collected:	---		
PM, grains/acf:	---	#VALUE!	
PM, grains/dscf:	---	#VALUE!	
PM, lb/hr:	---	#VALUE!	
PM lb/mmBtu (based on Fd):	#VALUE!	#VALUE!	#VALUE!
HCl, HF, and Br			
mg (net) collected:	1.37	---	
ppm:	0.44	---	
ug/dscm:	663.34	---	
lb/hr:	1.2584	---	
lb/mmBtu (based on Fd):	0.00053	---	
HF			
mg (net) collected:	2.72	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 8:10
End Time: 10:28

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	8:10:00	0.65	1.40	160.57	0.806	287	88	87	3.5	3.884	56.93
2	8:15:00	0.85	1.90	164.45	0.922	288	90	88	4.0	4.440	65.14
3	8:20:00	0.85	1.90	168.89	0.922	295	92	87	4.0	4.467	65.45
	8:25:00			173.36							
1	8:30:00	0.35	0.77	173.36	0.592	296	91	89	4.0	2.893	42.02
2	8:35:00	0.40	0.88	176.25	0.632	300	91	89	4.0	3.080	45.04
3	8:40:00	0.35	0.77	179.33	0.592	302	94	89	4.0	2.895	42.19
	8:45:00			182.23							
1	8:46:00	0.55	1.20	182.23	0.742	295	93	90	4.5	3.575	52.64
2	8:51:00	0.55	1.20	185.80	0.742	303	94	90	4.5	3.590	52.92
3	8:56:00	0.57	1.30	189.39	0.755	297	95	91	5.0	3.720	53.66
	9:01:00			193.11							
1	9:03:00	0.50	1.10	193.11	0.707	296	95	91	5.0	3.370	50.23
2	9:08:00	0.47	1.00	196.48	0.686	294	96	92	5.0	3.390	48.63
3	9:13:00	0.47	1.00	199.87	0.686	297	97	92	5.0	3.334	48.73
	9:18:00			203.20							
1	9:20:00	0.53	1.20	203.20	0.728	296	96	93	5.0	3.523	51.71
2	9:25:00	0.50	1.10	206.73	0.707	294	97	93	5.0	3.351	50.16
3	9:30:00	0.55	1.20	210.08	0.742	299	98	94	5.0	3.590	52.78
	9:35:00			213.67							
1	9:39:00	0.60	1.30	213.67	0.775	289	97	94	6.0	3.717	54.77
2	9:44:00	0.65	1.40	217.39	0.806	281	98	94	6.0	3.770	56.70
3	9:49:00	0.60	1.30	221.16	0.775	277	100	95	6.0	3.899	54.33
	9:54:00			225.05							
1	9:56:00	0.60	1.30	225.05	0.775	284	98	96	5.0	3.746	54.58
2	10:01:00	0.60	1.30	228.80	0.775	277	99	95	5.5	3.775	54.33
3	10:06:00	0.55	1.20	232.58	0.742	287	99	96	7.0	3.525	52.36
	10:11:00			236.10							
1	10:13:00	0.55	1.20	236.10	0.742	278	98	96	6.5	2.535	52.05
2	10:18:00	0.55	1.20	238.64	0.742	286	99	96	7.0	3.680	52.33
3	10:23:00	0.55	1.20	242.32	0.742	284	99	96	7.0	3.605	52.26
	10:28:00			245.92							
			1.22	85.354	0.743	291	96	92		85.354	
							93.90				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	RG				
Temp ID:	E-28		**Sample Plane:**	Vertical	
Meter ID:	E-28		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.993		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.07	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.33	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	2865.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	3035.00	**grams**
@	13	**in. Hg.**	**Difference:**	170.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	170.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.84	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	99.4	**°F**	**Gas Weight wet, Ms:**	29.010	**lb/lb mole**
Sqrt ΔP:	0.611	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	278.0	**°F**	**Gas Velocity, Vs:**	43.124	
Meter Volume, Vm:	72.553	**Cubic Feet**	**Volumetric Flow, ACFM:**	750,365	
Meter Volume, Vmstd:	61.666	**dscf**	**Volumetric Flow, DSCFM:**	418,212	
Meter Volume, Vwstd:	8.007	**wscf**	**Volumetric Flow, SCFM:**	472,515	
Moisture, Bws:	0.115		**Isokinetic Variance, %I:**	104.6	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	1.58	---	
ppm:	0.60	---	
ug/dscm:	904.83	---	
lb/hr:	1.4174	---	
lb/mmBtu (based on Fd):	0.00073	---	
HF			
mg (net) collected:	2.54	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 8:45
End Time: 10:56

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	8:45:00	0.50	1.12	335.86	0.707	270	93	93	7.0	3.470	49.37
2	8:50:00	0.50	1.12	339.33	0.707	270	94	93	7.0	3.470	49.37
3	8:55:00	0.45	1.01	342.80	0.671	275	99	95	7.0	4.150	46.99
	9:00:00			346.95							
1	9:01:00	0.35	0.78	346.95	0.592	282	99	97	5.0	2.880	41.64
2	9:06:00	0.32	0.71	349.83	0.566	289	98	96	5.0	2.760	40.00
3	9:11:00	0.28	0.62	352.59	0.529	290	98	96	5.0	2.590	37.44
	9:16:00			355.18							
1	9:18:00	0.28	0.62	355.18	0.529	277	96	95	5.0	2.570	37.12
2	9:23:00	0.30	0.67	357.75	0.548	279	96	95	5.0	2.720	38.47
3	9:28:00	0.30	0.67	360.47	0.548	272	97	95	5.0	2.670	38.29
	9:33:00			363.14							
1	9:35:00	0.35	0.78	363.14	0.592	271	99	99	5.0	2.880	41.33
2	9:40:00	0.43	0.96	366.02	0.656	275	99	97	5.0	3.430	45.94
3	9:45:00	0.35	0.78	369.45	0.592	274	100	97	5.0	2.900	41.42
	9:50:00			372.35							
1	9:51:00	0.38	0.84	372.35	0.616	286	102	96	5.0	2.940	43.51
2	9:56:00	0.38	0.84	375.29	0.616	285	102	97	7.0	2.960	43.48
3	10:01:00	0.43	0.96	378.25	0.656	290	102	99	6.0	3.060	46.40
	10:06:00			381.31							
1	10:09:00	0.45	1.01	381.31	0.671	281	102	100	7.0	3.250	47.18
2	10:14:00	0.45	1.01	384.56	0.671	282	104	102	7.0	3.290	47.22
3	10:19:00	0.45	1.01	387.85	0.671	288	104	101	7.5	3.235	47.41
	10:24:00			391.09							
1	10:25:00	0.32	0.75	391.09	0.566	265	104	101	7.0	2.785	39.36
2	10:30:00	0.30	0.67	393.87	0.548	270	105	102	7.0	2.680	38.24
3	10:35:00	0.30	0.67	396.55	0.548	267	104	103	7.0	2.715	38.16
	10:40:00			399.27							
1	10:41:00	0.35	0.78	399.27	0.592	272	106	102	6.0	2.905	41.36
2	10:46:00	0.40	0.89	402.17	0.632	283	105	103	5.5	3.110	44.55
3	10:51:00	0.40	0.89	405.28	0.632	270	106	102	5.5	3.133	44.15
	10:56:00			408.41							
			0.84	72.553	0.611	278	101	98		72.553	
							99.38				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 1

Project Number: M22E0517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	B. Zimperman				
Temp ID:	E-27		**Sample Plane:**	Horizontal	
Meter ID:	E-27		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.992		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**		
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.98	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-0.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.94	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5615.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5850.00	**grams**
@	5/6	**in. Hg.**	**Difference:**	235.00	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	235.00	
Oxygen:	7.5	**%**			
Nitrogen:	80.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.83	**Inches H_2O**	**Gas Weight dry, Md:**	30.300	**lb/lb mole**
Meter Temperature, Tm:	86.3	**°F**	**Gas Weight wet, Ms:**	28.360	**lb/lb mole**
Sqrt ΔP:	1.633	**Inches H_2O**	**Excess Air:**	55.066	**%**
Stack Temperature, Ts:	191.5	**°F**	**Gas Velocity, Vs:**	108.311	
Meter Volume, Vm:	68.203	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,361,081	
Meter Volume, Vmstd:	59.100	**dscf**	**Volumetric Flow, DSCFM:**	836,459	
Meter Volume, Vwstd:	11.069	**wscf**	**Volumetric Flow, SCFM:**	993,115	
Moisture, Bws:	0.158		**Isokinetic Variance, %I:**	109.1	
Meter Volume, Normal	55.071				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.000011	---	
ppm:	0.000001	---	
ug/dncm:	0.01	---	
lb/hr:	0.000021	---	
lb/mmBtu (based on Fd):	0.00000001	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Stack

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 10:00
End Time: 12:30

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	10:00:00	2.90	0.89	238.10	1.703	192	83	83	3.0	2.921	112.98
1	10:05:00	2.90	0.90	241.02	1.703	193	83	84	3.0	2.980	113.07
2	10:10:00	3.00	0.93	244.00	1.732	192	86	83	3.0	2.920	114.91
2	10:15:00	2.90	0.90	246.92	1.703	191	86	83	3.0	2.900	112.89
3	10:20:00	2.30	0.71	249.82	1.517	192	86	83	3.0	2.690	100.62
3	10:25:00	2.30	0.71	252.51	1.517	191	86	84	3.0	2.632	100.54
	10:30:00			255.14							
1	10:40:00	2.90	0.90	255.25	1.703	191	83	84	3.0	2.950	112.89
1	10:45:00	2.80	0.87	258.20	1.673	192	86	83	3.0	2.900	111.01
2	10:50:00	2.70	0.84	261.10	1.643	192	87	84	3.0	2.820	109.01
2	10:55:00	2.75	0.85	263.92	1.658	192	87	83	3.0	2.850	110.02
3	11:00:00	2.40	0.75	266.77	1.549	190	88	84	3.0	2.750	102.62
3	11:05:00	2.40	0.75	269.52	1.549	190	90	85	3.0	2.640	102.62
	11:10:00			272.16							
1	11:20:00	2.80	0.87	272.32	1.673	191	86	85	3.0	2.980	110.93
1	11:25:00	2.85	0.89	275.30	1.688	192	88	86	3.0	2.930	112.00
2	11:30:00	2.80	0.87	278.23	1.673	192	89	86	3.0	2.930	111.01
2	11:35:00	2.85	0.89	281.16	1.688	192	90	86	3.0	2.900	112.00
3	11:40:00	2.40	0.75	284.06	1.549	192	90	86	3.0	2.810	102.78
3	11:45:00	2.40	0.75	286.87	1.549	191	90	86	3.0	2.630	102.70
	11:50:00			289.50							
1	12:00:00	2.90	0.90	289.60	1.703	192	88	87	3.0	2.970	112.98
1	12:05:00	2.85	0.89	292.57	1.688	192	89	87	3.0	2.910	112.00
2	12:10:00	2.75	0.86	295.48	1.658	191	90	88	3.0	2.880	109.93
2	12:15:00	2.70	0.84	298.36	1.643	191	90	87	3.0	2.840	108.93
3	12:20:00	2.30	0.72	301.20	1.517	191	92	82	3.0	2.880	100.57
3	12:25:00	2.30	0.72	304.08	1.517	190	92	88	3.0	2.590	100.46
	12:30:00			306.67							
			0.83	68.203	1.633	191	88	85		68.203	
							86.29				

Field Notes/Comments:

TEST DATA - Ontario Hydro **Run No.: 2**

Project Number: M22E0517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	B. Zimperman				
Temp ID:	E-27		**Sample Plane:**	Horizontal	
Meter ID:	E-27		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.992		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**		
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.77	**in. Hg.**	
Static Pressure:	-1.60	**in. H_2O**	
Flue Pressure (Ps):	26.65	**in. Hg. abs.**	
Sample Train Leak Check **Pre:**	0.000		
Post:	0.000		
@	5/6	**in. Hg.**	
Carbon Dioxide:	12.0	**%**	
Oxygen:	7.0	**%**	
Nitrogen:	81.0	**%**	

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	0.00	**mls.**
Difference:	0.00	
Silica Initial Wt.	5615.00	**grams**
Silica Final Wt.	5855.00	**grams**
Difference:	240.00	
Total Water Gain:	240.00	

STACK PARAMETERS

Delta H:	0.80	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	92.1	**°F**	**Gas Weight wet, Ms:**	28.190	**lb/lb mole**
Sqrt ΔP:	1.637	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	187.7	**°F**	**Gas Velocity, Vs:**	109.148	
Meter Volume, Vm:	67.349	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,371,609	
Meter Volume, Vmstd:	57.297	**dscf**	**Volumetric Flow, DSCFM:**	831,876	
Meter Volume, Vwstd:	11.304	**wscf**	**Volumetric Flow, SCFM:**	995,995	
Moisture, Bws:	0.165		**Isokinetic Variance, %I:**	106.4	
Meter Volume, Normal	53.391				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury	**Filterable**	**Condensible**	**Total**
Particle Bound Mercury			0.00
mg (net) collected:	0.000000	---	
ppm:	0.000000	---	
ug/dncm:	0.00	---	
lb/hr:	0.000000	---	
lb/mmBtu (based on Fd):	0.0000000	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Stack

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 9:05
End Time: 11:30

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:05:00	2.90	0.86	452.11	1.703	189	90	89	3.0	2.867	112.72
1	9:10:00	2.90	0.86	454.98	1.703	190	88	90	3.0	2.930	112.81
2	9:15:00	3.00	0.89	457.91	1.732	189	89	89	3.0	2.990	114.65
2	9:20:00	2.90	0.86	460.90	1.703	189	89	88	3.0	2.910	112.72
3	9:25:00	2.50	0.74	463.81	1.581	188	91	88	3.0	2.740	104.58
3	9:30:00	2.50	0.74	466.55	1.581	188	92	88	3.0	2.690	104.58
	9:35:00			469.24							
1	9:46:00	2.70	0.80	471.41	1.643	188	91	90	3.0	2.792	108.68
1	9:51:00	2.70	0.81	474.20	1.643	188	93	90	3.0	2.750	108.68
2	9:56:00	2.70	0.81	476.95	1.643	188	93	90	3.0	2.830	108.68
2	10:01:00	2.80	0.84	479.78	1.673	187	93	91	3.0	2.900	110.59
3	10:06:00	2.50	0.75	482.68	1.581	187	94	90	3.0	2.710	104.50
3	10:11:00	2.40	0.72	485.39	1.549	187	94	91	3.0	2.660	102.38
	10:16:00			488.05							
1	10:22:00	2.90	0.87	488.20	1.703	186	92	90	3.5	2.803	112.46
1	10:27:00	2.80	0.84	491.00	1.673	188	93	91	3.5	2.950	110.67
2	10:32:00	2.80	0.84	493.95	1.673	188	94	91	3.5	2.850	110.67
2	10:37:00	2.70	0.81	496.80	1.643	188	95	91	3.5	2.800	108.68
3	10:42:00	2.50	0.75	499.60	1.581	187	95	91	3.5	2.720	104.50
3	10:47:00	2.40	0.72	502.32	1.549	188	95	91	3.0	2.674	102.46
	10:52:00			504.99							
1	11:00:00	2.90	0.87	505.15	1.703	187	94	92	3.5	2.861	112.55
1	11:05:00	2.80	0.84	508.01	1.673	188	96	93	3.5	2.860	110.67
2	11:10:00	2.70	0.81	510.87	1.643	187	97	93	3.5	2.950	108.60
2	11:15:00	2.70	0.81	513.82	1.643	188	97	94	3.5	2.850	108.68
3	11:20:00	2.40	0.72	516.67	1.549	186	98	94	3.0	2.670	102.31
3	11:25:00	2.30	0.69	519.34	1.517	186	98	93	3.0	2.592	100.15
	11:30:00			521.93							
			0.80	67.349	1.637	188	93	91		67.349	
							92.06				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 3

Project Number: M22E0517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	B. Zimperman				
Temp ID:	E-27		**Sample Plane:**	Horizontal	
Meter ID:	E-27		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.992		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.91	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.84	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5620.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5855.00	**grams**
@	5	**in. Hg.**	**Difference:**	235.00	
Carbon Dioxide:	12.4	**%**	**Total Water Gain:**	235.00	
Oxygen:	7.1	**%**			
Nitrogen:	80.5	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	2.79	**Inches H_2O**	**Gas Weight dry, Md:**	30.268	**lb/lb mole**
Meter Temperature, Tm:	98.3	**°F**	**Gas Weight wet, Ms:**	28.313	**lb/lb mole**
Sqrt ΔP:	1.668	**Inches H_2O**	**Excess Air:**	50.170	**%**
Stack Temperature, Ts:	187.9	**°F**	**Gas Velocity, Vs:**	110.636	
Meter Volume, Vm:	68.674	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,390,305	
Meter Volume, Vmstd:	58.390	**dscf**	**Volumetric Flow, DSCFM:**	854,335	
Meter Volume, Vwstd:	11.069	**wscf**	**Volumetric Flow, SCFM:**	1,016,284	
Moisture, Bws:	0.159		**Isokinetic Variance, %I:**	105.5	
Meter Volume, Normal	54.410				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.000000	---	
ppm:	0.000000	---	
ug/dncm:	0.00	---	
lb/hr:	0.000000	---	
lb/mmBtu (based on Fd):	0.0000000	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Stack

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 9:25
End Time: 11:35

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:25:00	2.90	2.90	654.06	1.703	190	96	94	3.0	2.926	112.81
1	9:30:00	3.00	3.00	656.99	1.732	190	95	94	3.0	2.980	114.73
2	9:35:00	2.90	2.90	659.97	1.703	190	93	93	3.0	2.870	112.81
2	9:40:00	3.00	3.00	662.84	1.732	190	94	93	3.0	2.960	114.73
3	9:45:00	2.40	2.40	665.80	1.549	189	96	94	3.0	2.640	102.54
3	9:50:00	2.50	2.50	668.44	1.581	188	96	93	3.0	2.695	104.58
	9:55:00			671.14							
1	10:00:00	2.90	2.90	671.30	1.703	188	96	94	3.0	2.900	112.63
1	10:05:00	2.80	2.80	674.20	1.673	187	97	95	3.0	2.850	110.59
2	10:10:00	2.90	2.90	677.05	1.703	187	98	94	3.0	2.960	112.55
2	10:15:00	2.90	2.90	680.01	1.703	188	100	95	3.0	2.850	112.63
3	10:20:00	2.50	2.50	682.86	1.581	187	100	96	3.0	2.650	104.50
3	10:25:00	2.50	2.50	685.51	1.581	187	101	96	3.0	2.735	104.50
	10:30:00			688.25							
1	10:30:00	3.00	3.00	688.39	1.732	187	99	97	3.0	2.911	114.47
1	10:35:00	2.90	2.90	691.30	1.703	189	101	97	3.0	2.940	112.72
2	10:40:00	2.90	2.90	694.24	1.703	189	102	98	3.0	2.900	112.72
2	10:45:00	2.90	2.90	697.14	1.703	189	102	99	3.0	2.930	112.72
3	10:50:00	2.60	2.60	700.07	1.612	187	102	99	3.0	2.800	106.57
3	10:55:00	2.60	2.60	702.87	1.612	187	103	99	3.0	2.815	106.57
	11:00:00			705.69							
1	11:05:00	2.90	2.90	705.83	1.703	187	102	99	3.0	2.973	112.55
1	11:10:00	3.00	3.00	708.80	1.732	187	103	99	3.0	2.990	114.47
2	11:15:00	3.00	3.00	711.79	1.732	187	105	100	3.0	2.990	114.47
2	11:20:00	2.90	2.90	714.78	1.703	187	106	100	3.0	2.950	112.55
3	11:25:00	2.50	2.50	717.73	1.581	186	105	101	3.0	2.750	104.42
3	11:30:00	2.50	2.50	720.48	1.581	186	105	101	3.0	2.709	104.42
	11:35:00			723.19							
			2.79	68.674	1.668	188	100	97		68.674	
							98.27				

Field Notes/Comments:

TEST DATA - Ontario Hydro **Run No.: 1**

Project Number: M22E05517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	RG				
Temp ID:	E52		**Sample Plane:**	Vertical	
Meter ID:	E52		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.244	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.15	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-9.50	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.45	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5595.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5740.00	**grams**
@	12/12	**in. Hg.**	**Difference:**	145.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	145.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.88	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	84.9	**°F**	**Gas Weight wet, Ms:**	29.211	**lb/lb mole**
Sqrt ΔP:	0.711	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	280.8	**°F**	**Gas Velocity, Vs:**	49.965	
Meter Volume, Vm:	70.750	**Cubic Feet**	**Volumetric Flow, ACFM:**	869,391	
Meter Volume, Vmstd:	62.300	**dscf**	**Volumetric Flow, DSCFM:**	493,701	
Meter Volume, Vwstd:	6.830	**wscf**	**Volumetric Flow, SCFM:**	547,822	
Moisture, Bws:	0.099		**Isokinetic Variance, %I:**	94.0	
			Meter Volume, Vmstd:	58.053	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury	Filterable	Condensible	Total
Particle Bound Mercury			0.00
mg (net) collected:	0.000624	---	
ppm	0.000042	---	
ug/dncm:	0.38	---	
lb/hr:	0.0007	---	
lb/TBtu (based on Fd):	0.0002839	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 10:00
End Time: 12:40

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	10:00:00	0.42	0.28	955.80	0.648	293	89	83	0.0	1.700	45.94
2	10:05:00	0.61	0.40	957.50	0.781	300	79	80	0.0	2.070	55.62
3	10:10:00	0.61	0.40	959.57	0.781	292	80	81	0.0	1.960	55.33
	10:15:00			961.53							
1	10:38:00	0.40	0.86	964.90	0.632	292	82	81	2.0	3.015	44.81
2	10:43:00	0.40	0.86	967.92	0.632	298	82	82	2.0	2.315	44.98
3	10:48:00	0.45	0.97	970.23	0.671	268	85	82	2.0	3.191	46.76
	10:53:00			973.42							
1	10:55:00	0.35	0.75	973.42	0.592	277	84	82	2.0	2.819	41.49
2	11:00:00	0.40	0.86	976.24	0.632	273	84	82	2.0	2.870	44.24
3	11:05:00	0.40	0.86	979.11	0.632	280	84	83	2.0	3.002	44.45
	11:10:00			982.11							
1	11:12:00	0.48	1.00	982.11	0.693	285	83	82	3.0	3.298	48.85
2	11:17:00	0.52	1.10	985.41	0.721	283	87	84	3.0	2.960	50.78
3	11:22:00	0.45	0.96	988.37	0.671	285	88	83	2.5	3.140	47.30
	11:27:00			991.51							
1	11:30:00	0.40	0.86	991.51	0.632	278	88	84	2.0	2.970	44.39
2	11:35:00	0.38	0.81	994.48	0.616	285	88	84	2.0	2.870	43.47
3	11:40:00	0.42	0.90	997.35	0.648	290	89	85	3.5	3.180	45.85
	11:45:00			1000.53							
1	11:47:00	0.60	1.30	1000.53	0.775	271	85	85	1.0	3.620	54.10
2	11:52:00	0.55	1.20	1004.15	0.742	284	89	85	1.0	3.390	52.26
3	11:57:00	0.52	1.10	1007.54	0.721	275	90	85	1.0	3.530	50.51
	12:02:00	0.51		1011.07	0.714						39.57
1	12:04:00	0.57	1.10	1011.07	0.755	270	88	86	2.0	3.387	52.70
2	12:09:00	0.45	1.20	1014.46	1.517	272	89	86	2.0	3.523	106.03
3	12:14:00	0.55	0.97	1017.98	0.742	274	90	85	2.0	3.215	51.91
	12:19:00			1021.20							
1	12:25:00	0.40	0.86	1021.20	0.632	268	86	86	1.5	2.997	44.09
2	12:30:00	0.35	0.75	1024.19	0.592	276	88	85	1.0	2.828	41.46
3	12:35:00	0.35	0.75	1027.02	0.592	270	89	86	1.0	2.900	41.29
	12:40:00			1029.92							
			0.88	70.750	0.711	281	86	84		70.750	
							84.85				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E-52		**Sample Plane:**	Vertical	
Meter ID:	E-52		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.92	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.18	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5620.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5825.00	**grams**
@	15	**in. Hg.**	**Difference:**	205.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	205.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.36	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	97.7	**°F**	**Gas Weight wet, Ms:**	29.018	**lb/lb mole**
Sqrt ΔP:	0.731	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	284.8	**°F**	**Gas Velocity, Vs:**	51.949	
Meter Volume, Vm:	87.576	**Cubic Feet**	**Volumetric Flow, ACFM:**	903,920	
Meter Volume, Vmstd:	74.800	**dscf**	**Volumetric Flow, DSCFM:**	496,665	
Meter Volume, Vwstd:	9.656	**wscf**	**Volumetric Flow, SCFM:**	560,776	
Moisture, Bws:	0.114		**Isokinetic Variance, %I:**	106.8	
Meter Volume, Vmstd:	69.701				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.001100	---	
ppm:	0.000062	---	
ug/dncm:	0.56	---	
lb/hr:	0.0010	---	
lb/mmBtu (based on Fd):	0.0000004	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 9:05
End Time: 11:40

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:05:00	0.53	1.30	51.90	0.728	293	89	89	4.0	3.625	51.61
2	9:10:00	0.58	1.50	55.53	0.762	291	88	88	4.0	3.750	53.92
3	9:15:00	0.64	1.60	59.28	0.800	295	89	89	4.0	3.958	56.79
	9:20:00			63.23							
1	9:25:00	0.49	1.20	63.23	0.700	283	91	91	5.0	3.546	49.29
2	9:30:00	0.65	1.60	66.78	0.806	285	93	93	5.0	3.990	56.85
3	9:35:00	0.55	1.40	70.77	0.742	286	95	95	5.0	3.686	52.33
	9:40:00			74.46							
1	9:45:00	0.39	0.98	74.46	0.624	290	98	98	5.0	3.148	44.18
2	9:50:00	0.46	1.20	77.60	0.678	291	101	101	5.0	3.323	48.02
3	9:55:00	0.60	1.50	80.93	0.775	289	103	103	5.0	3.966	54.77
	10:00:00			84.89							
1	10:05:00	0.50	1.30	84.89	0.707	285	104	104	5.0	3.521	49.86
2	10:10:00	0.44	1.10	88.41	0.663	283	104	104	5.0	3.309	46.71
3	10:15:00	0.51	1.30	91.72	0.714	282	105	105	5.0	3.557	50.26
	10:20:00			95.28							
1	10:25:00	0.54	1.40	95.28	0.735	284	103	103	4.0	3.722	51.78
2	10:30:00	0.49	1.20	99.00	0.700	285	101	101	4.0	3.456	49.36
3	10:35:00	0.62	1.60	102.46	0.787	289	99	99	4.0	3.948	55.67
	10:40:00			106.41							
1	10:45:00	0.37	0.93	106.41	0.608	278	98	98	4.0	3.034	42.69
2	10:50:00	0.43	1.10	109.44	0.656	279	98	98	4.0	3.294	46.05
3	10:55:00	0.46	1.20	112.73	0.678	278	97	97	4.0	3.392	47.60
	11:00:00			116.13							
1	11:05:00	0.50	1.30	116.13	0.707	279	98	98	4.0	3.520	49.66
2	11:10:00	0.71	1.80	119.65	0.843	281	98	98	4.0	4.226	59.26
3	11:15:00	0.63	1.60	123.87	0.794	280	98	98	4.0	3.959	55.78
	11:20:00			127.83							
1	11:25:00	0.47	1.20	127.83	0.686	281	98	98	4.0	3.426	48.21
2	11:30:00	0.70	1.80	131.26	0.837	284	99	99	4.0	4.165	58.96
3	11:35:00	0.65	1.60	135.42	0.806	285	98	98	4.0	4.055	56.85
	11:40:00			139.48							
			1.36	87.576	0.731	285	98	98		87.576	
							97.71				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E-52		**Sample Plane:**	Vertical	
Meter ID:	E-52		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.07	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.33	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	5655.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	5760.00	**grams**
@	13	**in. Hg.**	**Difference:**	105.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	105.00	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.23	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	93.2	**°F**	**Gas Weight wet, Ms:**	29.624	**lb/lb mole**
Sqrt ΔP:	0.678	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	289.9	**°F**	**Gas Velocity, Vs:**	47.732	
Meter Volume, Vm:	81.351	**Cubic Feet**	**Volumetric Flow, ACFM:**	830,531	
Meter Volume, Vmstd:	70.416	**dscf**	**Volumetric Flow, DSCFM:**	480,910	
Meter Volume, Vwstd:	4.946	**wscf**	**Volumetric Flow, SCFM:**	514,686	
Moisture, Bws:	0.066		**Isokinetic Variance, %I:**	103.9	
Meter Volume, Vmstd:	65.615				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.001000	---	
ppm:	0.000060	---	
ug/dncm:	0.54	---	
lb/hr:	0.0009	---	
lb/mmBtu (based on Fd):	0.0000004	---	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 9:25
End Time: 12:00

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	9:25:00	0.41	1.00	63.39	0.640	283	93	93	4.0	3.225	45.09
2	9:30:00	0.75	1.90	66.62	0.866	285	94	94	4.0	4.366	61.07
3	9:35:00	0.82	2.10	70.98	0.906	287	95	95	4.0	4.481	63.94
	9:40:00			75.46							
1	9:45:00	0.25	0.64	75.46	0.500	289	94	94	4.0	2.541	35.35
2	9:50:00	0.23	0.58	78.01	0.480	291	94	94	4.0	2.395	33.95
3	9:55:00	0.33	0.84	80.40	0.574	291	93	93	4.0	2.825	40.67
	10:00:00			83.23							
1	10:05:00	0.35	0.89	83.23	0.592	293	92	92	3.0	2.970	41.94
2	10:10:00	0.27	0.69	86.20	0.520	291	92	92	3.0	2.588	36.79
3	10:15:00	0.20	0.51	88.78	0.447	291	92	92	3.0	2.317	31.66
	10:20:00			91.10							
1	10:25:00	0.21	0.53	91.10	0.458	295	92	93	3.0	2.213	32.53
2	10:30:00	0.25	0.64	93.31	0.500	296	93	93	3.0	2.506	35.52
3	10:35:00	0.24	0.61	95.82	0.490	299	94	94	3.0	2.460	34.87
	10:40:00			98.28							
1	10:45:00	0.49	1.30	98.28	0.700	300	94	94	3.0	3.490	49.85
2	10:50:00	0.53	1.40	101.77	0.728	298	94	94	3.0	3.636	51.78
3	10:55:00	0.50	1.30	105.41	0.707	298	94	94	3.0	3.545	50.29
	11:00:00			108.95							
1	11:05:00	0.70	1.80	108.95	0.837	295	94	94	3.0	4.180	59.39
2	11:10:00	0.61	1.60	113.13	0.781	293	94	94	3.0	3.951	55.37
3	11:15:00	0.60	1.50	117.08	0.775	296	95	95	3.0	3.697	55.02
	11:20:00			120.78							
1	11:25:00	0.61	1.60	120.78	0.781	280	92	92	3.0	4.036	54.89
2	11:30:00	0.54	1.40	124.81	0.735	278	91	91	3.0	3.675	51.57
3	11:35:00	0.52	1.30	128.49	0.721	279	91	91	3.0	3.600	50.64
	11:40:00			132.09							
1	11:45:00	0.69	1.80	132.09	0.831	286	92	92	3.0	4.144	58.61
2	11:50:00	0.72	1.80	136.23	0.849	284	93	93	3.0	4.246	59.79
3	11:55:00	0.73	1.90	140.48	0.854	280	95	93	3.0	4.264	60.04
	12:00:00			144.74							
			1.23	81.351	0.678	290	93	93		81.351	
							93.19				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 1

Project Number: M22E05517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-51		**Sample Plane:**	Horizontal	
Meter ID:	E-51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**		
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.98	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-0.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.94	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.002		**Silica Initial Wt.**	3425.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	3630.00	**grams**
@	13/8	**in. Hg.**	**Difference:**	205.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	205.00	.
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.86	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	91.3	**°F**	**Gas Weight wet, Ms:**	28.564	**lb/lb mole**
Sqrt ΔP:	1.593	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	194.5	**°F**	**Gas Velocity, Vs:**	105.500	
Meter Volume, Vm:	71.814	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,325,762	
Meter Volume, Vmstd:	62.356	**dscf**	**Volumetric Flow, DSCFM:**	833,747	
Meter Volume, Vwstd:	9.656	**wscf**	**Volumetric Flow, SCFM:**	962,849	
Moisture, Bws:	0.134		**Isokinetic Variance, %I:**	106.4	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 13:25
End Time: 15:38

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	13:25:00	2.80	0.95	94.47	1.673	193	87	87	4.0	3.197	110.70
1	13:30:00	2.80	0.95	97.67	1.673	194	86	87	4.0	3.070	110.79
2	13:35:00	2.70	0.92	100.74	1.643	194	88	87	4.0	3.130	108.79
2	13:40:00	2.70	0.92	103.87	1.643	194	89	86	4.0	3.080	108.79
3	13:45:00	2.30	0.78	106.95	1.517	194	93	87	4.0	2.870	100.41
3	13:50:00	2.30	0.78	109.82	1.517	193	93	87	4.0	2.893	100.33
	13:55:00			112.71							
1	14:00:00	2.60	0.88	112.71	1.612	194	91	87	4.0	2.967	106.76
1	14:05:00	2.65	0.90	115.68	1.628	194	93	87	4.0	3.020	107.78
2	14:10:00	2.40	0.82	118.70	1.549	193	95	88	4.0	2.910	102.49
2	14:15:00	2.55	0.87	121.61	1.597	194	95	88	4.0	2.890	105.72
3	14:20:00	2.30	0.78	124.50	1.517	193	95	88	4.0	2.820	100.33
3	14:25:00	2.20	0.75	127.32	1.483	193	95	89	4.0	2.791	98.13
	14:30:00			130.11							
1	14:35:00	2.80	0.95	130.11	1.673	194	92	89	4.0	3.199	110.79
1	14:40:00	2.80	0.95	133.31	1.673	194	93	89	4.0	3.110	110.79
2	14:45:00	2.60	0.88	136.42	1.612	195	95	90	4.0	3.090	106.84
2	14:50:00	2.60	0.88	139.51	1.612	195	96	90	4.0	3.110	106.84
3	14:55:00	2.30	0.78	142.62	1.517	194	96	90	4.0	2.810	100.41
3	15:00:00	2.30	0.78	145.43	1.517	193	97	90	4.0	2.851	100.33
	15:05:00			148.28							
1	15:08:00	2.80	0.95	148.28	1.673	195	95	91	4.0	3.189	110.87
1	15:13:00	2.80	0.95	151.47	1.673	195	96	90	4.0	3.160	110.87
2	15:18:00	2.60	0.88	154.63	1.612	196	97	91	4.0	3.070	106.92
2	15:23:00	2.60	0.88	157.70	1.612	198	96	91	4.0	3.050	107.08
3	15:28:00	2.20	0.75	160.75	1.517	198	97	92	4.0	2.750	100.74
3	15:33:00	2.20	0.75	163.50	1.483	198	98	92	4.0	2.787	98.50
	15:38:00			166.29							
			0.86	71.814	1.593	195	94	89		71.814	
							91.27				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-27		**Sample Plane:**	Horizontal	
Meter ID:	E-27		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.992		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**		
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.77	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.60	**in. H_2O**	**Final Impinger Content:**	0.00	**mls.**
Flue Pressure (Ps):	26.65	**in. Hg. abs.**	**Difference:**	0.00	
Sample Train Pre:	0.002		**Silica Initial Wt.**	3430.00	**grams**
Leak Check Post:	0.018		**Silica Final Wt.**	3665.00	**grams**
@	14/4	**in. Hg.**	**Difference:**	235.00	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	235.00	
Oxygen:	6.5	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.85	**Inches H_2O**	**Gas Weight dry, Md:**	30.260	**lb/lb mole**
Meter Temperature, Tm:	98.5	**°F**	**Gas Weight wet, Ms:**	28.352	**lb/lb mole**
Sqrt ΔP:	1.602	**Inches H_2O**	**Excess Air:**	43.671	**%**
Stack Temperature, Ts:	190.3	**°F**	**Gas Velocity, Vs:**	106.733	
Meter Volume, Vm:	71.429	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,341,262	
Meter Volume, Vmstd:	60.070	**dscf**	**Volumetric Flow, DSCFM:**	819,101	
Meter Volume, Vwstd:	11.069	**wscf**	**Volumetric Flow, SCFM:**	970,028	
Moisture, Bws:	0.156		**Isokinetic Variance, %I:**	104.4	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 11:50
End Time: 13:58

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	11:50:00	2.90	0.96	56.41	1.703	191	94	93	3.0	3.133	112.49
1	11:55:00	2.90	0.96	59.54	1.703	191	93	92	3.0	3.140	112.49
2	12:00:00	2.60	0.86	62.68	1.612	190	96	93	3.0	3.020	106.43
2	12:05:00	2.60	0.86	65.70	1.612	190	98	93	3.0	3.020	106.43
3	12:10:00	2.10	0.69	68.72	1.449	190	99	94	3.0	2.710	95.65
3	12:15:00	2.10	0.69	71.43	1.449	189	100	94	3.0	2.693	95.58
	12:20:00			74.12							
1	12:22:00	2.70	0.89	74.12	1.643	191	99	95	4.0	2.997	108.54
1	12:27:00	2.70	0.89	77.12	1.643	191	100	95	4.0	3.070	108.54
2	12:32:00	2.80	0.92	80.19	1.673	191	100	95	4.0	3.120	110.53
2	12:37:00	2.80	0.92	83.31	1.673	192	101	95	4.0	3.110	110.62
3	12:42:00	2.10	0.69	86.42	1.449	190	102	95	4.0	2.710	95.65
3	12:47:00	2.10	0.69	89.13	1.449	190	103	96	4.0	2.710	95.65
	12:52:00			91.84							
1	12:54:00	2.80	0.92	91.84	1.673	191	101	97	4.0	3.060	110.53
1	12:59:00	2.80	0.92	94.90	1.673	191	101	97	4.0	3.110	110.53
2	13:04:00	2.80	0.92	98.01	1.673	191	102	97	4.0	3.090	110.53
2	13:09:00	2.80	0.92	101.10	1.673	191	104	98	4.0	3.110	110.53
3	13:14:00	2.40	0.79	104.21	1.549	190	104	98	4.0	2.860	102.25
3	13:19:00	2.40	0.79	107.07	1.549	190	104	99	4.0	2.851	102.25
	13:24:00			109.92							
1	13:28:00	2.80	0.92	109.92	1.673	190	102	99	4.0	3.129	110.45
1	13:33:00	2.80	0.92	113.05	1.673	190	103	99	4.0	3.120	110.45
2	13:38:00	2.70	0.89	116.17	1.643	190	103	99	4.0	3.000	108.46
2	13:43:00	2.70	0.89	119.17	1.643	190	103	99	4.0	3.010	108.46
3	13:48:00	2.20	0.73	122.18	1.483	189	104	99	4.0	2.840	97.83
3	13:53:00	2.20	0.73	125.02	1.483	189	104	99	4.0	2.816	97.83
	13:58:00			127.84							
			0.85	71.429	1.602	190	101	96		71.429	
							98.54				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	D. Ryan				
Temp ID:	E-27		**Sample Plane:**	Horizontal	
Meter ID:	E-27		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.992		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.91	**in. Hg.**	
Static Pressure:	-1.60	**in. H_2O**	
Flue Pressure (Ps):	26.79	**in. Hg. abs.**	
Sample Train Leak Check **Pre:**	0.000		
Post:	0.000		
@	6	**in. Hg.**	
Carbon Dioxide:	12.1	**%**	
Oxygen:	6.8	**%**	
Nitrogen:	81.1	**%**	

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	0.00	**mls.**
Difference:	0.00	
Silica Initial Wt.	3435.00	**grams**
Silica Final Wt.	3684.00	**grams**
Difference:	249.00	
Total Water Gain:	249.00	

STACK PARAMETERS

Delta H:	0.88	**Inches H_2O**	**Gas Weight dry, Md:**	30.208	**lb/lb mole**
Meter Temperature, Tm:	108.1	**°F**	**Gas Weight wet, Ms:**	28.220	**lb/lb mole**
Sqrt ΔP:	1.634	**Inches H_2O**	**Excess Air:**	46.542	**%**
Stack Temperature, Ts:	189.8	**°F**	**Gas Velocity, Vs:**	108.260	
Meter Volume, Vm:	72.525	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,360,446	
Meter Volume, Vmstd:	60.288	**dscf**	**Volumetric Flow, DSCFM:**	828,636	
Meter Volume, Vwstd:	11.728	**wscf**	**Volumetric Flow, SCFM:**	989,831	
Moisture, Bws:	0.163		**Isokinetic Variance, %I:**	103.5	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 11:40
End Time: 13:49

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	11:40:00	2.90	0.96	19.50	1.703	189	106	104	3.0	3.159	112.32
1	11:45:00	2.90	0.96	22.66	1.703	190	106	104	4.0	3.160	112.40
2	11:50:00	2.80	0.92	25.82	1.673	189	107	104	4.0	3.080	110.36
2	11:55:00	2.80	0.92	28.90	1.673	189	108	104	4.0	3.100	110.36
3	12:00:00	2.40	0.79	32.00	1.549	189	109	104	4.0	2.880	102.18
3	12:05:00	2.40	0.79	34.88	1.549	189	110	104	4.0	2.864	102.18
	12:10:00			37.74							
1	12:13:00	2.90	0.96	37.74	1.703	190	108	105	4.0	3.066	112.40
1	12:18:00	2.90	0.96	40.81	1.703	190	109	105	4.0	3.160	112.40
2	12:23:00	2.80	0.92	43.97	1.673	189	110	105	4.0	3.190	110.36
2	12:28:00	2.80	0.92	47.16	1.673	189	111	105	4.0	3.120	110.36
3	12:33:00	2.40	0.79	50.28	1.549	189	111	105	4.0	2.790	102.18
3	12:38:00	2.40	0.79	53.07	1.549	189	112	105	4.0	2.872	102.18
	12:43:00			55.94							
1	12:46:00	2.90	0.96	55.94	1.703	190	110	105	4.0	3.198	112.40
1	12:51:00	2.90	0.96	59.14	1.703	190	109	106	4.0	3.090	112.40
2	12:56:00	2.80	0.92	62.23	1.673	190	110	106	4.0	3.080	110.45
2	13:01:00	2.80	0.92	65.31	1.673	190	112	107	4.0	3.110	110.45
3	13:06:00	2.30	0.76	68.42	1.517	191	112	108	4.0	2.860	100.18
3	13:11:00	2.30	0.76	71.28	1.517	191	113	108	4.0	2.840	100.18
	13:16:00			74.12							
1	13:19:00	2.80	0.92	74.12	1.673	191	110	108	4.0	3.000	110.53
1	13:23:00	2.80	0.92	77.12	1.673	191	111	108	4.0	3.080	110.53
2	13:29:00	2.80	0.92	80.20	1.673	191	111	108	4.0	3.090	110.53
2	13:33:00	2.80	0.92	83.29	1.673	190	112	108	4.0	3.080	110.45
3	13:39:00	2.30	0.76	86.37	1.517	190	113	109	4.0	2.810	100.10
3	13:43:00	2.30	0.76	89.18	1.517	190	113	109	4.0	2.846	100.10
	13:49:00			92.03							
			0.88	72.525	1.634	190	110	106		72.525	
							108.06				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 1

Project Number: M22E05517 **Test Date:** 5/18/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	RG				
Temp ID:	E28		**Sample Plane:**	Vertical	
Meter ID:	E28		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.993		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.15	**in. Hg.**		
Static Pressure:	-9.50	**in. H_2O**		
Flue Pressure (Ps):	26.45	**in. Hg. abs.**		
Sample Train Leak Check Pre:	0.000			
Post:	0.000			
@	11/9	**in. Hg.**		
Carbon Dioxide:	14.0	**%**		
Oxygen:	5.0	**%**		
Nitrogen:	81.0	**%**		

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	0.00	**mls.**
Difference:	0.00	
Silica Initial Wt.	3605.00	**grams**
Silica Final Wt.	3820.00	**grams**
Difference:	215.00	
Total Water Gain:	215.00	

STACK PARAMETERS

Delta H:	1.13	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	87.4	**°F**	**Gas Weight wet, Ms:**	28.900	**lb/lb mole**
Sqrt ΔP:	0.760	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	283.9	**°F**	**Gas Velocity, Vs:**	53.808	
Meter Volume, Vm:	82.220	**Cubic Feet**	**Volumetric Flow, ACFM:**	936,262	
Meter Volume, Vmstd:	71.677	**dscf**	**Volumetric Flow, DSCFM:**	514,757	
Meter Volume, Vwstd:	10.127	**wscf**	**Volumetric Flow, SCFM:**	587,481	
Moisture, Bws:	0.124		**Isokinetic Variance, %I:**	98.8	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 5/18/2004
Start Time: 13:25
End Time: 15:45

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	13:25:00	0.50	1.10	78.11	0.707	277	85	85	4.0	3.349	49.11
2	13:30:00	0.56	1.20	81.46	0.748	277	86	85	4.0	3.521	51.98
3	13:35:00	0.56	1.20	84.98	0.748	274	89	85	4.0	3.566	51.87
	13:40:00			88.55							
1	13:43:00	0.50	1.10	88.55	0.707	276	87	85	3.0	3.362	49.08
2	13:48:00	0.50	1.10	91.91	0.707	279	88	85	3.0	3.363	49.18
3	13:53:00	0.55	1.20	95.27	0.742	284	88	85	3.0	3.534	51.76
	13:58:00			98.81							
1	14:00:00	0.61	1.30	98.81	0.781	277	86	88	3.0	3.705	54.25
2	14:05:00	0.57	1.20	102.51	0.755	272	89	86	3.0	3.590	52.26
3	14:10:00	0.52	1.10	106.10	0.721	270	90	86	3.0	3.430	49.85
	14:15:00			109.53							
1	14:21:00	0.45	0.97	109.53	0.671	283	87	86	4.0	3.180	46.78
2	14:26:00	0.51	1.10	112.71	0.714	289	88	86	4.0	3.400	50.01
3	14:31:00	0.51	1.10	116.11	0.714	285	89	86	4.0	3.395	49.87
	14:36:00			119.51							
1	14:38:00	0.48	1.00	119.51	0.693	287	87	87	2.0	3.285	48.45
2	14:43:00	0.48	1.00	122.79	0.693	290	88	87	2.0	3.320	48.55
3	14:48:00	0.45	0.97	126.11	0.671	293	89	87	2.0	3.189	47.10
	14:53:00			129.30							
1	14:54:00	0.50	1.10	129.30	0.707	283	89	87	2.0	3.361	49.31
2	14:59:00	0.55	1.20	132.66	0.742	291	89	88	2.0	3.530	52.00
3	15:04:00	0.50	1.10	136.19	0.707	292	90	87	2.0	3.380	49.61
	15:09:00			139.57							
1	15:11:00	0.35	0.75	139.57	0.592	294	89	87	1.5	2.815	41.56
2	15:16:00	0.40	0.86	142.39	1.517	293	89	87	2.0	3.007	106.51
3	15:21:00	0.35	0.75	145.39	0.592	291	90	87	2.0	2.798	41.48
	15:26:00			148.19							
1	15:30:00	0.66	1.40	148.19	0.812	282	89	88	2.0	3.840	56.62
2	15:35:00	0.80	1.70	152.03	0.894	287	89	87	2.5	4.240	62.55
3	15:40:00	0.80	1.70	156.27	0.894	288	91	88	2.5	4.060	62.59
	15:45:00			160.33							
			1.13	82.220	0.760	284	88	86		82.220	
							87.42				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 2

Project Number: M22E05517 **Test Date:** 5/19/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation	
Plant:	Holcomb Station	
Test Location:	Air Heater Outlet	
Source Condition:	Normal	
Test Engineer:	RG	
Temp ID:	E28	
Meter ID:	E28	
Meter Calibration Factor:	0.993	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	6.0	ft.
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.250	in.
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	10.00	Feet
Width:	29.00	Feet
Duct Area:	290.000	Sq. Ft.
Sample Plane:	Vertical	
Port Length:	5.50	in.
Port Size (diameter):	3.50	in.
Port Type:	Nipple	
Number of Ports Sampled:	8	
Number of Points per Port:	3	
Minutes per Point:	5.0	
Total Number of Traverse Points:	24	
Test Length:	120	min.

STACK CONDITIONS

Barometric Pressure (Pb):		26.92	in. Hg.
Static Pressure:		-10.00	in. H_2O
Flue Pressure (Ps):		26.18	in. Hg. abs.
Sample Train Leak Check	**Pre:**	0.000	
	Post:	0.000	
	@	12/13	in. Hg.
Carbon Dioxide:		14.0	%
Oxygen:		5.0	%
Nitrogen:		81.0	%

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	mls.
Final Impinger Content:	0.00	mls.
Difference:	0.00	
Silica Initial Wt.	3610.00	grams
Silica Final Wt.	3825.00	grams
Difference:	215.00	
Total Water Gain:	215.00	

STACK PARAMETERS

Delta H:	1.25	Inches H_2O
Meter Temperature, Tm:	99.7	°F
Sqrt ΔP:	0.746	Inches H_2O
Stack Temperature, Ts:	292.2	°F
Meter Volume, Vm:	88.514	Cubic Feet
Meter Volume, Vmstd:	74.861	dscf
Meter Volume, Vwstd:	10.127	wscf
Moisture, Bws:	0.119	

Gas Weight dry, Md:	30.440	lb/lb mole
Gas Weight wet, Ms:	28.958	lb/lb mole
Excess Air:	30.518	%
Gas Velocity, Vs:	53.324	
Volumetric Flow, ACFM:	927,832	
Volumetric Flow, DSCFM:	502,054	
Volumetric Flow, SCFM:	569,967	
Isokinetic Variance, %I:	105.8	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	Filter	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 5/19/2004
Start Time: 11:50
End Time: 14:04

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	11:50:00	0.58	1.30	246.93	0.762	295	97	97	5.0	3.719	53.54
2	11:55:00	0.65	1.50	250.65	0.806	295	99	98	5.0	3.940	56.68
3	12:00:00	0.60	1.30	254.59	0.775	302	100	97	5.0	3.800	54.71
	12:05:00			258.39							
1	12:08:00	0.65	1.50	258.39	0.806	311	100	98	6.0	4.990	57.28
2	12:13:00	0.60	1.30	263.38	0.775	307	100	98	6.0	3.715	54.89
3	12:18:00	0.60	1.30	267.10	0.775	315	101	98	7.0	3.835	55.17
	12:23:00			270.93							
1	12:25:00	0.35	0.78	270.93	0.592	305	100	98	4.0	2.865	41.87
2	12:30:00	0.35	0.78	273.80	0.592	297	100	98	4.0	2.960	41.65
3	12:35:00	0.42	0.94	276.76	0.648	298	100	97	5.0	3.345	45.65
	12:40:00			280.10							
1	12:43:00	0.50	1.10	280.10	0.707	300	99	98	6.0	3.460	49.88
2	12:48:00	0.50	1.10	283.56	0.707	291	100	97	6.0	3.440	49.58
3	12:53:00	0.50	1.10	287.00	0.707	292	101	98	6.0	3.550	49.61
	12:58:00			290.55							
1	13:00:00	0.58	1.30	290.55	0.762	297	100	98	6.0	3.390	53.61
2	13:05:00	0.53	1.20	293.94	0.728	286	102	98	6.0	3.525	50.87
3	13:10:00	0.53	1.20	297.47	0.728	286	102	98	6.0	3.577	50.87
	13:15:00			301.04							
1	13:17:00	0.55	1.20	301.04	0.742	284	101	99	6.0	3.613	51.76
2	13:22:00	0.55	1.20	304.66	0.742	276	102	99	6.0	3.615	51.48
3	13:27:00	0.55	1.20	308.27	0.742	280	102	98	6.0	3.630	51.62
	13:32:00			311.90							
1	13:33:00	0.55	1.20	311.90	0.742	285	102	99	7.0	3.650	51.79
2	13:38:00	0.60	1.30	315.55	0.775	281	103	99	7.5	3.790	53.95
3	13:43:00	0.60	1.30	319.34	0.775	283	103	99	7.5	3.800	54.02
	13:48:00			323.14							
1	13:49:00	0.65	1.50	323.14	0.806	280	103	100	7.0	3.945	56.11
2	13:54:00	0.70	1.60	327.09	0.837	281	104	99	8.0	4.085	58.27
3	13:59:00	0.75	1.70	331.17	0.866	286	105	100	8.0	4.275	60.52
	14:04:00			335.45							
			1.25	88.514	0.746	292	101	98		88.514	
							99.67				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 3

Project Number: M22E05517 **Test Date:** 5/20/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	RG				
Temp ID:	E28		**Sample Plane:**	Vertical	
Meter ID:	E28		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.993		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.06	**in. Hg.**		
Static Pressure:	-10.00	**in. H_2O**		
Flue Pressure (Ps):	26.32	**in. Hg. abs.**		
Sample Train Leak Check **Pre:**	0.000			
Post:	0.000			
@	14	**in. Hg.**		
Carbon Dioxide:	14.0	**%**		
Oxygen:	5.0	**%**		
Nitrogen:	81.0	**%**		

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	0.00	**mls.**
Difference:	0.00	
Silica Initial Wt.	3605.00	**grams**
Silica Final Wt.	3790.00	**grams**
Difference:	185.00	
Total Water Gain:	185.00	

STACK PARAMETERS

Delta H:	0.97	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	108.3	**°F**	**Gas Weight wet, Ms:**	28.958	**lb/lb mole**
Sqrt ΔP:	0.656	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	285.1	**°F**	**Gas Velocity, Vs:**	46.594	
Meter Volume, Vm:	77.008	**Cubic Feet**	**Volumetric Flow, ACFM:**	810,731	
Meter Volume, Vmstd:	64.430	**dscf**	**Volumetric Flow, DSCFM:**	445,240	
Meter Volume, Vwstd:	8.714	**wscf**	**Volumetric Flow, SCFM:**	505,455	
Moisture, Bws:	0.119		**Isokinetic Variance, %I:**	102.7	

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	N/A
List Mol. Wt. of Analyte if ppm needed:	N/A

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	---	---
Identify Analyte		
mg (net) collected:	---	---
ppm:	---	---
ug/dscm:	---	---
lb/hr:	---	---
lb/mmBtu (based on Fd):	---	---

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 5/20/2004
Start Time: 11:40
End Time: 13:50

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1	11:40:00	0.43	0.96	408.76	0.656	290	106	104	5.0	3.221	45.95
2	11:45:00	0.75	1.67	411.98	0.866	297	109	106	9.0	4.250	60.96
3	11:50:00	0.75	1.67	416.23	0.866	292	110	106	9.0	4.260	60.76
	11:55:00			420.49							
1	11:59:00	0.45	1.01	420.49	0.671	287	111	107	10.0	3.300	46.91
2	12:04:00	0.38	0.85	423.79	0.616	287	112	107	8.0	3.050	43.11
3	12:09:00	0.43	0.96	426.84	0.656	288	111	108	10.0	3.235	45.89
	12:14:00			430.08							
1	12:15:00	0.39	0.78	430.08	0.624	270	110	108	8.0	2.815	43.17
2	12:20:00	0.30	0.61	432.89	0.548	280	109	108	7.0	2.740	38.12
3	12:25:00	0.30	0.67	435.63	0.548	272	109	109	7.0	2.730	37.91
	12:30:00			438.36							
1	12:31:00	0.32	0.71	438.36	0.566	296	109	109	8.0	2.750	39.80
2	12:36:00	0.32	0.71	441.11	0.566	291	110	109	8.0	2.730	39.66
3	12:41:00	0.32	0.71	443.84	0.566	294	110	108	8.0	2.767	39.74
	12:46:00			446.61							
1	12:47:00	0.40	0.89	446.61	0.632	289	109	109	9.0	3.043	44.29
2	12:52:00	0.35	0.78	449.65	0.592	296	110	109	8.5	2.880	41.62
3	12:57:00	0.40	0.89	452.53	0.632	291	111	109	9.0	3.112	44.34
	13:02:00			455.64							
1	13:03:00	0.50	1.12	455.64	0.707	283	109	109	11.0	3.488	49.31
2	13:08:00	0.50	1.12	459.13	0.707	284	111	109	11.0	3.400	49.35
3	13:13:00	0.50	1.12	462.53	0.707	286	112	110	11.0	3.451	49.41
	13:18:00			465.98							
1	13:19:00	0.45	1.01	465.98	0.671	277	108	108	10.0	3.259	46.59
2	13:24:00	0.45	1.01	469.24	0.671	275	108	105	10.0	3.290	46.53
3	13:29:00	0.45	1.01	472.53	0.671	271	108	103	10.0	3.293	46.40
	13:34:00			475.82							
1	13:35:00	0.45	1.01	475.82	0.671	282	107	104	10.0	3.447	46.75
2	13:40:00	0.45	1.01	479.27	0.671	283	107	104	10.0	3.310	46.78
3	13:45:00	0.45	1.01	482.58	0.671	282	107	105	10.0	3.187	46.75
	13:50:00			485.77							
			0.97	77.008	0.656	285	109	107		77.008	
							108.25				

Field Notes/Comments:

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

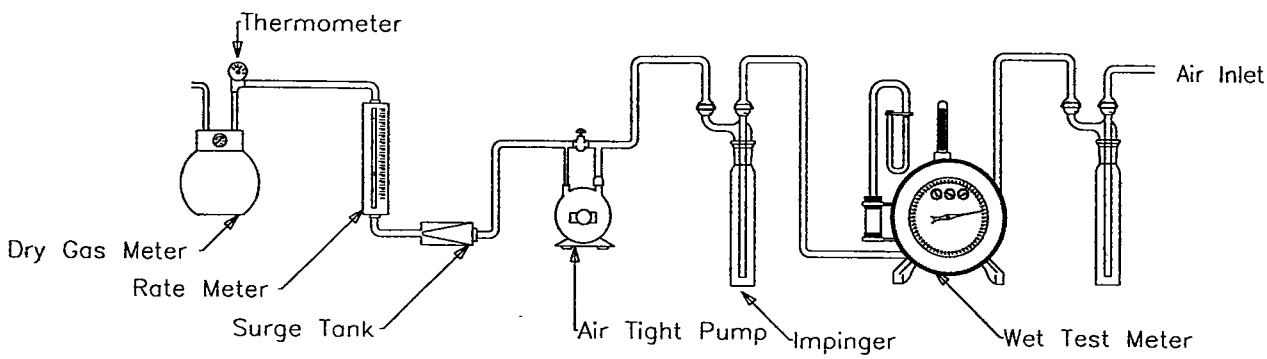
DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Gas Meter Calibration Train



Dwg - AF

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	04-13-04
Standard Meter No.	3623853	Calibrated By:	PSH
Standard Meter (Yr)	0.9973	Barometric Pressure :	29.45

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			113.436	36.077	65	76	69					
Inital			107.534	30.124	65	74	68					
Difference	1	0.20	5.902	5.953	65	75	69	72	21	4	1.004	1.421
Final			118.603	41.293	65	77	70					
Inital			113.514	36.141	65	76	69					
Difference	2	0.50	5.089	5.152	65	77	70	73	11	58	1.002	1.538
Final			102.331	24.916	65	73	66					
Inital			96.922	19.497	65	71	65					
Difference	3	0.70	5.409	5.419	65	72	66	69	10	45	1.004	1.550
Final			123.784	46.539	65	79	73					
Inital			118.784	41.481	65	77	71					
Difference	4	0.90	5.000	5.058	65	78	72	75	8	50	1.005	1.557
Final			28.874	51.710	65	81	74					
Inital			23.872	46.626	65	79	73					
Difference	5	1.20	5.002	5.084	65	80	74	77	7	45	1.003	1.591
Final			107.469	30.067	65	74	68					
Inital			102.467	25.049	65	73	66					
Difference	6	2.00	5.002	5.018	65	74	67	70	6	9	1.002	1.691
									Average		1.003	1.558

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 65 °F Date: 04-13-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	601	0.1
1200	1201	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E22	Date:	05-02-2004
Standard Meter No.	2298907	Calibrated By:	D. Runyan
Standard Meter (Yr)	1.0053	Barometric Pressure :	29.57

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			18.130	55.815	68	69	66					
Inital			12.480	50.248	68	65	65					
Difference	1	0.20	5.650	5.567	68	67	66	66	23	0	1.011	1.881
Final			25.383	62.985	68	72	68					
Inital			18.130	55.815	68	69	66					
Difference	2	0.50	7.253	7.170	68	71	67	69	18	45	1.012	1.888
Final			32.565	70.095	68	76	70					
Inital			25.383	62.985	68	72	68					
Difference	3	0.70	7.182	7.110	68	74	69	72	15	45	1.015	1.892
Final			40.795	78.275	68	77	72					
Inital			32.565	70.095	68	76	70					
Difference	4	0.90	8.230	8.180	68	77	71	74	16	0	1.015	1.903
Final			49.612	87.026	68	78	73					
Inital			40.795	78.275	68	77	72					
Difference	5	1.20	8.817	8.751	68	78	73	75	15	15	1.018	2.004
Final			55.555	92.975	68	80	74					
Inital			49.612	87.026	68	78	73					
Difference	6	2.00	5.943	5.949	68	79	74	76	8	0	1.010	2.019
									Average		1.013	1.931

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E22 Name: D. Runyan

Ambient Temperature: 65 °F Date: 05-02-2004

Omega Engineering Calibrator Model No. CL23A Serial # T-124947

Date Of Calibration Verification: July 17, 2002

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E22	Date:	06-10-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.33

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			20.418	79.958	73	86	85					
Inital			15.417	74.800	73	86	83					
Difference	1	0.20	5.001	5.158	73	86	84	85	19	1	0.991	1.628
Final			25.549	85.265	73	88	86					
Inital			20.484	80.032	73	86	85					
Difference	2	0.50	5.065	5.233	73	87	86	86	12	36	0.991	1.738
Final			10.230	69.517	73	85	82					
Inital			5.228	64.390	73	82	80					
Difference	3	0.70	5.002	5.127	73	84	81	82	10	35	0.991	1.773
Final			30.670	90.537	73	90	87					
Inital			25.669	85.388	73	88	86					
Difference	4	0.90	5.001	5.149	73	89	87	88	9	23	0.996	1.775
Final			35.805	95.821	73	91	87					
Inital			30.802	90.678	73	90	87					
Difference	5	1.20	5.003	5.143	73	91	87	89	8	17	0.999	1.839
Final			15.380	74.770	73	87	83					
Inital			10.377	69.653	73	85	82					
Difference	6	2.00	5.003	5.117	73	86	83	84	6	30	0.993	1.903
									Average		0.993	1.776

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E22 Name: PSH

Ambient Temperature: 72 °F Date: 06-10-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	1	0.2
600	601	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E28	Date:	05-07-04
Standard Meter No.	2547159	Calibrated By:	KJF
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.56

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			23.075	68.105	70	76	73					
Inital			18.075	63.015	70	76	73					
Difference	1	0.20	5.000	5.090	70	76	73	75	17	49	0.990	1.430
Final			34.287	79.540	70	81	78					
Inital			29.280	74.435	70	80	77					
Difference	2	0.50	5.007	5.105	70	81	78	79	11	38	0.996	1.508
Final			12.507	57.356	69	76	71					
Inital			7.495	52.270	69	75	70					
Difference	3	0.70	5.012	5.086	69	76	71	73	9	55	0.991	1.542
Final			39.676	85.052	70	83	78					
Inital			34.675	79.945	70	80	78					
Difference	4	0.90	5.001	5.107	70	82	78	80	8	38	0.995	1.496
Final			44.879	90.352	70	85	79					
Inital			39.875	85.236	70	83	78					
Difference	5	1.20	5.004	5.116	70	84	79	81	7	50	0.996	1.636
Final			17.900	62.838	69	78	73					
Inital			12.890	57.742	69	74	72					
Difference	6	2.00	5.010	5.096	69	76	73	74	6	5	0.988	1.655
									Average		0.993	1.544

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E28 Name: KJF

Ambient Temperature: 69 °F Date: 05-07-04

Omega Engineering Calibrator Model No. CL23A Serial # T-124947

Date Of Calibration Verification: July 17, 2002

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E27	Date:	04-22-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.45

Formula Protection Password: MPA

Run Number	Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final		107.090	86.867	65	75	70					
Inital		102.087	81.767	65	75	68					
Difference 1	0.20	5.003	5.100	65	75	69	72	18	22	0.994	1.502
Final		112.168	92.065	65	77	71					
Inital		107.167	86.939	65	75	70					
Difference 2	0.50	5.001	5.126	65	76	71	73	12	0	0.990	1.601
Final		96.930	76.534	65	73	67					
Inital		91.928	71.458	65	72	66					
Difference 3	0.70	5.002	5.076	65	73	67	70	10	9	0.992	1.614
Final		117.266	97.300	65	79	72					
Inital		112.263	92.164	65	77	71					
Difference 4	0.90	5.003	5.136	65	78	72	75	9	3	0.990	1.633
Final		122.412	102.572	65	81	73					
Inital		117.411	97.439	65	79	72					
Difference 5	1.20	5.001	5.133	65	80	73	76	7	54	0.992	1.656
Final		102.044	81.703	65	76	68					
Inital		97.042	76.639	65	73	67					
Difference 6	2.00	5.002	5.064	65	75	68	71	6	8	0.994	1.679
								Average		0.992	1.614

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E27 Name: PSH

Ambient Temperature: 65 °F Date: 04-22-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference* Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E52	Date:	04-27-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.43

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			107.107	17.185	65	78	76					
Inital			102.106	12.077	65	78	74					
Difference	1	0.20	5.001	5.108	65	78	75	77	18	32	1.000	1.519
Final			112.251	22.427	66	80	77					
Inital			107.248	17.324	66	78	76					
Difference	2	0.50	5.003	5.103	66	79	77	78	12	7	1.001	1.624
Final			96.872	6.780	65	74	71					
Inital			91.870	1.705	65	73	69					
Difference	3	0.70	5.002	5.075	65	74	70	72	10	21	0.997	1.672
Final			117.332	27.603	66	81	77					
Inital			112.331	22.511	66	80	77					
Difference	4	0.90	5.001	5.092	66	81	77	79	9	13	1.004	1.690
Final			122.418	32.779	66	82	78					
Inital			117.417	27.692	66	81	77					
Difference	5	1.20	5.001	5.087	66	82	78	80	8	4	1.005	1.724
Final			102.022	12.052	65	78	74					
Inital			97.017	6.930	65	75	71					
Difference	6	2.00	5.005	5.122	65	77	73	75	6	20	0.990	1.778
									Average		0.999	1.668

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E52 Name: PSH

Ambient Temperature: 65 °F Date: 04-27-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	600	0.0
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E52	Date:	06-01-04
Standard Meter No,	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.01

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			62.713	106.125	63	80	74					
Inital			57.415	100.664	63	79	72					
Difference	1	0.20	5.298	5.461	63	80	73	76	19	3	0.994	1.440
Final			67.803	111.373	64	83	76					
Inital			62.802	106.213	63	80	74					
Difference	2	0.50	5.001	5.160	64	82	75	78	11	53	0.995	1.570
Final			52.212	95.338	63	77	70					
Inital			47.211	90.211	63	73	68					
Difference	3	0.70	5.001	5.127	63	75	69	72	10	5	0.990	1.598
Final			73.054	116.800	64	85	78					
Inital			67.937	111.522	64	83	76					
Difference	4	0.90	5.117	5.278	64	84	77	81	9	10	0.998	1.602
Final			80.114	124.081	64	86	79					
Inital			75.023	118.826	64	85	78					
Difference	5	1.20	5.091	5.255	64	86	79	82	7	59	0.999	1.632
Final			57.378	100.618	63	79	72					
Inital			52.297	95.433	63	77	70					
Difference	6	2.00	5.081	5.185	63	78	71	75	6	23	0.996	1.764
									Average		0.996	1.601

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E52 Name: PSH

Ambient Temperature: 63 °F Date: 06-01-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	600	0.0
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	04-13-04
Standard Meter No.	3623853	Calibrated By:	PSH
Standard Meter (Yr)	0.9973	Barometric Pressure :	29.45

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			113.436	36.077	65	76	69					
Inital			107.534	30.124	65	74	68					
Difference	1	0.20	5.902	5.953	65	75	69	72	21	4	1.004	1.421
Final			118.603	41.293	65	77	70					
Inital			113.514	36.141	65	76	69					
Difference	2	0.50	5.089	5.152	65	77	70	73	11	58	1.002	1.538
Final			102.331	24.916	65	73	66					
Inital			96.922	19.497	65	71	65					
Difference	3	0.70	5.409	5.419	65	72	66	69	10	45	1.004	1.550
Final			123.784	46.539	65	79	73					
Inital			118.784	41.481	65	77	71					
Difference	4	0.90	5.000	5.058	65	78	72	75	8	50	1.005	1.557
Final			28.874	51.710	65	81	74					
Inital			23.872	46.626	65	79	73					
Difference	5	1.20	5.002	5.084	65	80	74	77	7	45	1.003	1.591
Final			107.469	30.067	65	74	68					
Inital			102.467	25.049	65	73	66					
Difference	6	2.00	5.002	5.018	65	74	67	70	6	9	1.002	1.691
									Average		1.003	1.558

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 65 °F Date: 04-13-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	601	0.1
1200	1201	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E28	Date:	05-07-04
Standard Meter No.	2547159	Calibrated By:	KJF
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.56

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			23.075	68.105	70	76	73					
Inital			18.075	63.015	70	76	73					
Difference	1	0.20	5.000	5.090	70	76	73	75	17	49	0.990	1.430
Final			34.287	79.540	70	81	78					
Inital			29.280	74.435	70	80	77					
Difference	2	0.50	5.007	5.105	70	81	78	79	11	38	0.996	1.508
Final			12.507	57.356	69	76	71					
Inital			7.495	52.270	69	75	70					
Difference	3	0.70	5.012	5.086	69	76	71	73	9	55	0.991	1.542
Final			39.676	85.052	70	83	78					
Inital			34.675	79.945	70	80	78					
Difference	4	0.90	5.001	5.107	70	82	78	80	8	38	0.995	1.496
Final			44.879	90.352	70	85	79					
Inital			39.875	85.236	70	83	78					
Difference	5	1.20	5.004	5.116	70	84	79	81	7	50	0.996	1.636
Final			17.900	62.838	69	78	73					
Inital			12.890	57.742	69	74	72					
Difference	6	2.00	5.010	5.096	69	76	73	74	6	5	0.988	1.655
									Average		0.993	1.544

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E28 Name: KJF

Ambient Temperature: 69 °F Date: 05-07-04

Omega Engineering Calibrator Model No. CL23A Serial # T-124947

Date Of Calibration Verification: July 17, 2002

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

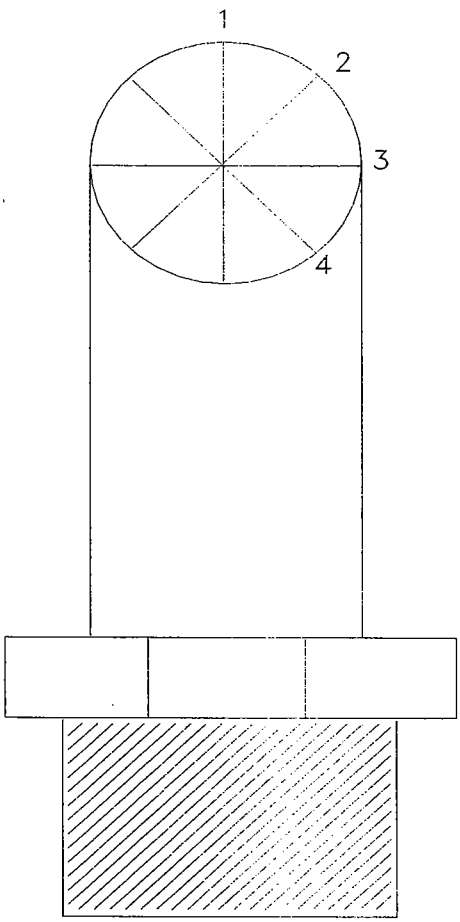
$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

Nozzle Calibration

Date: 5/18/2004

Nozzle ID No.: N/A

Analyst: D. Ryan



Pre Test		Post Test
0.150	1	√
0.150	2	√
0.150	3	√
0.150	4	√

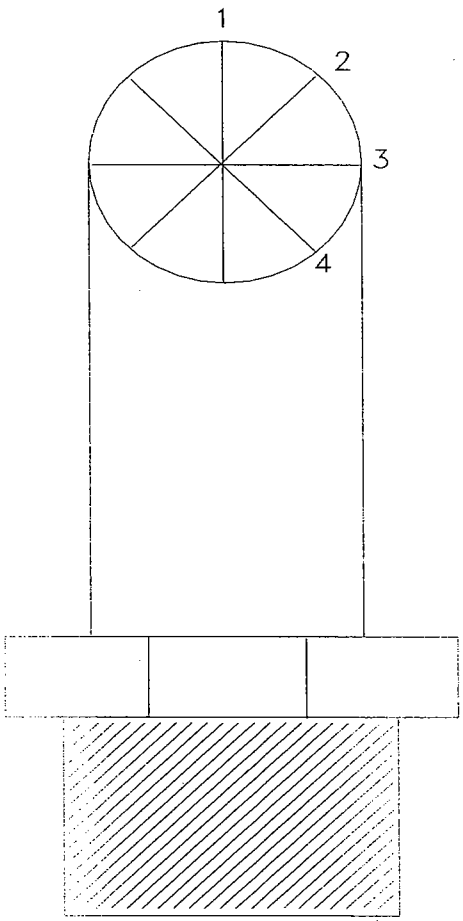
Average
0.150

Nozzle Calibration

Date: 5/20/2004

Nozzle ID No.: N/A

Analyst: JM



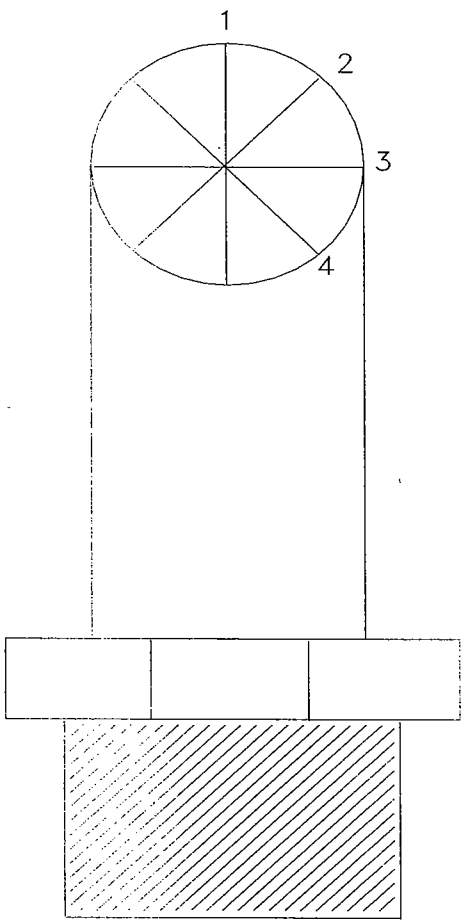
Pre Test		Post Test
0.157	1	√
0.157	2	√
0.158	3	√
0.156	4	√

Average
0.157

Nozzle Calibration

Date: 5/18/2004 Nozzle ID No.: N/A

Analyst: MRE



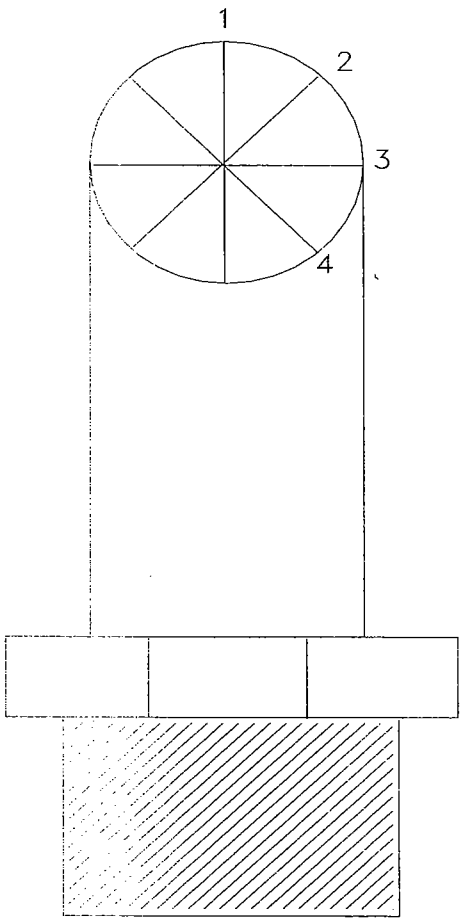
Pre Test		Post Test
0.250	1	√
0.249	2	√
0.249	3	√
0.250	4	√

Average
0.250

Nozzle Calibration

Date: 5/19/2004 Nozzle ID No.: N/A

Analyst: MRE



Pre Test		Post Test
0.252	1	√
0.253	2	√
0.253	3	√
0.253	4	√

Average
0.253

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? X yes ____ no

Pitot tube openings damaged? ____ yes (explain below) X no

α_1 = 0 ° (<10°), α_2 = 0 ° (<10°) z = A sin γ = 0.007 (in.); (<0.125 in.)

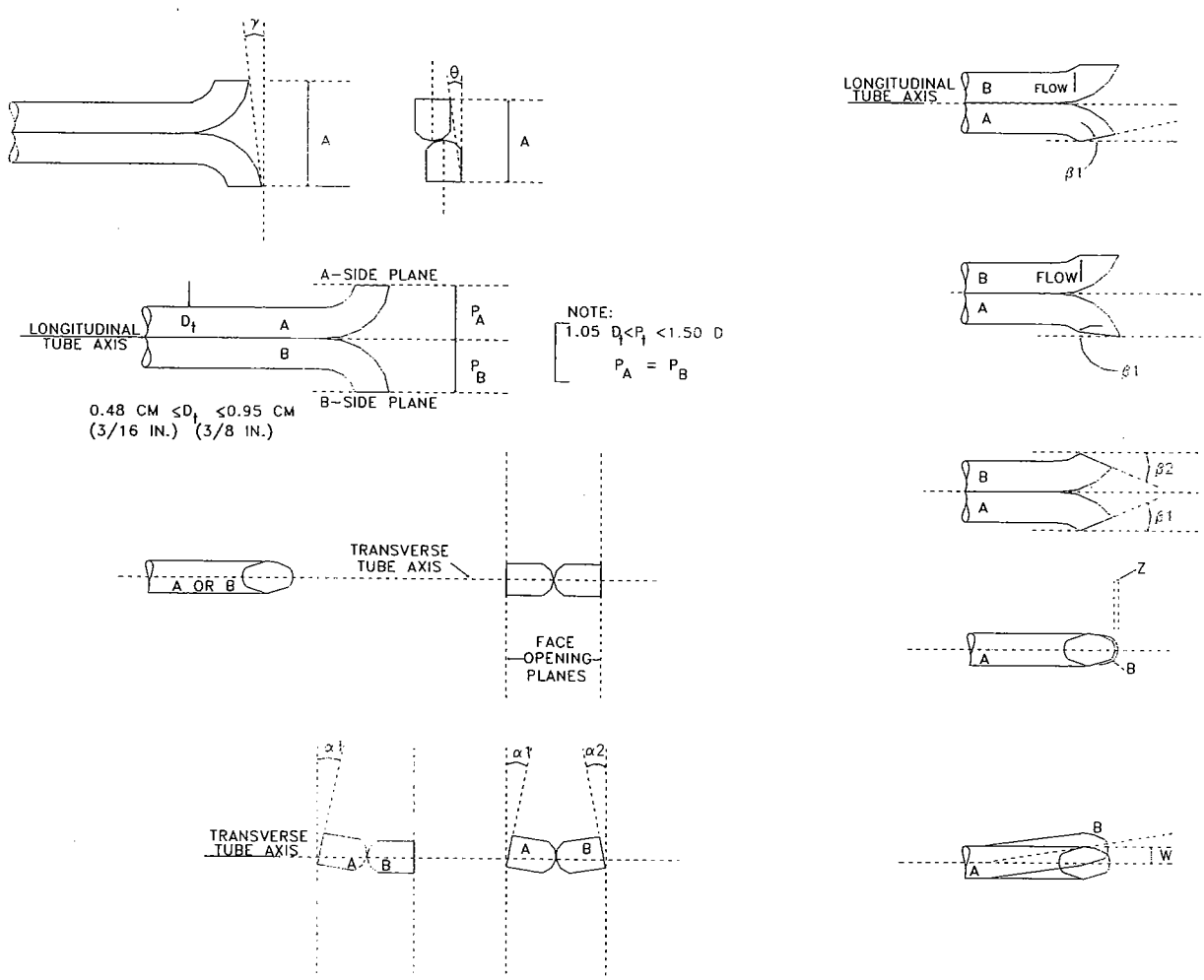
β_1 = 1 ° (<5°), β_2 = 1 ° (<5°) w = A sin θ = 0.007 (in.); (<0.03125 in.)

γ = 0.5 °, θ = 0.5 °, A = 0.757 (in.) P_A = 0.38 (in.), P_B = 0.38 (in.), D_t = 0.250 (in.)

Comments: _____

Calibration required? ____ yes x no

Pitot Tube No.: 722 Date: 1/10/2004 Name: DCR



Pitot Tube Calibration Data

Calibration Pitot Tube: Type: Std. Hemi Size (OD): 0.375 Pitot ID #: S-1

Type "S" Pitot Tube ID Number: 248 A & B Cp(std) = 0.99

Calibration Date: 6/24/94 Performed By: G. Moore

P_{std}, (in.) H_2O		A-Side Calibration		
Set Value	**Read Value**	**P_s, (in.) H_2O**	**$C_{p(S)}$ [a]**	**DEV.[b]**
0.25	0.26	0.36	0.841	0.003
0.55	0.56	0.79	0.834	0.005
0.85	0.88	1.25	0.831	0.008
1.00	1.00	1.40	0.837	0.001
2.00	1.90	2.60	0.846	0.008
3.00	3.20	4.44	0.840	0.002
		Average	0.838	0.005

P_{std}, (in.) H_2O		B-Side Calibration		
Set Value	**Read Value**	**P_s, (in.) H_2O**	**$C_{p(S)}$ [a]**	**DEV.[b]**
0.25	0.28	0.40	0.828	0.005
0.55	0.58	0.80	0.843	0.010
0.85	0.88	1.23	0.837	0.004
1.00	0.98	1.40	0.828	0.005
2.00	2.10	3.00	0.828	0.005
3.00	3.20	4.51	0.834	0.001
		Average	0.833	0.005

$\overline{C_p}(A) - \overline{C_p}(B) =$ 0.005 (must be ≤ 0.01)

[a] $C_{p(S)} = C_{p(std)}\sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$

[b] $DEV = C_{p(S)} - \overline{C_p}$, (must be ≤ 0.01)

ISOKINETIC TEST DATA

List Method Used: M26A Test Run No. 1 Run Date: 5-18-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER COGENERATION
Plant:
Test Location: STACK
Source Condition: HIGH (NORMAL) LOAD
Test Engineer: D. RYAN
Temp ID: E-51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID:
Pitot Tube Coefficient: 0.840
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.333'
Width (ft):
Duct Area (Sq. Ft.): 209.53
Disturbance (in diameters) Upstream >10 Downstream >10
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5"
Port Size (diameter in.): ≈3.5"
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.98
Static Pressure (in. H_2O): -0.6
Flue Pressure (in. Hg Abs): 26.93
Sample Train Leak Check: Pre: 0.000 Post: 0.000 @ 13/6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.2
Oxygen (%): 7.4
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): 200 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O: CLEAR
Silica Gel Exhausted?: NO
Impingers Recovered by: ELE / JW
Silica Gel Weighed by: ELE / JW
Sample Removed from Site by: ELE

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. N/A Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER GENERATION
Plant: HOLCUM STATION
Test Location: STACK

List Test Method Used: M26A
Test Run No. 1
Date: 5-18-04 Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.34 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.378 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	937	2.8	0.98	21.178	1.7	0.64			195	244	246	68°	92	90	4
-1	942	2.8	0.98	24.260	1.7	0.64		24.382	194	245	246	FULLY	93	90	4
-2	947	2.7	0.92	27.630	1.6	0.62		27.586	194	246	245	ICED	90	89	3
-2	952	2.7	0.92	30.620	1.6	0.62		30.691	194	246	245		86	89	3
-3	957	2.4	0.82	33.730	1.5	0.59		33.791	193	246	245		88	88	2
-3	1002	2.4	0.82	36.680	1.5	0.59		36.719	193	247	246		88	88	2
	1007			39.637				39.669							
2-1	1010	2.8	0.95	39.637	1.7	0.63			193	240	245		89	86	4
-1	1015	2.8	0.95	42.840	1.7	0.63		42.831	194	244	246		89	86	4
-2	1020	2.7	0.92	45.870	1.6	0.62		45.981	194	244	246		90	85	3
-2	1025	2.7	0.92	48.930	1.6	0.62		49.081	194	245	246		90	86	3
-3	1030	2.3	0.78	52.120	1.5	0.57		52.181	194	245	246		90	85	3
-3	1035	2.3	0.78	54.970	1.5	0.57		55.047	194	244	246		90	85	3
	1040			57.836				57.897							
3-1	1045	2.8	0.95	57.836	1.7	0.63			194	244	247		87	84	4
-1	1050	2.8	0.95	61.170	1.7	0.63		61.110	194	245	245		88	85	4
-2	1055	2.6	0.88	64.340	1.6	0.61		64.323	193	245	244		89	84	3
-2	1100	2.6	0.88	67.420	1.6	0.61		67.370	193	245	244		90	84	3
-3	1105	2.3	0.78	70.440	1.5	0.57		70.417	192	246	245		91	85	3
-3	1110	2.3	0.78	73.320	1.5	0.57		73.283	192	245	244		91	85	3
	1115			76.193				76.149							
4-1	1120	2.6	0.88	76.193	1.6	0.61			193	244	245		89	86	4
-1	1125	2.6	0.88	79.230	1.6	0.61		79.196	193	244	245		90	85	4
-2	1130	2.6	0.88	82.270	1.6	0.61		82.246	194	245	246		90	86	4
-2	1135	2.6	0.88	85.340	1.6	0.61		85.293	194	246	246		91	87	4
-3	1140	2.3	0.78	88.338	1.5	0.57		88.343	193	247	246		93	87	4
-3	1145	2.3	0.78	91.230	1.5	0.57		91.209	193	246	246		93	87	4
	1150			94.131				94.075							

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GE Energy – Form 1026

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M26A Test Run No. 2 Run Date: 5-19-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: STACK
Source Condition: HIGH (NORMAL)
Test Engineer: D. RYAN
Temp ID: E51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID:
Pitot Tube Coefficient: 0.836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft):
Width (ft):
Diameter (ft): 16'4"
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.77
Static Pressure (in. H_2O): -1.6
Flue Pressure (in. Hg Abs): 26.65
Sample Train Leak Check: Pre: 0.000 Post: 0.000 @ 13/6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.3
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O: CLEAR
Silica Gel Exhausted?: NO
Impingers Recovered by: ELE
Silica Gel Weighed by: ELE
Sample Removed from Site by: ELE

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. N/A Tare Wt (g) N/A
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER GENERATION
Plant: HOLCOMB KS
Test Location: STACK

List Test Method Used: M26A
Test Run No. 2
Date: 5-19-04
Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.33 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.311 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	810	2.9	0.96	84.749	1.7	0.62			194	260	253	<68°	92	91	3
-1	15	2.9	0.96	87.880	1.7	0.63		87.908	193	260	253	FULLY	91	91	3
-2	20	2.7	0.89	91.030	1.6	0.61		91.067	193	255	252	ICED	92	91	3
-2	25	2.7	0.89	94.070	1.6	0.61		94.115	192	254	252		94	91	3
-3	30	2.2	0.73	97.110	1.5	0.55		97.165	191	256	252		95	91	3
-3	35	2.2	0.73	99.900	1.5	0.55		99.916	190	256	253		97	91	3
	840			102.624				102.667							
2-1	842	2.8	0.92	102.624	1.7	0.62			190	253	254		97	92	3
1-1	847	2.8	0.92	105.710	1.7	0.62		105.771	190	252	254		97	91	3
0-2	852	2.7	0.89	108.820	1.6	0.61		108.875	191	253	254		98	92	3
-2	857	2.7	0.89	111.870	1.6	0.61		111.923	191	254	254		99	93	3
-3	902	2.2	0.73	114.930	1.5	0.55		114.973	190	254	253		99	93	3
-3	907	2.2	0.73	117.710	1.5	0.55		117.724	190	254	254		99	94	3
	912			120.463				120.475							
3-1	913	2.8	0.92	120.463	1.7	0.62			190	252	250		98	94	3
-1	918	2.8	0.92	123.510	1.7	0.62		123.579	191	253	250		99	94	3
-2	923	2.8	0.92	126.590	1.7	0.62		126.683	191	254	252		99	94	3
-2	928	2.8	0.92	129.790	1.7	0.62		129.787	191	254	254		99	94	3
-3	933	2.3	0.76	132.920	1.5	0.56		132.891	191	253	253		99	94	3
-3	938	2.3	0.76	135.730	1.5	0.56		135.704	190	254	252		100	94	3
	943			138.536				138.577							
4-1	946	2.7	0.89	138.536	1.6	0.61			190	250	253		100	94	3
-1	951	2.7	0.89	141.670	1.6	0.61		141.565	190	251	254		100	94	3
-2	956	2.7	0.89	144.640	1.6	0.61		144.613	190	253	254		99	94	3
-2	1001	2.7	0.89	147.680	1.6	0.61		147.665	190	254	254		98	94	3
-3	1006	2.2	0.73	150.730	1.5	0.55		150.713	190	254	254		98	94	3
-3	1011	2.2	0.73	153.480	1.5	0.55		153.464	189	254	254		98	94	3
	1016			156.227				156.215							

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GE Energy – Form 1026

ISOKINETIC TEST DATA

List Method Used: M26A Test Run No. #3 Run Date: 5-20-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB KS
Test Location: STACK
Source Condition: HIGH (NORMAL)
Test Engineer: D. RYAN
Temp ID: E-51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID: 722A
Pitot Tube Coefficient: 0.836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): ____ Diameter (ft): 16' 4"
Width (ft): ____
Duct Area (Sq. Ft.): ____
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): ≈3"
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.91
Static Pressure (in. H_2O): -1.6
Flue Pressure (in. Hg Abs): 26.79
Sample Train Leak Check: Pre: 0.002 Post: 0.001 @ 12/9 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.4
Oxygen (%): 7.1
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: CLEAR
Silica Gel Exhausted?: NO
Impingers Recovered by: GLG
Silica Gel Weighed by: GLG
Sample Removed from Site by: GLG

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. N/A Tare Wt (g) N/A
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB KS
Test Location: STACK

List Test Method Used: M26A
Test Run No. #3
Date: 5-20-04 Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.33 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	845	2.8	0.92	46.697	1.7	0.62			192	250	242	≤68°	99	99	4
-1	50	2.8	0.92	49.730	1.7	0.62	3.1	49.797	192	249	257	FLUX	99	100	4
-2	55	2.9	0.96	52.810	1.7	0.63		52.847	191	259	252	TOKD	102	99	3
-2	900	2.9	0.96	56.020	1.7	0.63	3.15	56.047	191	258	254		103	99	4
-3	05	2.4	0.79	59.140	1.5	0.57		59.197	191	259	253		103	99	4
-3	10	2.4	0.79	61.920	1.5	0.57	2.85	62.047	191	260	257		103	99	4
	915			64.830				64.897							
2-1	917	2.9	0.96	64.830	1.7	0.63			191	262	259		102	99	4
-1	22	2.9	0.96	68.020	1.7	0.63		68.047	192	260	256		103	99	4
-2	27	2.8	0.92	71.200	1.7	0.62		71.197	192	251	262		103	99	4
-2	32	2.8	0.92	74.260	1.7	0.62		74.293	192	251	257		103	99	4
-3	37	2.5	0.82	77.340	1.6	0.58		77.389	191	254	258		102	98	4
-3	42	2.5	0.82	80.300	1.6	0.58		80.314	191	252	257		103	98	4
	47			83.206				83.239							
3-1	957	2.8	0.92	83.206	1.7	0.62			190	246	253		101	98	4
-1	1002	2.8	0.92	86.000	1.7	0.62		86.335	191	248	254		101	99	4
-2	07	2.8	0.92	89.390	1.7	0.62		89.431	190	253	253		103	99	4
-2	12	2.8	0.92	92.510	1.7	0.62		92.527	189	254	253		104	99	4
-3	17	2.4	0.79	95.570	1.5	0.57		95.623	189	254	260		105	100	4
-3	22	2.4	0.79	98.510	1.5	0.57		98.489	189	254	258		106	100	4
	27			101.361				101.355							
4-1	1033	2.8	0.92	101.361	1.7	0.62			190	255	258		103	100	4
-1	38	2.8	0.92	104.480	1.7	0.62		104.451	190	254	258		104	100	4
-2	43	2.7	0.89	107.620	1.6	0.61		107.547	191	253	245		106	100	4
-2	48	2.7	0.89	110.610	1.6	0.61		110.587	191	252	259		107	101	4
-3	53	2.4	0.79	113.690	1.5	0.57		113.627	190	256	254		107	102	4
-3	58	2.4	0.79	116.520	1.5	0.57		116.493	190	254	259		107	102	4
	1103			119.372				119.359							

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GE Energy – Form 1026

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 5 & A Test Run No. 1 Run Date: 5/20/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet
Source Condition: N
Test Engineer: JM
Temp ID: EZL
Meter ID: EZL
Meter Calibration Factor: 1.013
Pitot ID:
Pitot Tube Coefficient: .8410
Probe Length (ft.): 11
Probe Liner Material: teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 11 Diameter (ft):
Width (ft): 16
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 7
Port Size (diameter in.): 4
Port Type: flange
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.92
Static Pressure (in. H_2O): -.5
Flue Pressure (in. Hg Abs): 25.817
Sample Train Leak Check: Pre: .000 Post: .009 @ 10/16 in. Hg
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 12.5
Oxygen (%): 7.8
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

Total of 8 ports tested 6

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Bay house

List Test Method Used: 26A
Test Run No. 1
Date: 5/20/04
Traverse Sheet 1 of 7

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	810	3.50	1.70	3.300	1.90	.732	3.660	—	181	254	255	681	72	70	6
2	815	3.50	1.70	7.05	1.90	.732	3.660	6.960	181	254	253	=	72	70	8
3	820	2.70	1.30	10.70	1.60	.643	3.215	10.620	176	253	251	=	73	70	7
4	825	1.40	.70	13.97	1.20	.463	2.315	13.835	176	252	247		73	70	5
	830			16.223				16.150							
1	834	1.00	.50	16.645	1.00	.3913	1.957	—	179	254	255		75	72	3
2	839	1.50	.70	18.68	1.20	.479	2.391	18.602	179	252	254		75	72	4
3	844	2.10	1.00	21.00	1.45	.567	2.835	20.998	179	251	253		78	73	6
4	849	2.10	1.00	23.90	1.45	.567	2.835	23.833	181	253	254		80	74	7
	854			26.713				26.668							
1	857	2.00	.94	28.140	1.41	.553	2.767	—	176	254	254		80	74	10
2	902	2.10	1.00	30.50	1.45	.567	2.835	30.907	176	253	252		80	74	11
3	907	2.40	1.10	33.31	1.55	.606	3.031	33.742	179	251	254		80	74	11
4	912	2.40	1.10	36.40	1.55	.606	3.031	36.773	178	252	251		80	74	11
	917			39.362				39.804							
1	920	2.40	1.10	40.137	1.55	.606	3.031	—	179	251	254		80	75	11
2	925	2.00	.94	42.20	1.41	.465	2.767	43.168	179	247	252		81	76	12
3	930	2.00	.94	45.56	1.41	.465	2.767	45.935	178	251	256		80	76	13
4	935	2.00	.94	47.91	1.41	.465	2.767	48.702	178	249	253		80	76	13
	940			50.173				51.469							
1	957	1.00	.50	53.352	1.00	.310	2.000	—	178	251	247		80	76	3
2	1002	1.50	.70	55.40	1.20	.479	2.391	55.352	179	247	252		80	74	3
3	1007	1.50	.70	57.75	1.20	.479	2.391	57.748	181	252	251		80	76	3
4	1012	2.00	.94	60.14	1.41	.465	2.767	60.138	182	251	247		81	76	7
	1017			62.910				62.905							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet

List Test Method Used: 26A
Test Run No. 1
Date: 5/20/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1020	1.50	.70	63.230	1.22	.479	2.396	—	178	251	249	68	82	77	4
2	1025	1.70	.80	65.63	1.304	.510	2.551	65.626	178	249	253		82	77	6
3	1030	1.70	.80	65.63	1.304	.510	2.551	68.177	179	251	252		82	77	6
4	1035	2.00	.90	70.73	1.414	.553	2.767	70.728	181	257	256		82	77	6
	1040			73.526				73.495							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 24A Test Run No. 2 Run Date: 5/19/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Power
Plant: Holcomb
Test Location: Baghouse Inlet
Source Condition: Normal
Test Engineer: JM
Temp ID: E22
Meter ID: E12
Meter Calibration Factor: 1.013
Pitot ID:
Pitot Tube Coefficient: .840
Probe Length (ft.): 11
Probe Liner Material: Teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 11 Diameter (ft):
Width (ft): 14
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 6
Port Size (diameter in.): 4
Port Type: Plugs
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg):
Static Pressure (in. H_2O): -15
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .003 Post: .009 @ 13/17 in. Hg
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 12.5
Oxygen (%): 7.5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet

List Test Method Used: 2G4
Test Run No. 2
Date: 5/4/04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1150	2.50	1.20	79.00	1.60	.617	3.093	—	178	252	251	68	80	78	5
2	1155	2.50	1.20	82.09	1.60	.617	3.093	82.093	178	254	251	=	80	79	5
3	1200	2.30	1.10	85.21	1.50	.59	2.967	85.186	177	251	251	—	82	78	6
4	1205	2.30	1.10	88.23	1.50	.59	2.967	88.153	176	252	252		85	79	7
	1210			91.197				91.120							
1	1213	2.10	1.00	92.643	1.50	.567	2.835	—	177	242	259		85	79	8
2	1218	2.00	.94	95.45	1.40	.553	2.767	95.478	178	249	253		86	80	8
3	1223	1.90	.90	98.25	1.40	.539	2.697	98.245	177	253	253		86	80	9
4	1228	1.50	.71	101.00	1.22	.479	2.396	100.942	174	251	252		86	81	9
	1233			103.414				103.338							
1	1236	2.50	1.20	104.636	1.60	.617	3.093	—	178	251	254		85	81	11
2	1241	2.10	1.00	107.76	1.50	.567	2.835	107.729	176	252	253		85	81	11
3	1246	2.50	1.20	110.63	1.60	.617	3.093	110.564	177	251	254		85	81	12
4	1251	2.00	1.00	113.66	1.50	.567	2.835	113.657	177	242	257		85	81	11
	1252			116.603	(Filter Change)			116.492							
1	1300	2.30	1.10	121.00	1.5	.59	2.967	—	178	251	249		85	81	3
2	1305	2.60	1.20	124.00	1.61	.631	3.155	123.967	177	249	252		87	82	4
3	1310	2.50	1.20	127.14	1.60	.617	3.093	127.122	178	252	247		88	83	5
4	1315	2.00	.94	130.22	1.40	.553	2.767	130.215	176	242	253		89	83	6
	1320			132.913				132.982							
1	1323	2.50	1.20	133.891	1.60	.617	3.093	—	177	251	251		88	84	7
2	1328	2.50	1.20	137.00	1.60	.617	3.093	136.934	177	252	254		88	84	9
3	1333	2.00	.94	140.40	1.40	.553	2.767	140.027	178	242	249		88	84	9
4	1338	1.40	.70	142.83	1.20	.463	2.315	142.794	174	251	252		89	84	9
	1343			145.167				145.109							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power
Plant: Holcomb
Test Location: Baghouse inlet

List Test Method Used: 26A
Test Run No. 2
Date: 5/19/09 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1346	3.20	1.50	145.500	1.80	.700	3.500	—	177	252	247	68	91	87	11
2	1351	3.10	1.50	148.84	1.76	.684	3.445	149.000	178	251	251	51	91	87	12
3	1356	2.50	1.20	152.39	1.59	.619	3.093	152.443	177	250	252		92	88	12
4	1401	1.90	.90	155.55	1.38	.539	2.697	155.533	178	249	249		93	89	12
	1406			158.934				158.232							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 26A Test Run No. 3 Run Date: 5/20/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet
Source Condition: Normal
Test Engineer: JM
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: 1.013
Pitot ID:
Pitot Tube Coefficient: .840
Probe Length (ft.): 11
Probe Liner Material: Teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 11 Diameter (ft):
Width (ft): 11
Duct Area (Sq. Ft.): 176
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 6
Port Size (diameter in.): 4
Port Type: Flange
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.08
Static Pressure (in. H_2O): -16
Flue Pressure (in. Hg Abs): 25.90
Sample Train Leak Check: Pre: .003 Post: .009 @ 11/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.5
Oxygen (%): 5.5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. ✓ Tare Wt (g) ✓
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet

List Test Method Used: 26A
Test Run No. 3
Date: 5/20/04
Traverse Sheet 6 of 7

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	845	2.50	1.20	162.251	1.58	.612	3.058	—	173	251	257	68	76	73	6
2	850	2.50	1.20	165.23	1.58	.612	3.058	165.309	173	252	247	5	78	73	6
3	855	2.20	1.00	168.26	1.48	.574	2.869	168.367	172	251	251	—	75	73	6
4	900	2.00	.94	171.27	1.41	.547	2.735	171.236	171	247	247		75	73	6
	905			173.943				173.971							
1	908	2.30	1.10	174.368	1.517	.587	2.933	—	172	251	249		76	74	7
2	913	2.30	1.10	177.31	1.517	.587	2.933	177.301	172	249	253		77	75	7
3	918	2.50	1.20	180.24	1.58	.612	3.058	180.234	171	251	251		77	75	7
4	923	2.20	1.00	183.29	1.48	.574	2.869	183.242	171	252	254		77	75	7
5	928	(Vac issue)		186.214	(Filter change)			186.161	(Nozzle clogged)						
1	936	2.40	1.20	188.643	1.55	.599	2.996	—	173	252	251		78	75	4
2	941	2.30	1.10	191.68	1.52	.587	2.933	191.639	173	251	257		78	75	5
3	946	2.30	1.10	194.63	1.52	.587	2.933	194.572	173	247	253		78	75	6
4	951	2.10	1.00	197.63	1.45	.561	2.803	197.505	171	251	247		79	76	7
	956			200.326				200.309							
1	958	1.90	.90	201.136	1.37	.533	2.666	—	171	247	251		81	78	7
2	1003	2.10	1.00	203.84	1.45	.561	2.803	203.802	172	253	252		83	79	8
3	1008	2.10	1.00	206.61	1.45	.561	2.803	206.605	171	252	252		82	78	11
4	1013	1.90	.90	209.50	1.37	.537	2.662	209.408	170	251	251		83	79	13
	1018			212.124	(Filter change)			212.074							
1	1022	2.50	1.20	215.214	1.58	.612	3.058	—	171	247	252		86	82	4
2	1027	2.30	1.10	218.29	1.52	.587	2.933	218.272	173	252	257		86	80	5
3	1032	2.30	1.10	221.36	1.52	.587	2.933	221.205	173	247	257		86	81	7
4	1037	1.90	.90	224.14	1.37	.533	2.666	224.138	173	251	252		87	83	7
	1042			226.943				226.804							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Baghouse Inlet

List Test Method Used: 26A
Test Run No. 3
Date: 5/20/04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1044	2.50	1.20	227.678	1.58	.612	3.058	—	173	249	253	68	89	83	9
2	1049	2.30	1.10	230.816	1.52	.587	2.933	230.736	173	251	247	71	90	84	10
3	1054	2.50	1.20	233.74	1.58	.612	3.058	233.669	173	252	249		91	85	13
4	1059	1.80	.84	236.89	1.342	.519	2.595	236.727	170	251	252		92	86	13
	1104			239.493				239.322							

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GE Energy – Form 1026

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M 26 A Test Run No. 1 Run Date: 5-18-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB, KS
Test Location: AIR HEATER OUTLET
Source Condition:
Test Engineer: MRE
Temp ID: E28
Meter ID: E28
Meter Calibration Factor: .993
Pitot ID: 248 A
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.):
Port Size (diameter in.): 4
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.15
Static Pressure (in. H_2O): -9.5
Flue Pressure (in. Hg Abs): 26.45
Sample Train Leak Check: Pre: 0.01 Post: 0 @ 12 ~~in. Hg~~
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g): 3015.0
Impinger Initial Wt (mL): Silica Initial Wt (g): 2845.0
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. 230 Tare Wt (g) 2.9085
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

00 FT.

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KS
Test Location: AIR HEATER OUTLET

List Test Method Used: M 26A
Test Run No. 1
Date: 5-18-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	x2.15 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	x.95 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	937	.52	1.1	95.196	.72	.70	3.452		289	250°			81	81	3
-2	942	.44	.95	98.710	.65	.53	3.151	98.516	291			FULLY	82	82	3
-3	947	.59	1.3	101.764	.76	.73	3.649	101.667	289				82	82	3
	952			105.425				105.316				ICED			
2-1	955	.65	1.4		.81	.77	3.830		295				80	80	4
-2	1000	.69	1.5	109.263	.83	.79	3.946	9.146	297				79	79	4
-3	1005	.49	1.0	13.123	.70	.67	3.325	13.092	293				79	79	4
	1010			16.449				16.417							
3-1	1015	.33	.71		.57	.54	2.729		284				81	81	4
-2	1020	.42	.90	19.135	.65	.62	3.078	19.146	281				81	81	4
-3	1025	.39	.84	22.203	.63	.59	2.966	22.224	276				81	81	4
	1030			25.200				25.190							
4-1	1035	.40	.86		.63	.60	3.009		292				82	82	5
-2	1040	.51	1.1	28.217	.71	.68	3.392	28.194	290				82	82	5
-3	1045	.46	.99	31.623	.68	.64	3.222	31.586	295				82	82	5
	1050			34.819				34.808							
5-1	1055	.43	.92		.66	.62	3.115		286				83	83	4
-2	1100	.55	1.2	38.003	.74	.71	3.523	37.923	284				83	83	4
-3	1105	.51	1.1	41.440	.71	.68	3.392	41.446	282				83	83	4
	1110			44.847				44.838							
6-1	1120	.65	1.4		.81	.77	3.830		279				85	85	4
-2	1125	.59	1.3	48.669	.77	.73	3.649	48.668	275				85	85	4
-3	1130	.68	1.5	52.325	.83	.78	3.917	52.317	282				85	85	4
	1135			56.233				56.234							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KS
Test Location: AIR HEATER OUTLET

List Test Method Used: M26A
Test Run No. 1
Date: 5-18-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp.~~ °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1140	.70	1.5		.84	.80	3.974		283	250°			86	86	4
-2	1145	.48	1.0	60.222	.69	.66	3.291	60.208	282				86	86	4
-3	1150	.55	1.2	63.511	.74	.71	3.523	63.499	287			FULLY	86	86	4
	1155			67.039				67.022							
8-1	1200	.47	1.0		.69	.65	3.256		281			ICED	87	87	4
-2	1205	.56	1.2	70.283	.75	.71	3.555	70.278	281				87	87	4
-3	1210	.60	1.3	73.846	.78	.74	3.679	73.833	283				87	87	4
	1215			177.577				177.512							
			1.4												

154

= Data does not get entered in Excel

$\sqrt{\Delta P} \times .97 \times 5$

Lb = X

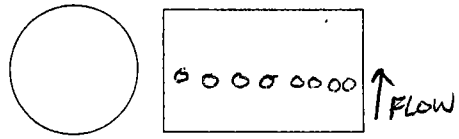
ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: Holcomb
Location: #1 HEATER outlet
Operator: RG
Date: 5-19-04
Run Number: R2-M26A-#1 Heater
Stack Diam., inches: 10/29
Assumed moisture, %: 8

Sample Box Number: E28
Meter Box Number: E28
Meter Calibration (Y): 0.993
Meter dH @: 1.544
Pitot Tube No.: N/A Cp: .840
Probe Length: 6 TC No.:
Probe Liner Material: TEFLON
Probe Heater Setting (°F): 250

Nozzle No.: Diameter: .25 (in.)
Filter Number: 231 / 2.8994
Static Pressure (Pa): -10 (in. H2O)
Barometric Pressure (Pb): 26.92 (in. Hg)
Ambient Temperature (°F): 65
Pretest Leak Rate: 0.0 cfm @ 9 (in. Hg)
Post Test Leak Rate: 0.0 cfm @ 12 (in. Hg)
Pitot Check: Pretest OK@3" Post Test OK@3"

Sheet 1 of 2
Isokinetic Factor, K:



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
1-	0	0810	-	-	-	-	160.566	87	87	-	-	-	-	-	
1	5	0815	3.5	287	.65	1.44	164.45	88	87	FULLY	250			164.476	
2	10	0820	4.0	288	.85	1.88	168.89	90	88	FACED				168.92	
3	15	0825	4.0	295	.85	1.88	173.357	92	87					173.361	
2-	0	0830	-	-	-	-	173.357					-	-	~~176.226~~ RG	
1	5	0835	4.0	296	.35	.77	176.250	91	89					176.226	
2	10	0840	4.0	300	.40	.88	179.330	91	89					179.317	
3	15	0845	4.0	302	.35	.77	182.225	94	89					182.199	
3-	0	0846	-	-	-	-	182.225	-	-			-	-	-	
1	5	0851	4.5	295	.56	1.22	185.800	93	90					185.822	
2	10	0856	4.5	303	.55	1.22	189.390	94	90					189.397	
3	15	0901	5.0	297	.57	1.26	193.110	95	91					193.052	
4-	0	0903	-	-	-	-	193.110	-	-			-	-	-	
1	5	0908	5.0	296	.50	1.11	196.480	95	91					196.539	
2	10	0913	5.0	294	.47	1.04	199.870	96	92					199.805	
3	15	0918	5.0	297	.47	1.04	203.204	97	92					203.195	
5-	0	0920	-	-	-	-	203.204	-	-			-	-	-	
1	5	0925	5.0	296	.53	1.17	206.727	96	93					206.735	
2	10	0930	5.0	294	.50	1.11	210.078	97	93					210.156	
3	15	0935	5.0	299	.55	1.22	213.668	98	94					213.675	
6-	0	0939	-	-	-	-	213.668	-	-			-	-	-	
1	5	0944	6.0	289	.60	1.33	217.385	97	94					217.425	
2	10	0949	6.0	281	.65	1.44	221.156	98	94					221.142	
3	15	0954	6.0	277	.60	1.33	225.054	100	95					224.912	
7-	0	0956	-	-	-	-	225.054	-	-			-	-	-	
1	5	1001	5.0	284	.60	1.33	228.800	98	96					228.811	
2	10	1006	5.5	277	.60	1.33	232.515	99	95					232.557	
3	15	1011	7.0	287	.55	1.22	236.100	99	96					236.112	

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GE Energy

ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB
Location: #1 HEATER OUTLET
Operator: RG
Date: 5-19-04
Run Number: R2-M26A-#1 HEATER
Stack Diam., inches: 10/29
Assumed moisture, %: 8

Sample Box Number E28
Meter Box Number E28
Meter Calibration (Y) .993
Meter dH @ 1.544
Pitot Tube No. N/A Cp .840
Probe Length 6' TC No.
Probe Liner Material TEFLON
Probe Heater Setting (°F) 250

Nozzle No. Diameter .125 (in.)
Filter Number 231/2.8994
Static Pressure (Pa) -10 (in. H2O)
Barometric Pressure (Pb) 26.92 (in. Hg)
Ambient Temperature (°F) 65
Pretest Leak Rate cfm @ (in. Hg)
Post Test Leak Rate cfm @ (in. Hg)
Pitot Check: Pretest Post Test

Sheet 2 of 2
Isokinetic Factor, K

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
8-	0	1013	-	-	-	-	236.100	-	-	FULLUP	250	-	-	-	
1	5	1018	6.5	278	.55	1.22	238.635	98	96	ICED				239.897	
2	10	1023	7.0	286	.55	1.22	242.318	99	96					242.232	
3	15	1028	7.0	284	.55	1.22		99	96					245.919	

GE Energy

23°C 86° = X

ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB
Location: #1 AHU
Operator: RG
Date: 5-20-04
Run Number: R3 - M26A
Stack Diam., inches: 10/29
Assumed moisture, %: 8

Sample Box Number E 28
Meter Box Number E 28
Meter Calibration (Y) 0.993
Meter dH @ 1.544
Pitot Tube No. N/A Cp .840
Probe Length 6' TC No. N/A
Probe Liner Material TEFLON
Probe Heater Setting (°F) 250

Nozzle No. _____ Diameter .250 (in.)
Filter Number 228 / 2-8038
Static Pressure (Pa) -10 (in. H2O)
Barometric Pressure (Pb) 27.07 (in. Hg)
Ambient Temperature (°F) 90°
Pretest Leak Rate 0.0 cfm @ 13 (in. Hg)
Post Test Leak Rate 0.0 cfm @ 12 (in. Hg)
Pitot Check: Pretest OK@3" Post Test OK@3"

Sheet 1 of 2
Isokinetic Factor, K .98

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (In. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
1-	0	0845	—	—	—	—	335.860	—	—	—	—	—	—	—	
1	5	0850	7.0	~~288~~ RG	.50	1.12	339.33	93	93	FULLY	250			339.325	STACK Temp 278
2	10	0855	7.0	270	.50	1.12	342.80	94	93	ICED				342.795	
3	15	0900	7.0	275	.45	1.01	346.95	99	95					346.087	
2 -	0	0901	—	—	—	—	346.95	—	—	—	—	—	—	—	
1	5	0906	5.0	282	.35	.78	349.83	99	97					349.849	
2	10	0911	5.0	289	.32	.71	352.590	98	96					352.602	
3	15	0916	5.0	290	.28	.62	355.18	98	96					355.~~18~~	355.182
3 -	0	0918	—	—	—	—	355.18	—	—	—	—	—	—	—	
1	5	0923	5.0	277	.28	.62	357.75	96	98					357.773	
2	10	0928	5.0	279	.30	.67	360.47	96	98					360.434	
3	15	0933	5.0	272	.30	.67	363.14	97	95					363.154	
4 -	0	0935	—	—	—	—	363.14	—	—	—	—	—	—	—	
1	5	0940	5.0	271	.35	.78	366.02	99	97					366.039	
2	10	0945	7.0	275	.43	.96	369.45	99	97					369.233	
3	15	0950	6.0	274	.35	.78	372.35	100	97					372.349	
5 -	0	0951	—	—	—	—	372.35	—	—	—	—	—	—	—	
1	5	0956	7.0	286	.38	.84	375.29	102	96					375.371	
2	10	1001	7.0	295	.38	.84	378.25	102	97					378.311	
3	15	1006	7.5	290	.43	.96	381.31	102	99					381.463	
6 -	0	1009	—	—	—	—	381.31	—	—	—	—	—	—	—	
1	5	1014	7.0	281	.45	1.01	384.56	102	100					384.597	
2	10	1019	7.0	282	.45	1.01	387.95	104	102					387.947	
3	15	1024	7.0	288	.45	1.01	391.085	104	101					391.137	
7 -	0	1025	—	—	—	—	391.085	—	—	—	—	—	—	—	
1	5	1030	6.0	265	.32	.75	393.870	104	101					393.857	
2	10	1035	5.5	270	.30	.67	396.55	105	102					396.554	
3	15	1040	5.5	267	.30	.67	399.265	104	103					399.234	

GE Energy

ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB
Location: #1 AHO
Operator: RG
Date: 5-20-04
Run Number: R3 - M26A
Stack Diam., Inches: 10/29
Assumed moisture, %: 8

Sample Box Number E28
Meter Box Number E28
Meter Calibration (Y) 0.993
Meter dH @ 1.544
Pitot Tube No. N/A Cp .840
Probe Length 6' TC No. N/A
Probe Liner Material TEFLON
Probe Heater Setting (°F) 250°

Nozzle No. N/A Diameter .250 (in.)
Filter Number 228 / 2-2038
Static Pressure (Pa) -10 (in. H2O)
Barometric Pressure (Pb) 27.07 (in. Hg)
Ambient Temperature (°F) 90
Pretest Leak Rate 0.0 cfm @ 13 (in. Hg)
Post Test Leak Rate 0.0 cfm @ 12 (in. Hg)
Pitot Check: Pretest ~~.KB~~" Post Test ~~.KB~~3"

Sheet 2 of 2
Isokinetic Factor, K

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	sokinetic Rate (%)	Target Volume (cf)	Comments
8-	0	1041	—	—	—	—	399.265	—	—	—	—	—	—	—	
1	5	1046	5.5	272	.35	.78	402.17	106	103	FULLY	.250			402.164	
2	10	1051	6.0	283	.40	.89	405.28	105	102	ICED				405.269	
3	15	1056	6.0	270	.40	.89	408.413	106	103					408.379	

GE Energy

Stack

CO_2 12.5 M=7

ISOKINETIC RUNSHEET

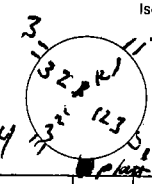
Orifice Hydro

Plant: Sunflower
City: Garden City
Location: Holcub Station Loc. 3 Stack
Operator: RL BZ
Date: 5-18-04
Run Number: 1-O.H.
Stack Diam., Inches: 16'4" (196")
Assumed moisture, %: 7

Sample Box Number
Meter Box Number E27
Meter Calibration (Y) .992
Meter dH @ 1.614
Pitot Tube No. Cp .84
Probe Length 6' TC No.
Probe Liner Material G1485
Probe Heater Setting (°F) 250 (Tan set)

Nozzle No. G1451 Diameter .144 (in.)
Filter Number 997
Static Pressure (Pa) -0.6 (in. H2O)
Barometric Pressure (Pb) 26.98 (in. Hg)
Ambient Temperature (°F) 80
Pretest Leak Rate 0.0 cfm @ 5 (in. Hg)
Post Test Leak Rate 0.0 cfm @ 6 (in. Hg)
Pitot Check: Pretest OK Post Test OK

Sheet ____ of ____
Isokinetic Factor, K



Plant Clean

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F) 1	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F) 3	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F) 2	Filter Temp. (°F) 3	Isokinetic Rate (%)	Target Volume (cf)	Comments
1	0	1000					238.099								leak check OK
1	5	1005	3"	192	2.9	0.89	241.02	83	83	60	249	240	100.2	241.61	
1	10	1010	3"	193	2.9	0.90	244.0	83	84	60	248	249	101.28	243.96	
2	15	1015	3"	192	3.0	.93	246.92	86	83	58	247	247	98.32	246.97	
2	20	1020	3"	191	2.9	.90	249.82	86	83	57	247	248	99.13	249.85	
3	25	1025	3"	192	2.3	.71	252.51	86	83	57	246	242	103.28	252.42	
3	30	1030	3"	191	2.3	.71	255.192	86	84	57	246	250	100.88	255.12	
1	0	1040					255.25								leak check OK
1	5	1045	3"	191	2.9	0.90	258.2	83	84	58	249	249	101.03	258.17	
1	10	1050	3"	192	2.8	0.87	261.1	86	83	57	249	260	100.96	261.07	
2	15	1055	3"	192	2.7	0.84	263.92	87	84	57	248	254	99.78	263.93	
2	20	1100	3"	192	2.75	0.85	266.77	87	83	57	249	252	100.02	266.77	
3	25	1105	3"	190	2.4	0.75	269.52	88	84	57	249	243	102.93	269.44	
3	30	11:10	3"	190	2.4	0.75	272.16	90	85	57	249	249	98.59	272.2	
1	0	1120					272.32								leak check OK
1	5	1125	3"	191	2.8	0.87	275.30	86	85	59	249	252	103.47	275.2	
1	10	1130	3"	192	2.85	0.89	278.23	88	86	58	249	250	100.65	278.21	
2	15	1135	3"	192	2.8	0.87	281.16	89	86	58	249	244	101.44	281.12	
2	20	1140	3"	192	2.85	0.89	284.06	90	86	58	250	248	99.43	284.08	
3	25	1145	3"	192	2.4	0.75	286.87	90	86	58	249	256	104.85	286.74	
3	30	1150	3"	191	2.4	0.75	289.50	90	86	58	249	249	98.15	289.55	
1	0	1200					289.6								leak check OK I.O. 289.6
1	5	1205	3"	192	2.9	0.90	292.57	88	87	61	249	252	101.05	292.54	
1	10	1210	3"	192	2.85	0.89	295.48	89	87	60	250	256	99.78	295.49	
2	15	1215	3"	191	2.75	0.86	298.36	90	88	59	249	248	100.2	298.35	
2	20	1220	3"	191	2.7	0.84	301.2	90	87	59	248	249	99.87	301.2	
3	25	1225	3"	191	2.3	0.72	304.88	92	82	59	249	241		303.82	
3	30	1230	3"	190	2.3	0.72	306.67	92	88	59	245	248		307.51	leak check O.K.

Port 1 — 159

Port 2

Port 4

Port 3

GE Energy

Cp 2.0

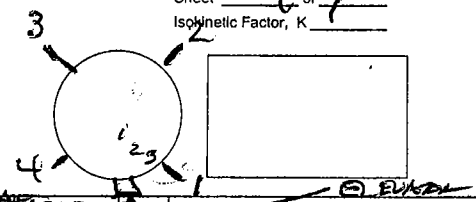
ISOKINETIC RUNSHEET

Plant: SUN FLOWER
City: HOLCOMB, KS
Location: #3 STACK
Operator: BOB Z
Date: 19 MAY 04
Run Number: O.H. - R2 - STACK
Stack Diam., Inches: 16
Assumed moisture, %: 10%

Sample Box Number
Meter Box Number E-27
Meter Calibration (Y) .992
Meter dH @ 1.614
Pitot Tube No. 7 Cp .84
Probe Length 6' TC No. 7
Probe Liner Material GLASS
Probe Heater Setting (°F) 250

Nozzle No. GLASS Diameter .144 (in.)
Filter Number 7994 - 7345
Static Pressure (Pa) -6.6 (in. H2O)
Barometric Pressure (Pb) 26.77 (in. Hg)
Ambient Temperature (°F) 90
Pretest Leak Rate 0.00 cfm @ 10" (in. Hg)
Post Test Leak Rate 0.005 cfm @ 7" (in. Hg)
Pitot Check: Pretest ✓ Post Test GOOD

Sheet 1 of 1
Isokinetic Factor, K



PUMP: CLOSED
@ EVERY

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
1	0	09:05					452.113								
1	5	09:10	3	189	2.9	.86	454.98	90	89	<68°	230	241	99	455.00	
1	10	09:15	3	190	2.9	.86	457.91	88	90		237	237	101	457.87	
2	15	09:20	3	189	3.0	.89	460.90	89	89	Fully	239	248	101	460.85	
2	20	09:25	3	189	2.9	.86	463.81	89	88	Iced	237	240	101	463.79	
3	25	09:30	3	188	2.5	.74	466.55	91	88		240	248	102	466.50	
3	30	09:35	3	188	2.5	.74	469.240	92	88		240	248	100	469.24	
1	0	09:46		188			471.408								
1	5	09:51	3	188	2.7	.80	474.20	91	90		239	247	100	474.21	
1	10	09:56	3	188	2.7	.81	476.95	93	90		239	245	98	477.00	
2	15	10:01	3	188	2.7	.81	479.78	93	90		239	243	101	479.75	
2	20	10:06	3	187	2.8	.84	482.68	93	91		240	242	101	482.64	
3	25	10:11	3	187	2.5	.75	485.39	94	90		239	242	100	485.38	
3	30	10:16	3	187	2.4	.72	488.050	94	91		239	248	100	488.04	
1	0	10:22					488.197								
1	5	10:27	3.5	186	2.9	.87	491.00	92	90	100	239	251	97	491.10	
1	10	10:32	3.5	188	2.8	.84	493.95	93	91	DRY	239	253	103	493.86	
2	15	10:37	3.5	188	2.8	.84	496.80	94	91		240	254	100	496.81	
2	20	10:42	3.5	188	2.7	.81	499.60	95	91		240	242	99	499.61	
3	25	10:47	3.5	187	2.5	.75	502.32	95	91		239	244	100	502.31	
3	30	10:52	3.0	188	2.4	.72	504.994	95	91		240	249	101	504.97	
1	0	11:00					505.149								
1	5	11:05	3.5	187	2.9	.87	508.01	94	92		240	240	100	508.06	
1	10	11:10	3.5	188	2.8	.84	510.97	96	93		239	252	101	510.94	
2	15	11:15	3.5	187	2.7	.81	513.82	97	93		239	240	101	513.79	
2	20	11:20	3.5	188	2.7	.81	516.67	97	94		239	248	100	516.64	
3	25	11:25	3.0	186	2.4	.72	519.34	98	94		239	247		519.34	
3	30	11:30	3.0	186	2.3	.69	521.932	98	93		240	244		521.95	

GE Energy

CO2 14.9

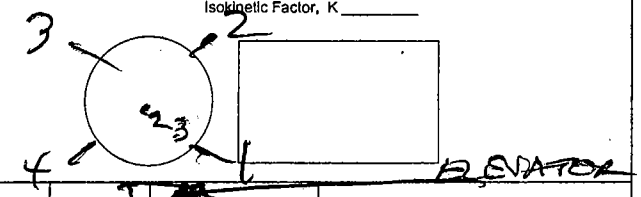
ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB, KS
Location: #3 STACK
Operator: BOB Z
Date: 23 MAY 04
Run Number: D.H.-R3-STACK
Stack Diam., Inches: 16'
Assumed moisture, %: 4%

Sample Box Number _____
Meter Box Number E27
Meter Calibration (Y) .992
Meter dH @ 4.614
Pitot Tube No. X Cp .84
Probe Length 6' TC No. X
Probe Liner Material GLASS
Probe Heater Setting (°F) 245

Nozzle No. X Diameter .144 (in.)
Filter Number 993 - 7028
Static Pressure (Pa) [illegible] (in. H2O)
Barometric Pressure (Pb) 26.91 (in. Hg)
Ambient Temperature (°F) 92
Pretest Leak Rate 0.000 cfm @ 8" (in. Hg)
Post Test Leak Rate 0.000 cfm @ 5" (in. Hg)
Pitot Check: Pretest ✓ Post Test 6000

Sheet _____ of _____
Isokinetic Factor, K _____



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
2 - 1	0	09:25					654.064								
1	5	09:30	3	190	2.9	.85	656.99	96	94	Filling ice box	245	245	101	656.95	
1	10	09:35	3	190	3.0	.88	659.97	95	94	down	246	245	102	659.92	
2	15	09:40	3	190	2.9	.85	662.84	93	93		246	245	100	662.85	
2	20	09:45	3	190	3.0	.88	665.80	94	93		246	245	101	665.77	
3	25	09:50	3	189	2.4	.71	668.44	96	94		246	245	100	668.43	
2 - 3	30	09:55	3	188	2.5	.74	671.135	96	93		245	245	100	671.12	
1 - 1	0	10:00					671.300								
1	5	10:05	3	188	2.9	.85	674.2	96	94	ADD ICE	245	246	101	674.19	
1	10	10:10	3	187	2.8	.83	677.05	97	95		246	245	100	677.05	
2	15	10:15	3	187	2.9	.86	680.01	98	94		246	245	102	679.95	
2	20	10:20	3	188	2.9	.86	682.86	100	95		246	246	98	682.91	
3	25	10:25	3	187	2.5	.74	685.51	100	96		245	245	98	685.56	
1 3	30	10:30	3	187	2.5	.74	688.245	101	96		245	246	19	688.21	
4 - 1	0	10:35					688.389								
1	5	10:40	3	187	3.0	.89	691.30	99	97	ADD ICE	245	245	98	691.35	
1	10	10:45	3	189	2.9	.86	694.24	101	97		246	245	101	694.21	
2	15	10:50	3	189	2.9	.86	697.14	102	98		245	245	100	697.15	
2	20	10:55	3	189	2.9	.86	700.07	102	99		246	245	100	700.06	
3	25	11:00	3	187	2.6	.77	702.87	102	99		246	245	101	702.84	
4 - 3	30	11:05	3	187	2.6	.78	705.685	103	99		246	245	102	705.64	
3 - 1	0	11:10					705.827								
1	5	11:15	3	187	2.9	.86	708.80	102	99	ADD ICE	245	244	102	708.75	
1	10	11:20	3	187	3.0	.89	711.79	103	99		246	245	100	711.77	
2	15	11:25	3	187	3.0	.90	714.78	105	100		245	244	100	714.77	
2	20	11:30	3	187	2.9	.87	717.73	106	100		246	245		717.71	
3	25	11:35	3	186	2.5	.75	720.48	105	101		246	245	101	720.46	
3 - 3	30	11:40	3	186	2.5	.75	723.189	105	101		245	245	99	723.21	

GE Energy

$\Delta P \times \cancel{67} = \Delta H$

$\sqrt{\Delta P} \times \cancel{95} \times 5 =$ THEORET

ISOKINETIC SAMPLING DATA SHEET

(Run No. 1)

Sheet 1 of 2

Plant/City: SCHOFLOCHER
Location: #1 HEAT INLET
Operator: RG
Test Date: 5-18-04 - O.H.
Stack Dia.(in): 10 \ 29
Stack Area (sq.ft): 290
Filter No.: 232 (2.8625)

TC No.: E52
Pitot Tube No. / Cp: .840 /
DGM No.: E52
DGM Y-factor / ΔH @: 0.999 /
Nozzle No. / Dia (in.): ~~.250~~ / ~~.183~~ .253
Probe Length / Material: 6 / TEFLON
Probe Heater Setting (°F): 250

Barometric Pressure (in. Hg): 27.15
Static Pressure (in. WC): -9.5
Assumed moisture, %: 8%
Assumed O2 / CO2 content %: 5 / 14
Pretest Leak Rate: 0.0 cfm @ 12 in. Hg
Post-test Leak Rate: cfm @ in. Hg
Pitot Leak Check: Pretest OK @ 3" Post-test

Isokinetic Factor (K): ~~.50~~ .95

Sketch Sample Locations (stack)

Traverse Point No.	Run Time (Min.)	Clock Time (24 hr)	Dry Gas Meter Volume Reading Vm (cu.ft)	Orifice Vel. Head ΔH (in. WC)	Stack Vel. Head ΔP (in. WC)	Stack Temp. Ts (°F)	Sampling Train Temperatures: DGM - in Tm (°F)	DGM - out Tm (°F)	Probe Tp (°F)	Filter Tf (°F)	Dryer Td (°F)	Inlet Vacuum (in. Hg)	Target Volume (cf)	Isokinetic Rate (%)	Comments
1	0	1000	955.80				92	82							I
1/1	5	1005	957.50	.2814	.42	293	89	83	250	FULLY		0	957.420		♡
2	10	1010	959.57	.401	.61	300	79	90		ICED		0	959.45		MY
3	15	1015	961.53	.401	.61	292	80	81				0	961.52		JOB
2	0	1038	964.90	1.06	.50	297	90	80				3.5	~~969.85~~		964.889
2/1	5	1043	967.915	.86	.40	292	82	81				2.0	967.904		
2	10	1048	970.23	.86	.40	298	82	82				2.0	970.19		
3	15	1052	973.421	.97	.45	268	85	82				2.5	973.416		
3	0	1055	973.421	~~.75~~	~~.35~~	~~277~~	~~84~~	~~82~~				2.0			
3/1	5	1100	976.24	.75	.35	277	84	82				2.0	976.231		
2	10	1105	979.11	.86	.40	272	84	82				2.0	979.05		
3	15	1110	982.112	.86	.40	280	84	83					982.114		
4	0	1112	982.112	–	–	–							–		
4/1	5	1117	985.41	1.032	.48	285	83	82				3.0	985.403		
2	10	1122	988.37	1.12	.52	283	87	84				3.0	988.353		
3	15	1127	991.51	.96	.45	285	88	83				2.5	~~989.01~~		991.556
5	0	1130	991.51	–	–	–							–		
5/1	5	1135	994.48	.86	.40	278	88	84				2.0	994.514		
2	10	1140	997.35	.81	.38	285	88	84				2.0	997.408		
3	15	1145	000.53	.90	.42	290	89	85				3.5	1000.428		
6	0	1147	000.53	–	–	–							–		
6/1	5	1152	004.15	1.29	.60	271	85	85				1.0	4.209		
2	10	1157	007.54	1.18	.55	284	89	85				1.0	7.673		
3	15	1202	11.07	1.12	.52	275	90	85				1.0	10.965		
			11.07												
							AVG =								

162

$\Delta P \times 2.15$
$\sqrt{\Delta P} \times .95 \times 5$

ISOKINETIC SAMPLING DATA SHEET (Run No. 1)

Sheet 2 of 2

Plant/City: SUNFLOWER
Location: #1 HEAT INLET
Operator: RG
Test Date: 5-18-04
Stack Dia.(in): 10129
Stack Area (sq.ft): 290
Filter No.:

TC No.: E52
Pitot Tube No. / Cp: .840 /
DGM No.: E52
DGM Y-factor / ΔH @: 0.999 /
Nozzle No. / Dia (in.): .253 /
Probe Length / Material: 6 / TEFLON
Probe Heater Setting (°F): 250

Barometric Pressure (in. Hg): 27.15
Static Pressure (in. WC): -9.5
Assumed moisture, %: 8%
Assumed O2 / CO2 content %: 5 / 14
Pretest Leak Rate: 0.0 cfm @ 12 in. Hg
Post-test Leak Rate: cfm @ in. Hg
Pitot Leak Check: Pretest ok @ 3" Post-test

Isokinetic Factor (K): .95

Sketch Sample Locations (stack)

Traverse Point No.	Run Time (Min.)	Clock Time (24 hr)	Dry Gas Meter Volume Reading Vm (cu.ft)	Orifice Vel. Head ΔH (in. WC)	Stack Vel. Head ΔP (in. WC)	Stack Temp. Ts (°F)	Sampling Train Temperatures: DGM - in Tm (°F)	DGM - out Tm (°F)	Probe Tp (°F)	Filter Tf (°F)	Dryer Td (°F)	Inlet Vacuum (in. Hg)	Target Volume (cf)	Isokinetic Rate (%)	Comments
7	0	12.04	11.07				87	85							
7/1	5	1209	14.457	1.1	.51	270	88	86	250	FULLY		2.0	14.462		
2	10	1214	17.98	1.23	.57	272	89	86		ICED		2.0	18.036		
3	15	1219	21.195	0.97	.45	274	90	85				2.0	21.166		
8	0	1225	21.195	–	–	–						–	–		
8/1	5	1230	24.192	0.86	.40	268	86	86				1.5	24.199		
2	10	1235	27.02	0.75	.35	276	88	85				1.0	27.062		
3	15	1240	29.92	0.75	.35	270	89	86				1.0	29.830		29.830
			74.12	0.884	0.4596		AVG =	84.79							

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: ONTARIO HYDRO Test Run No. 2 Run Date: 5/19/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET
Source Condition:
Test Engineer: MRE
Temp ID: E52
Meter ID: E52
Meter Calibration Factor: .999
Pitot ID:
Pitot Tube Coefficient: .840
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .253
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 29 Diameter (ft):
Width (ft): 10
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.):
Port Size (diameter in.): 4
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.92
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.19
Sample Train Leak Check: Pre: 0.0 Post: 0.0 @ 15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

COMMENTS & NOTES:

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. 229 Tare Wt (g) 2.9293
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET

List Test Method Used: ONTARIO HYDRO
Test Run No. 2
Date: 5/19/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	x.2.5 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	x.99 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	905	.53	1.3	51.900	.73	.72	3.604		293	250		FULLY	89	89	4
-2	910	.58	1.5	55.525	.75	.75	3.770	55.504	291			ICED	88	88	4
-3	915	.64	1.6	59.275	.80	.79	3.960	59.274	295				89	89	4
	920			63.233				63.234							
2-1	925	.49	1.2		.70	.70	3.500		283				91	91	5
-2	930	.65	1.6	66.779	.81	.81	4.031	66.734	285				93	93	5
-3	935	.55	1.4	70.769	.74	.74	3.708	70.765	286				95	95	5
	940			74.455				74.473							
3-1	945	.39	.98		.63	.63	3.123		290				98	98	5
-2	950	.46	1.2	77.603	.68	.68	3.391	77.596	291				101	101	5
-3	955	.60	1.5	80.926	.78	.78	3.873	80.987	289				103	103	5
	1000			84.892				84.860							
4-1	1005	.50	1.3		.71	.71	3.536		285				104	104	5
-2	1010	.44	1.1	88.413	.66	.66	3.317	88.396	283				104	104	5
-3	1015	.51	1.3	91.722	.71	.71	3.571	91.713	282				105	105	5
	1020			95.279				95.284							
5-1	1025	.54	1.4		.74	.74	3.674		284				103	103	4
-2	1030	.49	1.2	99.001	.70	.70	3.500	98.958	285				101	101	4
-3	1035	.62	1.6	102.457	.79	.79	3.937	102.458	289				99	99	4
	1040			106.405				106.395							
6-1	1045	.37	.93		.61	.61	3.041		278				98	98	4
-2	1050	.43	1.1	109.439	.66	.66	3.279	109.436	279				98	98	4
-3	1055	.46	1.2	112.733	.68	.68	3.391	112.715	278				97	97	4
	1100			116.125				116.106							

= Data does not get entered in Excel

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET

List Test Method Used: ONTARIO HYDRO
Test Run No. 2
Date: 5/19/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (×2.5)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (×.99 ×5)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1105	.50	1.3		.71	.71	3.536	116.106	279	250			98	98	4
-2	1110	.71	1.8	119.645	.84	.84	4.213	119.642	281			FULLY	98	98	4
-3	1115	.63	1.6	123.871	.79	.79	3.969	123.855	280				98	98	4
	1120			127.830				127.824				ICED			
8-1	1125	.47	1.2		.69	.69	3.428		281				98	98	4
-2	1130	.70	1.8	131.256	.84	.84	4.183	131.252	284				99	99	4
-3	1135	.65	1.6	135.421	.81	.81	4.031	135.435	285				98	98	4
	1140			139.476				139.466							

= Data does not get entered in Excel

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: ONTARIO HYDRO Test Run No. 3 Run Date: 5/20/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET
Source Condition:
Test Engineer: MRE
Temp ID: E52
Meter ID: E52
Meter Calibration Factor: .999
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .253
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.):
Port Size (diameter in.): 4
Port Type: NAPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.07
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.35
Sample Train Leak Check: Pre: 0.0 Post: 0.0 @ 13 in. Hg
Pitot Leak Check: Pre ↘ Post ↘
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. 234 Tare Wt (g) 2.9038
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET

List Test Method Used: ONT. HYDRO
Test Run No. 3
Date: 5/20/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (x 2.54)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (x 1 x 5)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	925	.41	1.0	63.392	.64	.64	3.202		283	250			93	93	4
-2	930	.75	1.9	66.617	.87	.87	4.330	66.594	285			FULLY	94	94	4
-3	935	.82	2.1	70.983	.91	.91	4.528	70.924	287				95	95	4
	940			75.464				75.452				ICED			
2-1	945	.25	.64		.50	.50	2.500		289				94	94	4
-2	950	.23	.58	78.005	.48	.48	2.398	77.952	291				94	94	4
-3	955	.33	.84	80.400	.58	.58	2.872	80.350	291				93	93	4
	1000			83.225				83.222							
3-1	1005	.35	.89		.59	.59	2.958		293				92	92	3
-2	1010	.27	.69	86.195	.52	.52	2.598	86.180	291				92	92	3
-3	1015	.20	.51	88.783	.45	.45	2.236	88.778	291				92	92	3
	1020			91.100				91.014							
4-1	1025	.21	.53		.46	.46	2.291		295				93	93	3
-2	1030	.25	.64	93.313	.50	.50	2.500	93.305	296				93	93	3
-3	1035	.24	.61	95.819	.49	.49	2.450	95.805	299				94	94	3
	1040			98.279				98.255							
5-1	1045	.49	1.3		.70	.70	3.500		300				94	94	3
-2	1050	.53	1.4	101.769	.73	.73	3.640	101.755	298				94	94	3
-3	1055	.50	1.3	105.405	.71	.71	3.536	105.395	298				94	94	3
	1100			108.950				108.931							
6-1	1105	.70	1.8		.84	.84	4.183		295				94	94	3
-2	1110	.61	1.6	113.130	.78	.78	3.905	113.114	293				94	94	3
-3	1115	.60	1.5	117.081	.78	.78	3.873	117.019	296				95	95	3
	1120			120.778				120.892							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB, KAN.
Test Location: AIR HEATER OUTLET

List Test Method Used: ONT. HYDRO
Test Run No. 3
Date: 5/20/04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
													92	92	3
7-1	1125	.61	1.6		.78	.78	3.905	120.892	280	250			91	91	3
-2	1130	.54	1.4	124.814	.74	.74	3.674	124.797	278			FULLY	91	91	3
-3	1135	.52	1.3	128.487	.72	.72	3.606	128.471	279						
	1140			132.087				132.077				ICED			
8-1	1145	.69	1.8		.83	.83	4.153		286				92	92	3
-2	1150	.72	1.8	136.233	.85	.85	4.243	136.230	284				93	93	3
-3	1155	.73	1.9	140.479	.85	.85	4.272	140.473	280				95	93	3
	1200			144.743				144.745							

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GE Energy – Form 1026

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M29 Test Run No. 1 Run Date: 5-18-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: FOLCUM
Test Location: STACK
Source Condition: HIGH (NORMAL)
Test Engineer: D. RYAN
Temp ID: E-51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID: 722A
Pitot Tube Coefficient: 0.836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16' 4"
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream >10 Downstream >10
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): ≈3
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.98
Static Pressure (in. H_2O): −0.6
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: 0.002 Post: 0.000 @ 13/8 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.0
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. N/A Tare Wt (g)
Filter No. N/A Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCUM
Test Location: STACK

List Test Method Used: 29
Test Run No. 1
Date: 5-18-04 Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.34 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.378 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	13:25	2.8	0.95	94.473	1.7	0.63			193	246	249	≤68°	87	87	4
-1	1330	2.8	0.95	97.670	1.7	0.63		97.635	194	246	248	FULL	86	87	4
-2	1335	2.7	0.92	100.740	1.6	0.62		100.797	194	249	250	ICED	88	87	4
-2	1340	2.7	0.92	103.870	1.6	0.62		103.902	194	250	250		89	86	4
-3	1345	2.3	0.78	106.950	1.5	0.57		107.008	194	250	250		93	87	4
-3	1350	2.3	0.78	109.820	1.5	0.57		109.814	193	250	250		93	87	4
	1355			112.713				112.740							
2-1	1400	2.6	.884	112.713	1.61	0.61	3.048	115.761	194	246	251		91	87	4
-1	1405	2.65	.901	115.68	1.625	0.615	3.077	118.757	194	246	249		93	87	4
-2	1410	2.40	.816	118.70	1.549	0.586	2.821	121.628	193	249	249		95	88	4
-2	1415	2.55	.867	121.61	1.597	0.604	3.018	124.628	194	248	249		95	88	4
-3	1420	2.30	.782	124.50	1.517	0.573	2.866	127.366	193	248	249		95	88	4
-3	1425	2.20	.748	127.32	1.483	0.561	2.803	130.123	193	248	252		95	89	4
	1430			130.111											
3-1	1435	2.8	0.95	130.111	1.7	0.63			194	246	249		92	89	4
-1	1440	2.8	0.95	133.310	1.7	0.63		133.285	194	247	249		93	89	4
-2	1445	2.6	0.88	136.420	1.6	0.61		136.447	195	248	249		95	90	4
-2	1450	2.6	0.88	139.510	1.6	0.61		139.494	195	248	249		96	90	4
-3	1455	2.3	0.78	142.620	1.5	0.57		142.544	194	247	250		96	90	4
-3	1500	2.3	0.78	145.430	1.5	0.57		145.410	193	246	251		97	90	4
	1505			148.281				148.276							
4-1	1508	2.8	0.95	148.281	1.7	0.63			195	246	250		95	91	4
-1	1513	2.8	0.95	151.470	1.7	0.63		151.439	195	246	250		96	90	4
-2	1518	2.6	0.88	154.630	1.6	0.61		154.601	196	248	250		97	91	4
-2	1523	2.6	0.88	157.700	1.6	0.61		157.648	198	250	250		96	91	4
-3	1528	2.2	0.75	160.750	1.5	0.56		160.695	198	250	251		97	92	4
-3	1533	2.2	0.75	163.500	1.5	0.56		163.498	198	250	250		98	92	4
	1538			166.287				166.301							

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GE Energy – Form 1026

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M29 Test Run No. #2 Run Date: 5-19-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER COGENERATION
Plant: HOLCOMB KS
Test Location: STACK
Source Condition: HIGH (NORMAL)
Test Engineer: D. RYAN
Temp ID: E-51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID:
Pitot Tube Coefficient: 0.836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16'4"
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): ≈3"
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.77
Static Pressure (in. H_2O): -1.6
Flue Pressure (in. Hg Abs): 26.65
Sample Train Leak Check: Pre: 0.002 Post: 0.018@14/4 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.5
Oxygen (%): 6.5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: STACK

List Test Method Used: M29
Test Run No. 2
Date: 5-19-04 Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.33 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.371 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1150	2.9	0.96	56.487	1.7	0.63			191	249	262	<680°	94	93	3
-1	1155	2.9	0.96	59.540	1.7	0.63		59.566	191	250	258	JULY	93	92	3
-2	1200	2.6	0.86	62.680	1.6	0.60		62.725	190	252	254	ICED	96	93	3
-2	1205	2.6	0.86	65.700	1.6	0.60		65.716	190	253	248		98	93	3
-3	1210	2.1	0.69	68.720	1.4	0.54		68.714	190	252	248		99	94	3
-3	1215	2.1	0.69	71.430	1.4	0.54		71.402	189	252	249		100	94	3
	1220			74.123				74.090							
2-1	1222	2.7	0.89	74.123	1.6	0.61			191	250	246		99	95	4
-1	1227	2.7	0.89	77.120	1.6	0.61		77.138	191	252	247		100	95	4
-2	1232	2.8	0.92	80.190	1.7	0.62		80.186	191	252	248		100	95	4
-2	1237	2.8	0.92	83.310	1.7	0.62		83.290	192	253	248		101	95	4
-3	1242	2.1	0.69	86.420	1.4	0.54		86.394	190	245	247		102	95	4
-3	1247	2.1	0.69	89.130	1.4	0.54		89.082	190	248	247		103	96	4
	1252			91.840				91.770							
3-1	1254	2.8	0.92	91.840	1.7	0.62			191	249	246		101	97	4
-1	1259	2.8	0.92	94.900	1.7	0.62		94.874	191	248	246		101	97	4
-2	1304	2.8	0.92	98.010	1.7	0.62		97.978	191	248	249		102	97	4
-2	1309	2.8	0.92	101.100	1.7	0.62		101.082	191	248	253		104	98	4
-3	1314	2.4	0.79	104.210	1.5	0.57		104.186	190	249	250		104	98	4
-3	1319	2.4	0.79	107.070	1.5	0.57		107.060	190	252	247		104	99	4
	1324			109.921				109.934							
4-1	1328	2.8	0.92	109.921	1.7	0.62			190	250	246		102	99	4
-1	1333	2.8	0.92	113.050	1.7	0.62		113.038	190	252	247		103	99	4
-2	1338	2.7	0.89	116.170	1.6	0.61		116.142	190	252	248		103	99	4
-2	1343	2.7	0.89	119.170	1.6	0.61		119.190	190	252	247		103	99	4
-3	1348	2.2	0.73	122.180	1.5	0.55		122.238	189	253	249		104	99	4
-3	1353	2.2	0.73	125.020	1.5	0.55		124.989	189	252	247		104	99	4
	1358			127.836				127.740							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M29 Test Run No. #3 Run Date: 5-20-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB KS
Test Location: #1 STACK
Source Condition: HIGH (NORMAL)
Test Engineer: S. RYAN
Temp ID: E-51
Meter ID: E-51
Meter Calibration Factor: 1.003
Pitot ID: 722A
Pitot Tube Coefficient: 0.836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): 0.150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): ____ Diameter (ft): 16'4"
Width (ft): ____
Duct Area (Sq. Ft.): ____
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.91
Static Pressure (in. H_2O): -1.6
Flue Pressure (in. Hg Abs): 26.79
Sample Train Leak Check: Pre: 0.000 Post: 0.000 @ 8/6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.1
Oxygen (%): 6.8
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____
Fuel Samples collected for analysis? Yes No

GE Mostardi Platt - Form 1053

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB KS
Test Location: STACK

List Test Method Used: M29
Test Run No. #3
Date: 5-20-09
Traverse Sheet 1 of 1

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.33 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1140	2.9	0.96	19.501	1.7	0.63			189	246	256	≤68°	106	104	3
-1	45	2.9	0.96	22.660	1.7	0.63		22.651	190	247	254	Fully	106	104	4
-2	50	2.8	0.92	25.820	1.7	0.62		25.801	189	249	255	Iced	107	104	4
-2	55	2.8	0.92	28.900	1.7	0.62		28.897	189	247	256		108	104	4
-3	1200	2.4	0.79	32.000	1.5	0.57		31.993	189	249	254		109	104	4
-3	05	2.4	0.79	34.880	1.5	0.57		34.859	189	250	254		110	104	4
	1210			37.744				37.725							
2-1	1213	2.9	0.96	37.744	1.7	0.63			190	247	257		108	105	4
-1	18	2.9	0.96	40.810	1.7	0.63		40.875	190	250	254		109	105	4
-2	23	2.8	0.92	43.970	1.7	0.62		44.025	189	250	258		110	105	4
-2	28	2.8	0.92	47.160	1.7	0.62		47.121	189	248	257		111	105	4
-3	33	2.4	0.79	50.280	1.5	0.57		50.217	189	250	258		111	105	4
-3	38	2.4	0.79	53.070	1.5	0.57		53.083	189	250	257		112	105	4
	43			55.942				55.949							
3-1	1246	2.9	0.96	55.942	1.7	0.63			190	248	257		110	105	4
-1	51	2.9	0.96	59.140	1.7	0.63		59.099	190	250	257		109	106	4
-2	56	2.8	0.92	62.230	1.7	0.62		62.249	190	250	258		110	106	4
-2	1301	2.8	0.92	65.310	1.7	0.62		65.345	190	249	257		112	107	4
-3	06	2.3	0.76	68.420	1.5	0.56		68.441	191	250	258		112	108	4
-3	11	2.3	0.76	71.280	1.5	0.56		71.247	191	251	262		113	108	4
	16			74.120				74.053							
4-1	1319	2.8	0.92	74.120	1.7	0.62			191	249	261		110	108	4
-1	23	2.8	0.92	77.120	1.7	0.62		77.149	191	250	261		111	108	4
-2	29	2.8	0.92	80.200	1.7	0.62		80.245	191	248	257		111	108	4
-2	33	2.8	0.92	83.290	1.7	0.62		83.341	190	250	260		112	108	4
-3	39	2.3	0.76	86.370	1.5	0.56		86.437	190	249	258		113	109	4
-3	43	2.3	0.76	89.180	1.5	0.56		89.243	190	250	260		113	109	4
	1349			92.026				92.049							

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GE Energy – Form 1026

ΔP X .95
√ΔP x .95 x 5

M29

ISOKINETIC SAMPLING DATA SHEET

(Run No. 1)

Sheet 1 of 2

Plant/City: SUNFLOWER
Location: #1 KERT INLET
Operator: RG
Test Date: 5-18-04
Stack Dia.(in): 10/29
Stack Area (sq.ft): 290
Filter No.: 227 / 2.9201

TC No.: E28
Pitot Tube No. / Cp: .840 /
DGM No.: E28
DGM Y-factor / ΔH @: 0.993 / 1.544
Nozzle No. / Dia (in.): .25 /
Probe Length / Material: 6 / TEFLON
Probe Heater Setting (°F): 250

Barometric Pressure (in. Hg): 27.15
Static Pressure (in. WC): -9.5
Assumed moisture, %: 8
Assumed O2 / CO2 content %: 14 / 5
Pretest Leak Rate: 0.0 cfm @ 11 in. Hg
Post-test Leak Rate: 0.0 cfm @ 9 in. Hg
Pitot Leak Check: Pretest ok@3" Post-test ok@3"

Isokinetic Factor (K): .95

Sketch Sample Locations (stack)

Traverse Point No.	Run Time (Min.)	Clock Time (24 hr)	Dry Gas Meter Volume Reading Vm (cu.ft)	Orifice Vel. Head ΔH (in. WC)	Stack Vel. Head ΔP (in. WC)	Stack Temp. Ts (°F)	Sampling Train Temperatures: DGM - in Tm (°F)	DGM - out Tm (°F)	Probe Tp (°F)	Filter Tf (°F)	Dryer Td (°F)	Inlet Vacuum (in. Hg)	Target Volume (cf)	Isokinetic Rate (%)	Comments
1-	0	1325	078.11				85	85							
-1	5	1330	81.459	1.075	.5	277	85	85	250	FULLY		4.0	81.469		
2	10	1335	84.98	1.20	.56	277	86	85		ICED		4.0	85.014		
3	15	1340	88.546	1.20	.56	274	89	85				4.0	88.535		
2-	0	1343	88.546	-	-	-						-	-		
1	5	1348	91.908	1.075	.50	276	87	85				3.0	91.805		
2	10	1353	95.271	1.075	.50	279	88	85				3.0	95.267		
3	15	1358	98.805	1.18	.55	284	88	85				3.0	98.794		
3 -	0	1400	98.805	-	-	-						-	-		
1	5	1405	102.51	1.31	.61	277	86	88				3.0	102.515		
2	10	1410	106.10	1.23	.57	272	89	86				3.0	106.096		
3	15	1415	109.53	1.12	.52	270	90	86				3.0	109.525		
4 -	0	1421	109.53	-	-	-						-	-		
1	5	1426	112.710	.968	.48	283	87	86				4.0	112.716		
2	10	1431	116.11	1.1	.51	289	88	86				40	116.102		
3	15	1436	119.505	1.1	.51	285	89	86				4.0	119.502		
5-	0	1438	119.505	-	-	-						-	-		
1	5	1443	122.79	1.03	.48	287	87	87				2.0	122.796		
2	10	1448	126.11	1.03	.48	290	88	87				2.0	126.081		
3	15	1453	129.299	.968	.45	293	89	87				2.0	129.296		
6-	0	1454	129.299	-	-	-									
1	5	1459	132.66	1.075	.50	283	89	87				2.0	132.658		
2	10	1504	136.19	1.18	.55	291	89	88				2.0	136.183		
3	15	1509	139.57	1.075	.50	292	90	87				2.0	139.549		
						AVG =									

M10 1

ISOKINETIC SAMPLING DATA SHEET (Run No. 1)

Sheet 2 of 2

Plant/City: SUNFLOWER
Location: #1 HEAT INLET
Operator: RG
Test Date: 5-18-04
Stack Dia.(in): 10/29
Stack Area (sq.ft): 290
Filter No.:

TC No.: E28
Pitot Tube No. / Cp: .840 /
DGM No.: E28
DGM Y-factor / ΔH @: 0.993 / 1.544
Nozzle No. / Dia (in.): .25 /
Probe Length / Material: 6 / TEFLON
Probe Heater Setting (°F): 250

Barometric Pressure (in. Hg): 27.15
Static Pressure (in. WC): -9.8
Assumed moisture, %: 8
Assumed O2 / CO2 content %: 14 / 5
Pretest Leak Rate: 0.0 cfm @ 11 in. Hg
Post-test Leak Rate: cfm @ in. Hg
Pitot Leak Check: Pretest OK @31" Post-test

Isokinetic Factor (K):

Sketch Sample Locations (stack)

Traverse Point No.	Run Time (Min.)	Clock Time (24 hr)	Dry Gas Meter Volume Reading Vm (cu.ft)	Orifice Vel. Head ΔH (in. WC)	Stack Vel. Head ΔP (in. WC)	Stack Temp. Ts (°F)	Sampling Train Temperatures: DGM - in Tm (°F)	DGM - out Tm (°F)	Probe Tp (°F)	Filter Tf (°F)	Dryer Td (°F)	Inlet Vacuum (in. Hg)	Target Volume (cf)	Isokinetic Rate (%)	Comments
7-	0	1511	139.57				89	88							
1	5	1516	142.385	0.753	.35	294	89	87	250	FULLY		1.5	142.380		
2	10	1521	145.392	0.86	.40	293	89	87		ICED		2.0	145.389		
3	15	1526	148.99	0.753	.35	291	90	87				2.0	148.200		
8-	0	1530	148.19	—	—	—						—	—		
1	5	1535	152.03	1.42	.66	282	89	88				2.0	152.049		
2	10	1540	156.27	1.72	.80	287	89	87				2.5	156.279		
3	15	1545	160.33	1.72	.80	288	91	88				2.5	160.295		
			82.22	1.134	0.5275	283.92	AVG =	85.88				2.77			

177

ΔP x 2.23
√ΔP x .98

ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB
Location: HI AHO
Operator: RG
Date: 5-20-04
Run Number: R3- M29
Stack Diam., inches: 10/29
Assumed moisture, %: 8

Sample Box Number E28
Meter Box Number E28
Meter Calibration (Y) .983
Meter dH @ 1.544
Pitot Tube No. N/A Cp .840
Probe Length 6' TC No. N/A
Probe Liner Material TEFLON
Probe Heater Setting (°F) 250

Nozzle No. N/A Diameter .250 (in.)
Filter Number
Static Pressure (Pa) -10 (in. H2O)
Barometric Pressure (Pb) 27.06 (in. Hg)
Ambient Temperature (°F) 95
Pretest Leak Rate 0.0 cfm @ 15 (in. Hg)
Post Test Leak Rate 0.0 cfm @ 14 (in. Hg)
Pitot Check: Pretest ok@3" Post Test ok@3"

Sheet 1 of 2
Isokinetic Factor, K .98

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
1→	0	1140	–	–	–	–	408.759	–	–	FULLY	–	–	–	–	
1	5	1145	5.0	290	.43	.96	411.98	106	104	ICED	250			411.972	
2	10	1150	9.0	297	.75	1.67	416.23	109	106					416.224	
3	15	1155	9.0	292	.75	1.67	420.49	110	106					420.474	
2-	0	1159	–	–	–	–	420.49	–	–	–	–	–	–	–	
1	5	1204	10.0	287	.45	1.01	423.79	111	107					423.777	
2	10	1209	8.0	287	.38	.85	426.84	112	107					426.811	
3	15	1214	10.0	288	.43	.96	430.075	111	108					430.053	
3 -	0	1215	–	–	–	–	430.075	–	–	–	–	–	–	–	
1	5	1220	8.0	270	.35	.78	432.89	110	108					432.974	
2	10	1225	7.0	280	.30	.67	435.63	109	108					435.574	
3	15	1230	7.0	272	.30	.67	438.360	109	109					438.314	
4 -	0	1231	–	–	–	–	438.360	–	–	–	–	–	–	–	
1	5	1236	8.0	296	.32	.71	441.11	109	109					441.132	
2	10	1241	8.0	291	.32	.71	443.84	110	109					443.882	
3	15	1246	8.0	294	.32	.71	446.607	110	108					446.612	
5 -	0	1247	–	–	–	–	446.607	–	–	–	–	–	–	–	
1	5	1252	9.0	289	.40	.89	449.65	109	109					449.706	
2	10	1257	8.5	296	.35	.78	452.53	110	109					452.549	
3	15	1302	9.0	291	.40	.89	455.642	111	109					455.629	
6 -	0	1303	–	–	–	–	455.642	–	–	–	–	–	–	–	
1	5	1308	11.0	283	.50	1.12	459.13	109	109					459.105	
2	10	1313	11.0	284	.50	1.12	462.53	111	109					462.595	
3	15	1318	11.0	286	.50	1.12	465.981	112	110					465.995	
7 -	0	1319	–	–	–	–	465.981	–	–	–	–	–	–	–	
1	5	1324	10.0	277	.45	1.01	469.24	108	108					469.268	
2	10	1329	10.0	275	.45	1.01	472.53	108	105					472.527	
3	15	1334	10.0	271	.45	1.01	475.823	108	103					475.817	

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ISOKINETIC RUNSHEET

Plant: SUNFLOWER
City: HOLCOMB
Location: #1 AHO
Operator: RG
Date: 5-20-04
Run Number: R3- M29
Stack Diam., inches: 290
Assumed moisture, %: 8

Sample Box Number E28
Meter Box Number E28
Meter Calibration (Y) .993
Meter dH @ 1.544
Pilot Tube No. N/A Cp .840
Probe Length 6' TC No. N/A
Probe Liner Material TEFLON
Probe Heater Setting (°F) 250

Nozzle No. N/A Diameter .250 (in.)
Filter Number
Static Pressure (Pa) -10 (in. H2O)
Barometric Pressure (Pb) 27.05 (in. Hg)
Ambient Temperature (°F) 95
Pretest Leak Rate 0.0 cfm @ 15 (in. Hg)
Post Test Leak Rate 0.0 cfm @ 14 (in. Hg)
Pilot Check: Pretest [illegible]" Post Test [illegible]"

Sheet 2 of 2
Isokinetic Factor, K .98

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Vacuum (in. Hg)	Stack Temp, Ts (°F)	Velocity Head, dP (in. H2O)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Inlet Temp, Tm (°F)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Probe Temp. (°F)	Filter Temp. (°F)	Isokinetic Rate (%)	Target Volume (cf)	Comments
8-	0	1335	—	—	—	—	475.823	—	—	—	—	—	—	—	
1	5	1340	10.0	282	.45	1.01	479.27	107	104	FLOW TUBE	250			479.246	
2	10	1345	10.0	283	.45	1.01	482.58	107	104					482.557	
3	15	1350	10.0	282	.45	1.01	485.767	107	108					485.867	

GE Energy

APPENDIX F

Parametric Source Test Results

GE Energy

Douglas Ryan
Project Supervisor

SDA SCRUBBER HCL, HF AND BR+ EMISSIONS PARAMETRIC STUDY

Performed At
Sunflower Electric Power Corporation
Holcomb, Kansas Facility
Unit 1
Holcomb, Kansas

Test Date
May 27, 2004

Report No.
GE Energy Management Services, Inc. Report M22E0517C

Report Submittal Date
August 6, 2004

GE Energy Management Services, Inc
888 Industrial Drive
Elmhurst, IL 60126
USA

T 630-530-6600
F 630-530-6630

GE Energy

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2.0 SUMMARY OF RESULTS 1

3.0 DISCUSSION OF RESULTS 2

4.0 TEST PROCEDURES 2
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- 4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination 2
- 4.3 Hydrogen Chloride (HCl) Hydrogen Flouride (HF) and Bromine (Br^+) Determination 2

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6.0 TEST RESULTS SUMMARY 4

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- Sample Train Diagrams 10
- Sample Analysis Data 13
- Calculation Nomenclature and Formulas 18
- Test Data and Results (Computerized) 22
- Calibration Data 34
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GE Energy

CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

GE ENERGY MANAGEMENT SERVICES, INC.

Jeffrey M. Crivlare
Senior Project Manager

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GE Energy

1.0 INTRODUCTION

GE Energy Management Services, Inc., ("GE Energy") performed a parametric HCl, HF, Br+ emission test program on Unit 1 at the Holcomb, Kansas Facility of Sunflower Electric Power Corporation in Holcomb, Kansas on May 27, 2004. The tests were authorized by Sunflower Electric and performed for ADA-ES, Inc.

1.1 Project Contact Information

Location	Address	Contact
Test Facility	Sunflower Electric Power Corporation Holcomb, Kansas Facility Holcomb, Kansas	Mr. Wayne Penrod Plant Manager wepenrod@sunflower.net
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Travis Starns Project Engineer 303-734-1727 (phone) 303-734-0330 (fax) traviss@adaes.com
Testing Company Representative	GE Energy Management Services, Inc. 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Douglas Ryan Project Supervisor 630-530-6621 (phone) 630-530-6630 (fax) douglas.ryan@ps.ge.com

Messrs. W. Zoeteman, T. Mei, J. May, F. Gonzalez, and D. Ryan of GE Energy conducted the tests.

2.0 SUMMARY OF RESULTS

The following table summarizes test results at each of the three test locations:

Parameter	Reference Method	Air Heater Outlet/SDA Inlet (Location 1)*	Stack (Location 3)
HCl, lbs/hr	Method 26A	0.6570	0.8248
HF, lbs/hr	Method 26A	0.2411	< 0.1805
Br+, lbs/hr	Method 26A	< 0.0743	< 0.1444

*All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.

Complete test results for all test locations and parameters are appended in section 6.0 of this report.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. No problems were encountered with the testing equipment throughout the test program.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Methods 1 through 4 and 26A. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/4-77-027b was used to determine the precise procedures.

4.1 Volumetric Flowrate Determination

In order to determine the emission rate on a lbs/hr basis, the gas velocity and volumetric flowrate were determined using Method 2, 40CFR60.

Velocity pressures were determined by traversing the test locations with S-type pitot tubes. Temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method collected samples in an integrated manner and analyzed the samples using a Hays Orsat gas analyzer. Several gas extractions were performed during each test run to ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Hydrogen Chloride (HCl) Hydrogen Flouride (HF) and Bromine (Br^+) Determination

Hydrogen chloride (HCl), hydrogen fluoride (HF), and Bromine (Br^+) concentrations were determined using Method 26A, 40CFR60. An integrated sample was extracted from each gas stream and passed through dilute (0.1 N) sulfuric acid. In the dilute acid, the HCl dissolved and formed chloride (Cl) ions. The chloride ions were then analyzed by ion chromatography. The sample train

consisted of a heated glass probe liner, a heated optional filter, and four impingers. The first and second impingers contained the dilute sulfuric acid, the third impinger contained a 0.1 N sodium hydroxide (NaOH) scrubber solution to remove any remaining chlorine, and the fourth impinger contained silica gel to absorb any remaining moisture. The train was leak checked prior to and after each run. The sample was then extracted isokinetically. The samples were recovered by quantitatively transferring the contents of the first two impingers and deionized water rinses to a sample jar. The samples were mixed and labeled, and the level marked for transfer to the laboratory. The samples were then analyzed by ion chromatography.

The test trains were weighed before and after each test for moisture determination.

5.0 QUALITY ASSURANCE PROCEDURES

GE Energy recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the GE Energy laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, the same person performing the analysis performed all reagent standardizations daily.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

GE Energy

HCL, HF, AND BR TEST RESULTS SUMMARY

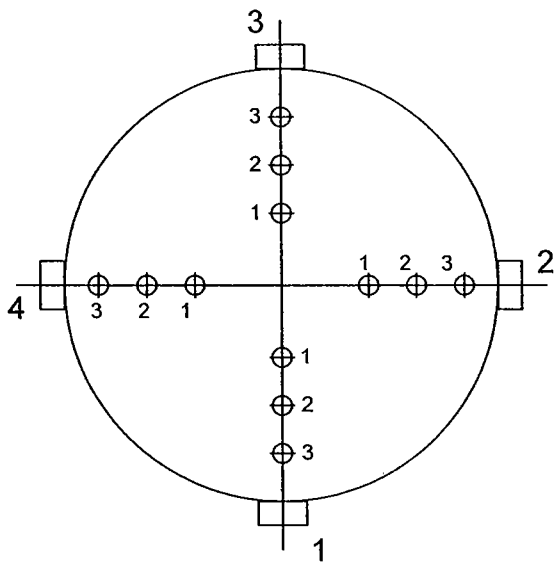
Company: Sunflower
Plant: Holcomb, KS
Unit: Air Heater Outlet

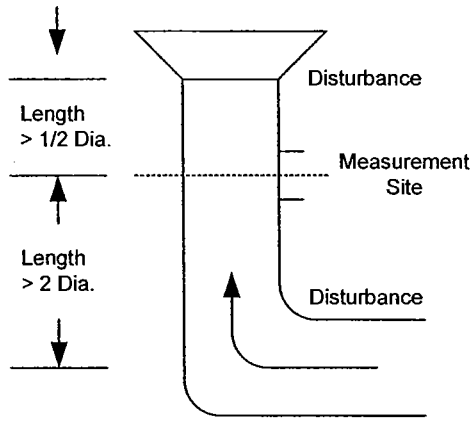
Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	5/27/2004	5/27/2004	5/27/2004	
Start Time	8:50	11:40	14:15	
End Time	11:15	13:55	16:34	
HCl Emissions				
ppm:	0.13	0.20	0.14	0.15
ug/dscm	196.54	301.25	206.56	234.78
lb/hr**	0.5508	0.8575	0.5626	0.6570
tons/yr**	2.4123	3.7557	2.4644	2.8775
lb/mmBtu	0.00016	0.00024	0.00017	0.00019
lb/Tbtu	157.73053	241.76468	165.76922	188.42148
HF Emissions				
ppm:	0.13	0.13	0.10	0.12
ug/dscm	104.82	111.33	82.62	99.59
lb/hr**	0.2937	0.3169	0.1125	0.2411
tons/yr**	1.2866	1.3880	0.4929	1.0558
lb/mmBtu	0.00008	0.00009	0.00007	0.00008
lb/Tbtu	84.12295	89.34782	66.30769	79.92615
Br Emissions*				
ppm:	0.01	0.01	0.01	0.01
ug/dscm	26.21	26.20	27.54	26.65
lb/hr**	0.0734	0.0746	0.0750	0.0743
tons/yr**	0.3216	0.3266	0.3286	0.3256
lb/mmBtu	0.00002	0.00002	0.00002	0.00002
lb/Tbtu	21.03074	21.02302	22.10256	21.38544
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	662,430	667,591	635,018	655,013
Gas Volumetric Flow Rate, dscfm	374,065	379,958	363,612	372,545
Average Gas Temperature, °F	285.1	287.6	287.6	286.8
Average Gas Velocity, ft/sec	38.071	38.367	36.495	37.644
Flue Gas Moisture, percent by volume	9.9	8.9	8.3	9.0
Average Flue Pressure, in. Hg	26.46	26.46	26.46	
Barometric Pressure, in. Hg	27.20	27.20	27.20	
Average %CO_2 by volume, dry basis	14.0	14.0	14.0	14.0
Average %O_2 by volume, dry basis	5.0	5.0	5.0	5.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.440	30.440	30.440	
Gas Sample Volume, dscf	53.905	53.925	51.291	
Isokinetic Variance	102.2	100.7	100.1	

* All Br emissions are based on sample analysis that are below the detection limit.
** All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.

APPENDIX

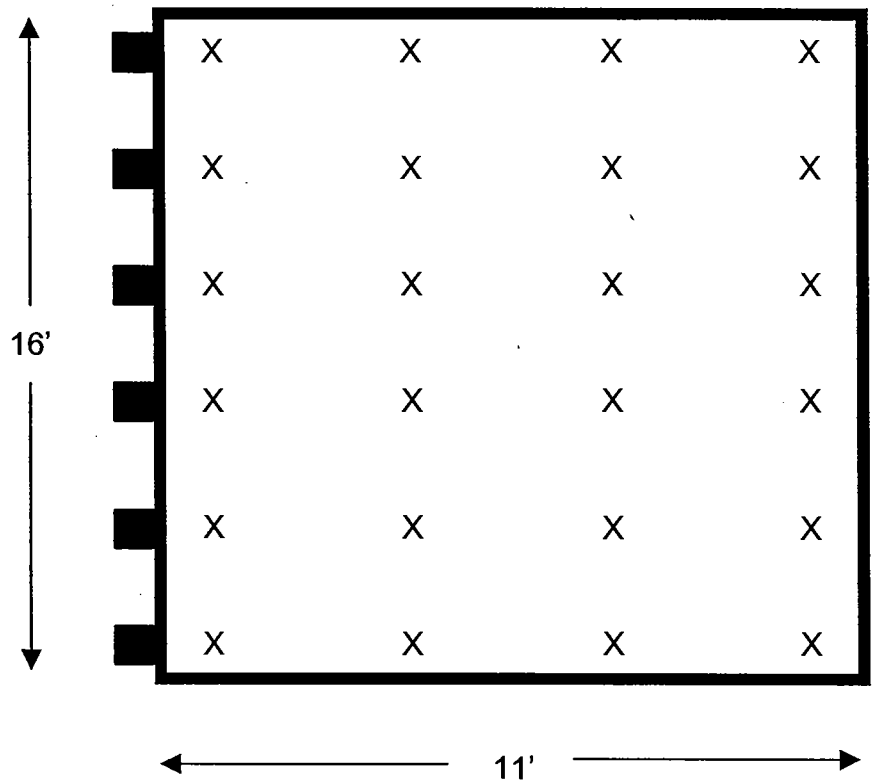
EQUAL AREA TRAVERSE FOR ROUND DUCTS





Job:	Sunflower Electric Holcomb, Kansas
Date:	May 27, 2004
Test Location:	Unit 1 Stack (Location 3)
Diameter:	16.333 feet
Area:	209.53 square feet
No. Sample Points:	12

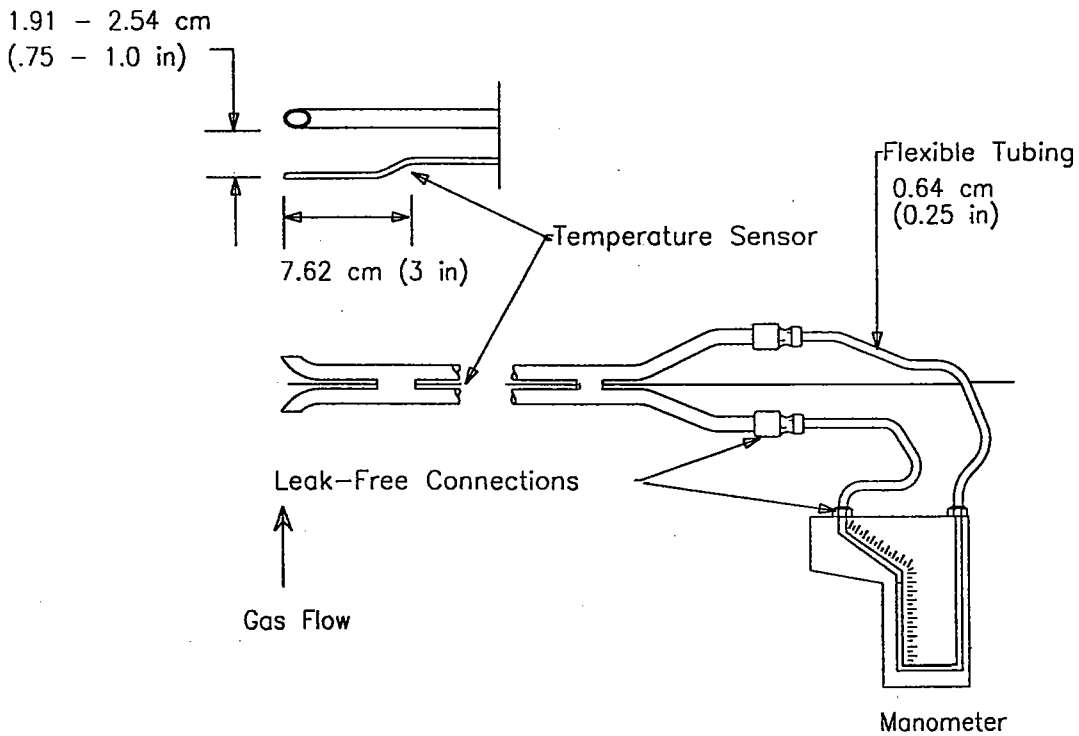
EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job:	Sunflower Electric Power Corporation Holcomb, Kansas		
Date:	May 27, 2004	Area:	176 Square Feet
Test Location:	Baghouse Inlet/SDA Outlet	No. Test Ports:	6
Length:	11 Feet	Tests Points per Port:	4
Width:	16 Feet		

S-Type Pitot Tube Manometer Assembly

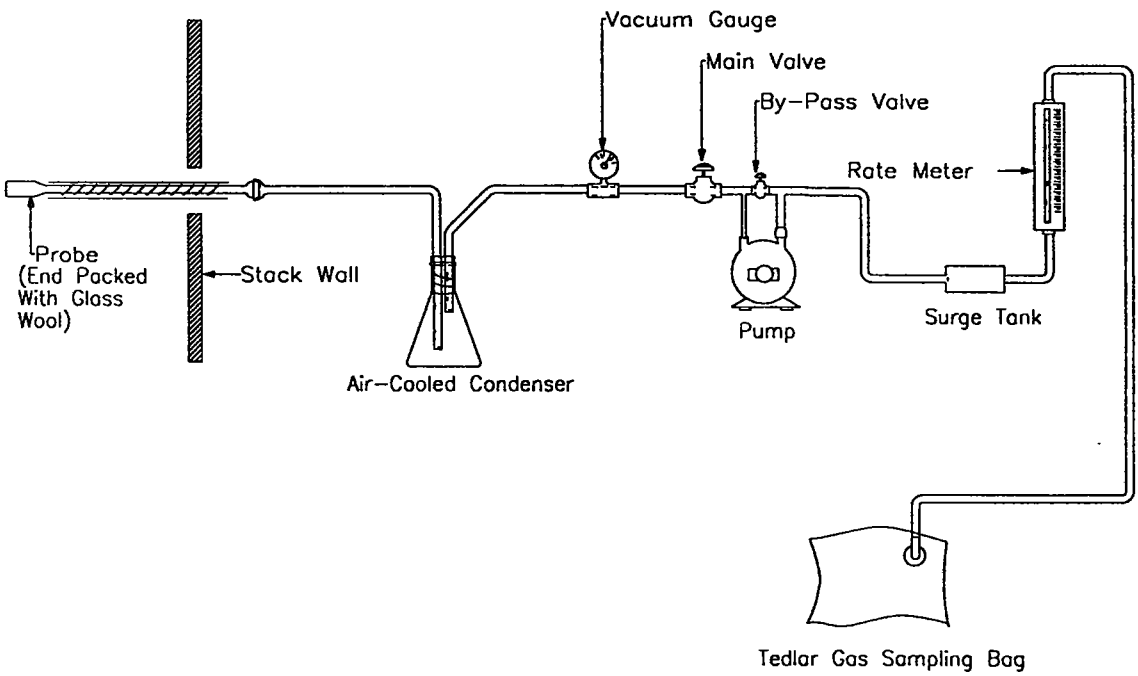
USEPA Method 2



Dwg - AD

Sampling Train for Integrated Gas Sampling

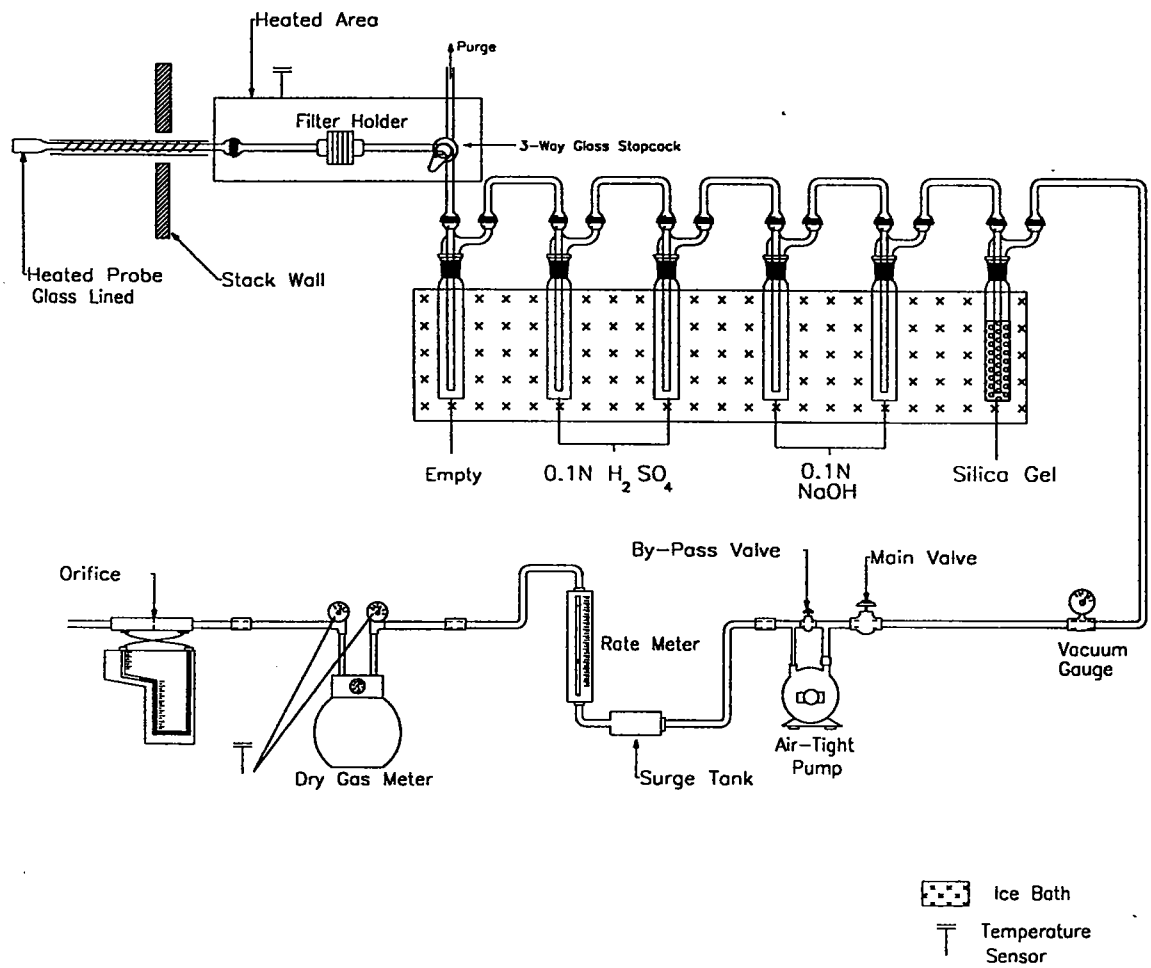
USEPA Method 3



Dwg - E

Determination of HCl, HF and Br Concentrations in Stack Gases

USEPA Method 26A Sample Train



Dwg - R

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64733
Report Date: 6/23/2004
Sample Received:
6/2/04 13:37

M22E0517-02

TEI Number: 64733 Sample: 001

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.58	mg	6/9/2004
HF (M26A)	0.16	mg	6/10/2004

TEI Number: 64734 Sample: 002

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.74	mg	6/10/2004
HF (M26A)	0.17	mg	6/10/2004

TEI Number: 64735 Sample: 003

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.58	mg	6/10/2004
HF (M26A)	0.12	mg	6/10/2004

TEI Number: 64736 Sample: 004

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.61	mg	6/10/2004
HF (M26A)	<0.1	mg	6/10/2004

Gayle E. O'Neill, Ph.D.

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LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64733
Report Date: 6/23/2004
Sample Received:
6/2/04 13:37

M22E0517-02

TEI Number: 64737 Sample: 005

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	0.57	mg	6/10/2004
HF (M26A)	<0.1	mg	6/10/2004

TEI Number: 64738 Sample: 006

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	1.03	mg	6/10/2004
HF (M26A)	<0.1	mg	6/10/2004

TEI Number: 64739 Sample: 007

JMC per Gayle O'Neill

TEST	RESULTS		DATE PERFORMED
HCl (M26A)	~~0.82~~ 0.28	mg	6/10/2004
HF (M26A)	<0.1	mg	6/10/2004

TEI Number: 64740 Sample: 008

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

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LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64733
Report Date: 6/23/2004
Sample Received:
6/2/04 13:37

M22E0517-02

TEI Number: 64741 Sample: 009

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

TEI Number: 64742 Sample: 010

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

TEI Number: 64743 Sample: 011

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

TEI Number: 64744 Sample: 012

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

TEI Number: 64745 Sample: 013

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

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LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 64733
Report Date: 6/23/2004
Sample Received:
6/2/04 13:37

M22E0517-02

TEI Number: 64746 Sample: 014

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	6/10/2004

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GE Energy

Read Instructions on Reverse Side Before Completing Form!

CHAIN OF CUSTODY RECORD

Project Number: M22E0517-02	Date Results Required:
Client: SUNFLOWER ELECTRIC / ADA	TAT Required: STD (10 DAY)
Plant/Location: HOLCOMB, KS.	PO Number: M86001082
Project Supervisor: D. RYAN	LIMS Entry: E.V.

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
001	05-27-04	AIR HEATER OUTLET #1	5	H_2SO_4 fract	M26A - HCl, HF	
002		#2				
003		#3				
004		STACK #1	4			
005		#2				
006		#3				
007		BLANK, 0.1N H_2SO_4			M26A - HCl, HF	
008	05/27	Air Heater Outl. #1	1	NaOH fract	M26A - Br_2	
009		#2	1			
010		#3	1			
011		Stack #1	1			
012		#2	1			
013		#3	1			
014		BLANK, 0.1N NaOH (1)				
015						
016						

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:
DMR TAM	05-27-04 1800	E.V. 06/1/04		

Special Instructions:

(C)

Example Calculations - Method 26A Test

Company: Sunflower
Plant: Holcomb, KS
Test Location: Air Heater Outlet
Run: 1
Date: 5/27/2004

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 14.0 $\%O_2$ = 5.0 $\%N_2$ = 81.0

Md = 30.44

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md = 30.44 Bws = 0.099

Ms = 29.21

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 0.999 Vm = 61.546 Pbar = 27.20
ΔH = 0.71 Tm = 548.5

Vm(std) = 53.905

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 125.9

Vw(std) = 5.930

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 5.930 Vm(std) = 53.905

Bws = 0.099

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P \text{ (avg)} \times (Ts \text{ (avg)} / (Ps \times Ms))^{1/2}$$

Cp = 0.841 Ts (avg) = 745.1 Sqrt ΔP (avg): 0.539
Ps = 26.46 Ms = 29.21

Vs = 38.07

Example Calculations - Method 26A Test

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs = 38.07 A = 290.000

Q = 662430

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 662430 Ps = 26.46 Ts (avg) = 745.1

Qstd = 415215

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1\text{-}Bws)$$

Qstd = 415215 Bws = 0.099

Qstd(dry) = 374065

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1\text{-}Bws)}$$

Ts = 745.1 Vm(std) = 5.930 Vs = 38.071
An = 0.000 θ = 120.0 Ps = 26.46
Bws = 0.099

%ISO = 102.2

PM Concentration:

This example represents the filterable fraction. For other fractions, use the obtained m_n for that particulate fraction.

$$Co = \frac{m_n \times 15.43}{Vm(std)}$$

m_n (g) = 0.2796 Vm(std) = 53.905

Co = 0.0800 gr/dscf

PM Emission Rate:

$$ER\ lb/hr = \frac{Co}{7000} \times Qstd(dry) \times 60$$

$$ER\ lb/mmBtu = \frac{Co}{7000} \times Fd\ (dscf/mmBtu) \times \frac{20.9}{20.9 - O2\%}$$

Co = 0.0800 Qstd(dry) = 374065

ER lb/hr = 256.612 lb/hr

ER lb/mmBtu = 0.000 lb/hr

CALCULATIONS FOR CHLORINE (HCl)

Concentration of Chlorine:

$$\frac{\text{lbs HCl}}{\text{dscf}} = \frac{\mu\text{g HCl in sample}}{4.536 \times 10^8 \times \text{dscf}}$$

where:

$4.536 \times 10^8 = \mu\text{g/lb}$

dscf = Volume of gas sampled

$$\mu\text{g/lb HCl} = \mu\text{g Cl} \times \frac{36.453}{35.453}$$

Parts Per Million v/v- Hydrogen Chloride

$$\text{ppm HCl} = \frac{\text{lbs HCl}}{\text{dscf}} \div \frac{36.453}{385 \times 10^6}$$

where:

385 = Volume of 1 lb mole of gas at 68F and 29.92 in. Hg

10^6 = Conversion of ppm v/v

VOLUMETRIC AIR FLOW CALCULATIONS

$$Vm\,(std) = 17.647 \times Vm \times \left[\frac{P_{bar} + \frac{DH}{13.6}}{(460 + Tm)} \right] \times Y$$

$$Vw\,(std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\,(std)}{Vw\,(std) + Vm\,(std)} \right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + \left[0.28 \times (100 - \%CO_2 - \%O_2)\right]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\,(of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)} \right] \times (1 - Bws)$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)} \right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E0517 **Test Date:** 5/27/2004

TEST PARAMETERS

Company:	Sunflower		**Duct Shape:**	Rectangular	
Plant:	Holcomb, KS		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E52		**Sample Plane:**	Vertical	
Meter ID:	E52		**Port Length:**		**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.20	**in. Hg.**	**Initial Impinger Content:**	300.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	404.00	**mls.**
Flue Pressure (Ps):	26.46	**in. Hg. abs.**	**Difference:**	104.00	
Sample Train Pre:	0.006		**Silica Initial Wt.**	226.20	**grams**
Leak Check Post:	0.009		**Silica Final Wt.**	248.10	**grams**
@	10	**in. Hg.**	**Difference:**	21.90	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	125.90	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.71	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	88.5	**°F**	**Gas Weight wet, Ms:**	29.207	**lb/lb mole**
Sqrt ΔP:	0.539	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	285.1	**°F**	**Gas Velocity, Vs:**	38.071	
Meter Volume, Vm:	61.546	**Cubic Feet**	**Volumetric Flow, ACFM:**	662,430	
Meter Volume, Vmstd:	53.905	**dscf**	**Volumetric Flow, DSCFM:**	374,065	
Meter Volume, Vwstd:	5.930	**wscf**	**Volumetric Flow, SCFM:**	415,215	
Moisture, Bws:	0.099		**Isokinetic Variance, %I:**	102.2	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	0.2796	---	
PM, grains/acf:	0.045	---	
PM, grains/dscf:	0.080	---	
PM, lb/hr:	256.612	---	
PM lb/mmBtu (based on Fd):	0.147	---	
HCl, HF, and Br			
mg (net) collected:	0.30	---	
ppm:	0.13	---	
ug/dscm:	196.54	---	
lb/hr:	0.2754	---	
lb/mmBtu (based on Fd):	0.00016	---	
HF			
mg (net) collected:	0.16		
ppm:	0.13	---	
ug/dscm:	104.82	---	
lb/hr:	0.1469	---	
lb/mmBtu (based on Fd):	0.00008	---	
Br		---	
mg (net) collected:	0.04		
ppm:	0.01		
ug/dscm:	26.21		
lb/hr:	0.0367		
lb/mmBtu (based on Fd):	0.00002		

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 5/27/2004
Start Time: 8:50
End Time: 11:15

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:50:00	0.41	0.94	68.00	0.640	290	83	83	2.0	3.030	45.35
-2	8:55:00	0.65	1.50	71.03	0.806	291	84	82	2.0	3.800	57.14
-3	9:00:00	0.37	0.85	74.83	0.608	290	85	83	2.0	2.296	43.08
	9:05:00			77.13							
2-1	9:07:00	0.25	0.60	78.00	0.500	280	85	85	2.0	2.360	35.17
-2	9:12:00	0.25	0.60	80.36	0.500	279	85	83	2.0	2.440	35.15
-3	9:17:00	0.25	0.60	82.80	0.500	293	85	83	2.0	2.323	35.48
	9:22:00			85.12							
3-1	9:24:00	0.23	0.76	86.00	0.480	283	86	84	2.0	2.710	33.81
-2	9:29:00	0.28	0.84	88.71	0.529	286	87	84	2.0	2.550	37.38
-3	9:34:00	0.22	0.51	91.26	0.469	291	88	85	2.0	2.311	33.24
	9:39:00			93.57							
4-1	9:41:00	0.33	0.76	94.36	0.574	284	89	88	3.0	2.713	40.52
-2	9:46:00	0.37	0.85	97.07	0.608	291	89	87	3.0	2.907	43.11
-3	9:51:00	0.25	0.60	99.98	0.500	286	89	87	5.0	2.400	35.32
	9:56:00			102.38							
5-1	10:08:00	0.37	0.85	103.48	0.608	283	90	89	5.0	2.924	42.88
-2	10:13:00	0.28	0.64	106.40	0.529	292	91	88	5.0	2.500	37.53
-3	10:18:00	0.22	0.51	108.90	0.469	279	91	88	3.0	2.237	32.97
	10:23:00			111.14							
6-1	10:25:00	0.28	0.64	112.00	0.529	276	93	91	3.0	2.500	37.12
-2	10:30:00	0.34	0.78	114.50	0.583	284	94	90	3.0	2.830	41.13
-3	10:35:00	0.26	0.60	117.33	0.510	283	95	90	3.0	2.484	35.94
	10:40:00			119.81							
7-1	10:42:00	0.25	0.60	120.94	0.500	273	93	92	2.0	2.364	35.01
-2	10:47:00	0.25	0.60	123.30	0.500	284	93	92	2.0	2.370	35.27
-3	10:52:00	0.25	0.60	125.67	0.500	291	93	92	2.0	2.473	35.43
	10:57:00			128.14							
8-1	11:00:00	0.25	0.60	129.10	0.500	281	93	92	2.0	2.280	35.20
-2	11:05:00	0.25	0.60	131.38	0.500	291	93	92	2.0	2.350	35.43
-3	11:10:00	0.25	0.60	133.73	0.500	281	94	92	2.0	2.394	35.20
	11:15:00			136.12							
			0.71	61.546	0.539	285	90	88		61.546	
							88.54				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E0517 **Test Date:** 5/27/2004

TEST PARAMETERS

Company:	Sunflower		**Duct Shape:**	Rectangular	
Plant:	Holcomb, KS		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E52		**Sample Plane:**	Vertical	
Meter ID:	E52		**Port Length:**		**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.20	**in. Hg.**	**Initial Impinger Content:**	300.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	386.00	**mls.**
Flue Pressure (Ps):	26.46	**in. Hg. abs.**	**Difference:**	86.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	215.90	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	241.60	**grams**
@	10	**in. Hg.**	**Difference:**	25.70	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	111.70	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.68	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	96.6	**°F**	**Gas Weight wet, Ms:**	29.334	**lb/lb mole**
Sqrt ΔP:	0.544	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	287.6	**°F**	**Gas Velocity, Vs:**	38.367	
Meter Volume, Vm:	62.483	**Cubic Feet**	**Volumetric Flow, ACFM:**	667,591	
Meter Volume, Vmstd:	53.925	**dscf**	**Volumetric Flow, DSCFM:**	379,958	
Meter Volume, Vwstd:	5.261	**wscf**	**Volumetric Flow, SCFM:**	417,028	
Moisture, Bws:	0.089		**Isokinetic Variance, %I:**	100.7	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.46	---	
ppm:	0.20	---	
ug/dscm:	301.25	---	
lb/hr:	0.4287	---	
lb/mmBtu (based on Fd):	0.00024	---	
HF			
mg (net) collected:	0.17		
ppm:	0.13		
ug/dscm:	111.33		
lb/hr:	0.1584		
lb/mmBtu (based on Fd):	0.00009		
Br			
mg (net) collected:	0.04		
ppm:	0.01		
ug/dscm:	26.20		
lb/hr:	0.0373		
lb/mmBtu (based on Fd):	0.00002		

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 5/27/2004
Start Time: 11:40
End Time: 13:55

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:40:00	0.36	0.83	40.40	0.600	283	95	95	2.0	2.800	42.29
-2	11:45:00	0.34	0.78	43.20	0.583	291	96	93	2.0	2.800	41.32
-3	11:50:00	0.27	0.62	46.00	0.520	289	96	93	2.0	2.513	36.78
	11:55:00			48.51							
2-1	11:57:00	0.36	0.83	49.50	0.600	284	96	93	2.0	2.800	42.32
-2	12:02:00	0.27	0.62	52.30	0.520	283	97	93	2.0	2.510	36.63
-3	12:07:00	0.25	0.57	54.81	0.500	283	96	94	2.0	2.406	35.25
	12:12:00			57.22							
3-1	12:14:00	0.32	0.73	58.20	0.566	290	97	95	2.0	2.700	40.06
-2	12:19:00	0.36	0.83	60.90	0.600	289	97	95	2.0	2.810	42.46
-3	12:24:00	0.25	0.57	63.71	0.500	290	97	95	2.0	2.413	35.41
	12:29:00			66.12							
4-1	12:31:00	0.32	0.73	67.00	0.566	290	97	95	2.0	2.600	40.06
-2	12:36:00	0.27	0.62	69.60	0.520	287	97	95	2.0	2.700	36.73
-3	12:41:00	0.34	0.73	72.30	0.583	291	97	95	2.0	2.593	41.32
	12:46:00			74.89							
5-1	12:48:00	0.36	0.83	75.30	0.600	291	97	95	2.0	2.870	42.52
-2	12:53:00	0.27	0.62	78.17	0.520	280	97	95	2.0	2.530	36.55
-3	12:58:00	0.25	0.57	80.70	0.500	296	97	95	2.0	2.446	35.55
	13:03:00			83.15							
6-1	13:05:00	0.36	0.83	84.00	0.600	291	98	96	2.0	2.900	42.52
-2	13:10:00	0.25	0.57	86.90	0.500	291	99	96	2.0	2.500	35.43
-3	13:15:00	0.25	0.57	89.40	0.500	280	100	96	2.0	2.364	35.17
	13:20:00			91.76							
7-1	13:23:00	0.26	0.60	92.10	0.510	291	101	97	3.0	2.470	36.14
-2	13:28:00	0.32	0.73	94.57	0.566	278	101	97	3.0	2.630	39.74
-3	13:33:00	0.27	0.62	97.20	0.520	293	101	97	3.0	2.514	36.87
	13:38:00			99.71							
8-1	13:40:00	0.32	0.73	100.00	0.566	290	101	98	3.0	2.700	40.06
-2	13:45:00	0.26	0.60	102.70	0.510	286	101	97	3.0	2.330	36.02
-3	13:50:00	0.27	0.62	105.03	0.520	286	101	97	3.0	2.584	36.70
	13:55:00			107.61							
			0.68	62.483	0.544	288	98	95		62.483	
							96.65				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E0517 **Test Date:** 5/27/2004

TEST PARAMETERS

Company:	Sunflower		**Duct Shape:**	Rectangular	
Plant:	Holcomb, KS		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	J. May				
Temp ID:	E52		**Sample Plane:**	Vertical	
Meter ID:	E52		**Port Length:**		**in.**
Meter Calibration Factor:	0.999		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.20	**in. Hg.**	**Initial Impinger Content:**	300.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	382.00	**mls.**
Flue Pressure (Ps):	26.46	**in. Hg. abs.**	**Difference:**	82.00	
Sample Train Pre:	0.001		**Silica Initial Wt.**	212.70	**grams**
Leak Check Post:	0.007		**Silica Final Wt.**	229.80	**grams**
@	12	**in. Hg.**	**Difference:**	17.10	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	99.10	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.61	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	103.8	**°F**	**Gas Weight wet, Ms:**	29.402	**lb/lb mole**
Sqrt ΔP:	0.518	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	287.6	**°F**	**Gas Velocity, Vs:**	36.495	
Meter Volume, Vm:	60.205	**Cubic Feet**	**Volumetric Flow, ACFM:**	635,018	
Meter Volume, Vmstd:	51.291	**dscf**	**Volumetric Flow, DSCFM:**	363,612	
Meter Volume, Vwstd:	4.668	**wscf**	**Volumetric Flow, SCFM:**	396,702	
Moisture, Bws:	0.083		**Isokinetic Variance, %I:**	100.1	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.30	---	
ppm:	0.14	---	
ug/dscm:	206.56	---	
lb/hr:	0.2813	---	
lb/mmBtu (based on Fd):	0.00017	---	
HF			
mg (net) collected:	0.12		
ppm:	0.10		
ug/dscm:	82.62		
lb/hr:	0.1125		
lb/mmBtu (based on Fd):	0.00007		
Br			
mg (net) collected:	0.04		
ppm:	0.01		
ug/dscm:	27.54		
lb/hr:	0.0375		
lb/mmBtu (based on Fd):	0.00002		

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 5/27/2004
Start Time: 14:15
End Time: 16:34

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	14:15:00	0.34	0.78	7.74	0.583	270	103	103	3.0	2.759	40.74
-2	14:20:00	0.29	0.67	10.50	0.539	282	103	101	3.0	2.600	37.93
-3	14:25:00	0.26	0.60	13.10	0.510	291	103	101	3.0	2.416	36.14
	14:30:00			15.52							
2-1	14:33:00	0.34	0.78	16.20	0.583	293	102	102	3.0	2.800	41.38
-2	14:38:00	0.29	0.67	19.00	0.539	291	102	102	3.0	2.510	38.16
-3	14:43:00	0.26	0.60	21.51	0.510	290	102	102	3.0	2.452	36.11
	14:48:00			23.96							
3-1	14:53:00	0.31	0.71	24.51	0.557	290	103	103	3.0	2.587	39.43
-2	14:58:00	0.25	0.57	27.10	0.500	287	103	103	3.0	2.310	35.34
-3	15:03:00	0.25	0.57	29.41	0.500	276	103	103	3.0	2.350	35.08
	15:08:00			31.76							
4-1	15:11:00	0.25	0.57	32.40	0.500	279	104	103	2.0	2.400	35.15
-2	15:16:00	0.29	0.67	34.80	0.539	284	104	103	2.0	2.500	37.99
-3	15:21:00	0.27	0.52	37.30	0.520	293	104	103	2.0	3.536	36.87
	15:26:00			40.84							
5-1	15:28:00	0.30	0.69	41.70	0.548	291	105	104	2.0	2.600	38.82
-2	15:33:00	0.27	0.62	44.30	0.520	289	105	104	2.0	2.500	36.78
-3	15:38:00	0.25	0.57	46.80	0.500	274	105	104	2.0	2.393	35.03
	15:43:00			49.19							
6-1	15:45:00	0.23	0.53	50.00	0.480	293	105	103	2.0	2.270	34.03
-2	15:50:00	0.25	0.57	52.27	0.500	290	105	103	2.0	2.430	35.41
-3	15:55:00	0.27	0.62	54.70	0.520	291	105	103	2.0	2.403	36.82
	16:00:00			57.10							
7-1	16:02:00	0.25	0.57	57.64	0.500	293	106	105	3.0	2.357	35.48
-2	16:07:00	0.27	0.62	60.00	0.520	291	106	105	3.0	2.600	36.82
-3	16:12:00	0.23	0.53	62.60	0.480	294	106	105	3.0	2.313	34.06
	16:17:00			64.91							
8-1	16:19:00	0.25	0.57	65.70	0.500	291	106	105	3.0	2.400	35.43
-2	16:24:00	0.25	0.57	68.10	0.500	286	106	105	3.0	2.400	35.32
-3	16:29:00	0.25	0.57	70.50	0.500	293	106	105	3.0	2.319	35.48
	16:34:00			72.82							
			0.61	60.205	0.518	288	104	103		60.205	
							103.79				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E0517 **Test Date:** 5/27/2004

TEST PARAMETERS

Company:	Sunflower		**Duct Shape:**	Circular	
Plant:	Holcomb, KS		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T. Mei				
Temp ID:	E51		**Sample Plane:**	Horizontal	
Meter ID:	E51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	300.00	**mls.**
Static Pressure:	-1.50	**in. H_2O**	**Final Impinger Content:**	510.00	**mls.**
Flue Pressure (Ps):	26.89	**in. Hg. abs.**	**Difference:**	210.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	214.40	**grams**
Leak Check Post:	0.005		**Silica Final Wt.**	236.10	**grams**
@	10	**in. Hg.**	**Difference:**	21.70	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	231.70	
Oxygen:	7.0	**%**			
Nitrogen:	80.5	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.84	**Inches H_2O**	**Gas Weight dry, Md:**	30.280	**lb/lb mole**
Meter Temperature, Tm:	98.8	**°F**	**Gas Weight wet, Ms:**	28.416	**lb/lb mole**
Sqrt ΔP:	1.608	**Inches H_2O**	**Excess Air:**	49.116	**%**
Stack Temperature, Ts:	190.2	**°F**	**Gas Velocity, Vs:**	106.015	
Meter Volume, Vm:	71.153	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,332,234	
Meter Volume, Vmstd:	60.997	**dscf**	**Volumetric Flow, DSCFM:**	824,767	
Meter Volume, Vwstd:	10.913	**wscf**	**Volumetric Flow, SCFM:**	972,328	
Moisture, Bws:	0.152		**Isokinetic Variance, %I:**	105.2	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	0.2796	---	
PM, grains/acf:	0.044	---	
PM, grains/dscf:	0.071	---	
PM, lb/hr:	500.011	---	
PM lb/mmBtu (based on Fd):	0.149	---	
HCl, HF, and Br			
mg (net) collected:	0.33	---	
ppm:	0.13	---	
ug/dscm:	191.06	---	
lb/hr:	0.5902	---	
lb/mmBtu (based on Fd):	0.00018	---	
HF			
mg (net) collected:	0.10		
ppm:	0.07		
ug/dscm:	57.90		
lb/hr:	0.1789		
lb/mmBtu (based on Fd):	0.00005		
Br			
mg (net) collected:	0.04		
ppm:	0.01		
ug/dscm:	23.16		
lb/hr:	0.0715		
lb/mmBtu (based on Fd):	0.00002		

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Stack

Test Run: 1 **Test Date:** 5/27/2004
Start Time: 8:50
End Time: 10:56

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:50:00	2.90	0.94	10.99	1.703	190	92	91	4.0	3.140	112.25
-1	8:55:00	2.90	0.94	14.13	1.703	190	93	91	4.0	3.110	112.25
-2	9:00:00	2.80	0.91	17.24	1.673	192	97	92	4.0	3.113	110.47
-2	9:05:00	2.80	0.91	20.35	1.673	192	98	93	4.0	3.068	110.47
-3	9:10:00	2.20	0.72	23.42	1.483	190	99	93	4.0	2.742	97.77
-3	9:15:00	2.20	0.72	26.16	1.483	190	100	93	4.0	2.756	97.77
	9:20:00			28.91							
2-1	9:22:00	2.70	0.88	28.91	1.643	190	99	94	4.0	3.025	108.31
-1	9:27:00	2.70	0.88	31.94	1.643	190	99	94	4.0	3.038	108.31
-2	9:32:00	2.60	0.85	34.98	1.612	191	101	95	4.0	2.986	106.37
-2	9:37:00	2.60	0.85	37.96	1.612	191	101	95	4.0	2.987	106.37
-3	9:42:00	2.30	0.75	40.95	1.517	190	102	96	4.0	2.760	99.97
-3	9:47:00	2.30	0.75	43.71	1.517	190	102	96	4.0	2.784	99.97
	9:52:00			46.49							
3-1	9:54:00	2.80	0.91	46.49	1.673	189	102	97	4.0	3.101	110.22
-1	9:59:00	2.80	0.91	49.60	1.673	189	102	97	4.0	3.069	110.22
-2	10:04:00	2.70	0.88	52.66	1.643	190	104	98	4.0	3.045	108.31
-2	10:09:00	2.70	0.88	55.71	1.643	190	104	98	4.0	3.026	108.31
-3	10:14:00	2.40	0.78	58.74	1.549	190	105	99	4.0	2.867	102.12
-3	10:19:00	2.40	0.78	61.60	1.549	190	105	99	4.0	2.838	102.12
	10:24:00			64.44							
4-1	10:26:00	2.80	0.91	64.44	1.673	190	103	99	4.0	3.076	110.30
-1	10:31:00	2.80	0.91	67.52	1.673	190	103	99	4.0	3.104	110.30
-2	10:36:00	2.70	0.88	70.62	1.643	190	105	100	4.0	3.043	108.31
-2	10:41:00	2.70	0.88	73.66	1.643	190	105	100	4.0	3.037	108.31
-3	10:46:00	2.20	0.72	76.70	1.483	190	105	100	4.0	2.736	97.77
-3	10:51:00	2.20	0.72	79.44	1.483	190	105	100	4.0	2.702	97.77
	10:56:00			82.14							
			0.84	71.153	1.608	190	101	96		71.153	
							98.75				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E0517 **Test Date:** 5/27/2004

TEST PARAMETERS

Company:	Sunflower		**Duct Shape:**	Circular	
Plant:	Holcomb, KS		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T. Mei				
Temp ID:	E51		**Sample Plane:**	Horizontal	
Meter ID:	E51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.003		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	722A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.150	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	300.00	**mls.**
Static Pressure:	-1.50	**in. H_2O**	**Final Impinger Content:**	508.00	**mls.**
Flue Pressure (Ps):	26.89	**in. Hg. abs.**	**Difference:**	208.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	209.80	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	226.50	**grams**
@	10	**in. Hg.**	**Difference:**	16.70	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	224.70	
Oxygen:	7.3	**%**			
Nitrogen:	80.2	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.85	**Inches H_2O**	**Gas Weight dry, Md:**	30.292	**lb/lb mole**
Meter Temperature, Tm:	103.6	**°F**	**Gas Weight wet, Ms:**	28.465	**lb/lb mole**
Sqrt ΔP:	1.612	**Inches H_2O**	**Excess Air:**	52.621	**%**
Stack Temperature, Ts:	190.4	**°F**	**Gas Velocity, Vs:**	106.717	
Meter Volume, Vm:	71.321	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,341,060	
Meter Volume, Vmstd:	60.619	**dscf**	**Volumetric Flow, DSCFM:**	832,968	
Meter Volume, Vwstd:	10.583	**wscf**	**Volumetric Flow, SCFM:**	978,394	
Moisture, Bws:	0.149		**Isokinetic Variance, %I:**	103.6	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
Sample ID:			
Item:	**Filter**	---	
PM, grams (net) collected:	---	---	
PM, grains/acf:	---	---	
PM, grains/dscf:	---	---	
PM, lb/hr:	---	---	
PM lb/mmBtu (based on Fd):	#VALUE!	---	
HCl, HF, and Br			
mg (net) collected:	0.29	---	
ppm:	0.11	---	
ug/dscm:	168.94	---	
lb/hr:	0.5271	---	
lb/mmBtu (based on Fd):	0.00016	---	
HF			
mg (net) collected:	0.10		
ppm:	0.07		
ug/dscm:	58.26		
lb/hr:	0.1818		
lb/mmBtu (based on Fd):	0.00005		
Br			
mg (net) collected:	0.04		
ppm:	0.01		
ug/dscm:	23.30		
lb/hr:	0.0727		
lb/mmBtu (based on Fd):	0.00002		

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Stack

Test Run: 2 **Test Date:** 5/27/2004
Start Time: 11:41
End Time: 13:46

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:41:00	2.80	0.91	82.45	1.673	190	99	99	4.0	3.109	110.30
-1	11:46:00	2.80	0.91	85.56	1.673	190	100	99	4.0	3.067	110.30
-2	11:51:00	2.70	0.88	88.63	1.643	190	103	99	4.0	3.020	108.31
-2	11:56:00	2.70	0.88	91.65	1.643	190	104	100	4.0	3.047	108.31
-3	12:01:00	2.20	0.72	94.70	1.483	189	104	100	4.0	2.713	97.70
-3	12:06:00	2.20	0.72	97.41	1.483	189	104	100	4.0	2.749	97.70
	12:11:00			100.16							
2-1	12:13:00	2.90	0.94	100.16	1.703	190	104	100	4.0	3.141	112.25
-1	12:18:00	2.90	0.94	103.30	1.703	190	104	100	4.0	3.120	112.25
-2	12:23:00	2.80	0.91	106.42	1.673	190	104	100	4.0	3.086	110.30
-2	12:28:00	2.80	0.91	109.51	1.673	190	104	100	4.0	3.109	110.30
-3	12:33:00	2.40	0.78	112.62	1.549	190	105	100	4.0	2.855	102.12
-3	12:38:00	2.40	0.78	115.47	1.549	190	105	100	4.0	2.865	102.12
	12:43:00			118.34							
3-1	12:45:00	2.80	0.91	118.34	1.673	190	106	101	5.0	3.087	110.30
-1	12:50:00	2.90	0.91	121.42	1.703	190	106	101	5.0	3.090	112.25
-2	12:55:00	2.70	0.88	124.51	1.643	190	106	101	5.0	3.024	108.31
-2	13:00:00	2.70	0.88	127.54	1.643	190	106	101	5.0	3.034	108.31
-3	13:05:00	2.30	0.75	130.57	1.517	188	109	103	5.0	2.798	99.81
-3	13:10:00	2.30	0.75	133.37	1.517	188	109	103	5.0	2.804	99.81
	13:15:00			136.17							
4-1	13:16:00	2.70	0.88	136.17	1.643	190	109	104	5.0	3.022	108.31
-1	13:21:00	2.70	0.88	139.19	1.643	190	109	104	5.0	3.063	108.31
-2	13:26:00	2.60	0.85	142.26	1.612	196	110	104	5.0	2.963	106.78
-2	13:31:00	2.60	0.85	145.22	1.612	196	110	104	5.0	2.971	106.78
-3	13:36:00	2.30	0.75	148.19	1.517	192	110	104	5.0	2.800	100.12
-3	13:41:00	2.30	0.75	150.99	1.517	192	110	104	5.0	2.784	100.12
	13:46:00			153.78							
			0.85	71.321	1.612	190	106	101		71.321	
							103.56				

Field Notes/Comments:

TRAVERSE DATA: Method 26A

Company: Sunflower
Plant: Holcomb, KS
Location: Stack

Test Run: 3 **Test Date:** 5/27/2004
Start Time: 14:15
End Time: 16:18

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	14:15:00	2.70	0.88	55.78	1.643	193	107	106	4.0	3.027	108.56
-1	14:20:00	2.70	0.88	58.81	1.643	193	108	106	4.0	3.042	108.56
-2	14:25:00	2.50	0.81	61.85	1.581	198	109	106	4.0	2.911	104.86
-2	14:30:00	2.50	0.81	64.76	1.581	198	110	107	4.0	2.931	104.86
-3	14:35:00	2.40	0.78	67.69	1.549	196	110	107	4.0	2.837	102.59
-3	14:40:00	2.40	0.78	70.53	1.549	196	110	107	4.0	2.873	102.59
	14:45:00			73.40							
2-1	14:46:00	2.80	0.94	73.40	1.673	190	113	107	4.0	3.158	110.30
-1	14:51:00	2.80	0.94	76.56	1.673	190	113	107	4.0	3.192	110.30
-2	14:56:00	2.70	0.90	79.75	1.643	191	114	107	4.0	3.119	108.40
-2	15:01:00	2.70	0.90	82.87	1.643	191	114	107	4.0	3.102	108.40
-3	15:06:00	2.20	0.73	85.98	1.483	190	114	107	4.0	2.814	97.77
-3	15:11:00	2.20	0.73	88.79	1.483	190	113	107	4.0	2.814	97.77
	15:16:00			91.60							
3-1	15:17:00	2.90	0.97	91.60	1.703	191	110	108	4.0	3.223	112.34
-1	15:22:00	2.90	0.97	94.83	1.703	191	111	108	4.0	3.236	112.34
-2	15:27:00	2.80	0.94	98.06	1.673	190	111	108	4.0	3.179	110.30
-2	15:32:00	2.80	0.94	101.24	1.673	190	112	109	4.0	3.171	110.30
-3	15:37:00	2.40	0.80	104.41	1.549	190	112	109	4.0	2.934	102.12
-3	15:42:00	2.40	0.80	107.35	1.549	190	113	109	4.0	2.923	102.12
	15:47:00			110.27							
1-1	15:48:00	2.80	0.94	110.27	1.673	189	111	108	4.0	3.175	110.22
-1	15:53:00	2.80	0.94	113.44	1.673	189	112	109	4.0	3.163	110.22
-2	15:58:00	2.70	0.90	116.61	1.643	190	114	110	4.0	3.121	108.31
-2	16:03:00	2.70	0.90	119.73	1.643	190	114	110	4.0	3.114	108.31
-3	16:08:00	2.30	0.77	122.84	1.517	188	115	110	4.0	2.882	99.81
-3	16:13:00	2.30	0.77	125.72	1.517	188	115	110	4.0	2.870	99.81
	16:18:00			128.59							
			0.86	72.811	1.611	191	112	108		72.811	
							109.88				

Field Notes/Comments:

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

NOZZLES

The nozzles are measured according to Method 5, Section 5.1.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

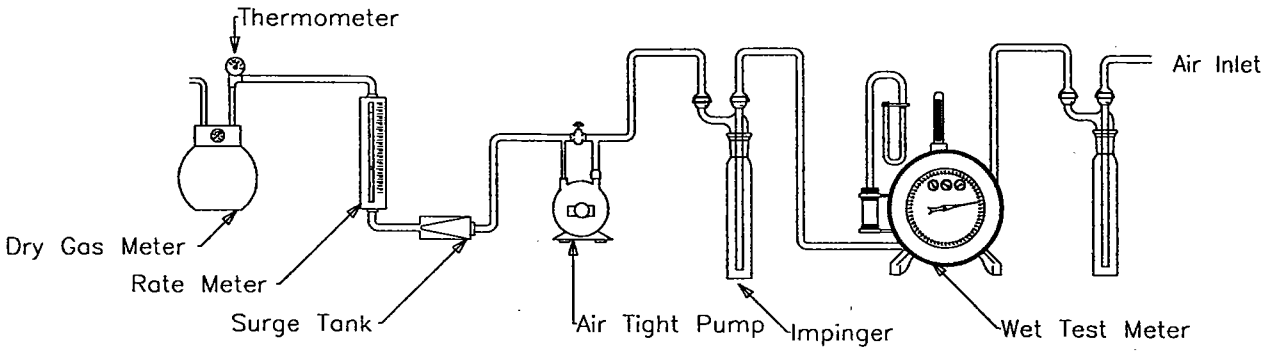
DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Gas Meter Calibration Train



Dwg - AF

METER BOX CALIBRATION

Dry Gas Meter No.	E52	Date:	04-27-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.43

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			107.107	17.185	65	78	76					
Inital			102.106	12.077	65	78	74					
Difference	1	0.20	5.001	5.108	65	78	75	77	18	32	1.000	1.519
Final			112.251	22.427	66	80	77					
Inital			107.248	17.324	66	78	76					
Difference	2	0.50	5.003	5.103	66	79	77	78	12	7	1.001	1.624
Final			96.872	6.780	65	74	71					
Inital			91.870	1.705	65	73	69					
Difference	3	0.70	5.002	5.075	65	74	70	72	10	21	0.997	1.672
Final			117.332	27.603	66	81	77					
Inital			112.331	22.511	66	80	77					
Difference	4	0.90	5.001	5.092	66	81	77	79	9	13	1.004	1.690
Final			122.418	32.779	66	82	78					
Inital			117.417	27.692	66	81	77					
Difference	5	1.20	5.001	5.087	66	82	78	80	8	4	1.005	1.724
Final			102.022	12.052	65	78	74					
Inital			97.017	6.930	65	75	71					
Difference	6	2.00	5.005	5.122	65	77	73	75	6	20	0.990	1.778
									Average		0.999	1.668

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E52 Name: PSH

Ambient Temperature: 65 °F Date: 04-27-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference* Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	600	0.0
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E52	Date:	06-01-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.01

Formula Protection Password: MPA

Run Number	Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final		62.713	106.125	63	80	74					
Inital		57.415	100.664	63	79	72					
Difference 1	0.20	5.298	5.461	63	80	73	76	19	3	0.994	1.440
Final		67.803	111.373	64	83	76					
Inital		62.802	106.213	63	80	74					
Difference 2	0.50	5.001	5.160	64	82	75	78	11	53	0.995	1.570
Final		52.212	95.338	63	77	70					
Inital		47.211	90.211	63	73	68					
Difference 3	0.70	5.001	5.127	63	75	69	72	10	5	0.990	1.598
Final		73.054	116.800	64	85	78					
Inital		67.937	111.522	64	83	76					
Difference 4	0.90	5.117	5.278	64	84	77	81	9	10	0.998	1.602
Final		80.114	124.081	64	86	79					
Inital		75.023	118.826	64	85	78					
Difference 5	1.20	5.091	5.255	64	86	79	82	7	59	0.999	1.632
Final		57.378	100.618	63	79	72					
Inital		52.297	95.433	63	77	70					
Difference 6	2.00	5.081	5.185	63	78	71	75	6	23	0.996	1.764
								Average		0.996	1.601

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E52 Name: PSH

Ambient Temperature: 63 °F Date: 06-01-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference* Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	600	0.0
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	04-13-04
Standard Meter No.	3623853	Calibrated By:	PSH
Standard Meter (Yr)	0.9973	Barometric Pressure :	29.45

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			113.436	36.077	65	76	69					
Inital			107.534	30.124	65	74	68					
Difference	1	0.20	5.902	5.953	65	75	69	72	21	4	1.004	1.421
Final			118.603	41.293	65	77	70					
Inital			113.514	36.141	65	76	69					
Difference	2	0.50	5.089	5.152	65	77	70	73	11	58	1.002	1.538
Final			102.331	24.916	65	73	66					
Inital			96.922	19.497	65	71	65					
Difference	3	0.70	5.409	5.419	65	72	66	69	10	45	1.004	1.550
Final			123.784	46.539	65	79	73					
Inital			118.784	41.481	65	77	71					
Difference	4	0.90	5.000	5.058	65	78	72	75	8	50	1.005	1.557
Final			28.874	51.710	65	81	74					
Inital			23.872	46.626	65	79	73					
Difference	5	1.20	5.002	5.084	65	80	74	77	7	45	1.003	1.591
Final			107.469	30.067	65	74	68					
Inital			102.467	25.049	65	73	66					
Difference	6	2.00	5.002	5.018	65	74	67	70	6	9	1.002	1.691
									Average		1.003	1.558

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 65 °F Date: 04-13-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference* Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	601	0.1
1200	1201	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	06-22-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.41

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			42.420	51.122	72	76	75					
Inital			37.399	46.121	72	76	74					
Difference	1	0.20	5.021	5.001	72	76	75	75	18	34	1.010	1.558
Final			47.474	56.177	72	78	76					
Inital			42.469	51.174	72	76	75					
Difference	2	0.50	5.005	5.003	72	77	76	76	11	52	1.007	1.598
Final			32.264	40.992	71	75	73					
Inital			27.254	35.991	71	73	72					
Difference	3	0.70	5.010	5.001	71	74	73	73	10	6	1.004	1.620
Final			52.568	61.294	72	80	77					
Inital			47.567	56.267	72	78	76					
Difference	4	0.90	5.001	5.027	72	79	77	78	9	4	1.003	1.677
Final			57.684	66.459	72	82	78					
Inital			52.683	61.411	72	80	77					
Difference	5	1.20	5.001	5.048	72	81	78	79	8	1	1.001	1.743
Final			37.357	46.089	71	77	74					
Inital			32.348	41.082	71	75	73					
Difference	6	2.00	5.009	5.007	71	76	74	75	6	24	1.002	1.854
									Average		1.005	1.675

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 71 °F Date: 06-22-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	600	0.0
1200	1200	0.0

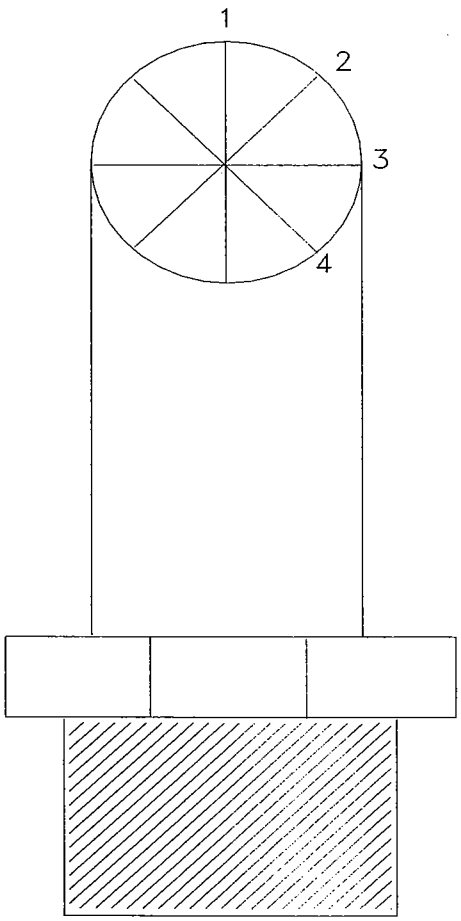
$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

Nozzle Calibration

Date: 5/27/2004

Nozzle ID No.: N/A

Analyst: JM



Pre Test		Post Test
0.251	1	√
0.250	2	√
0.250	3	√
0.250	4	√

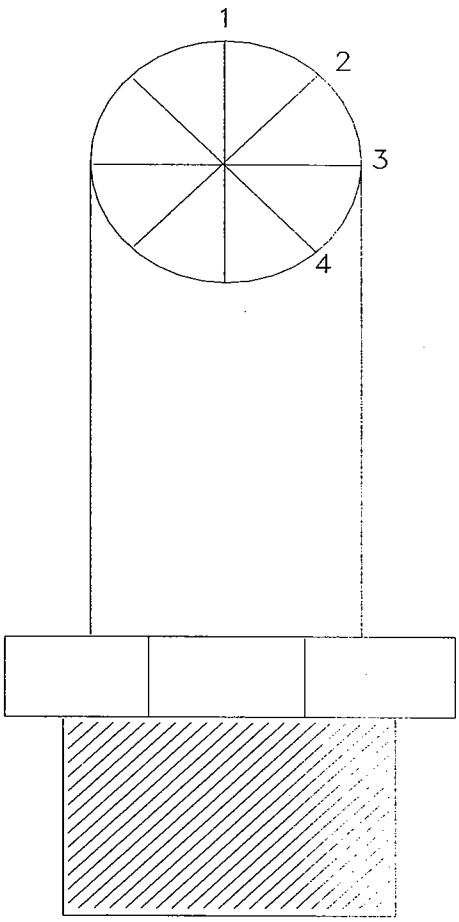
Average
0.250

Nozzle Calibration

Date: 5/27/2004

Nozzle ID No.: N/A

Analyst: TM



Pre Test		Post Test
0.150	1	√
0.150	2	√
0.149	3	√
0.150	4	√

Average
0.150

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 26A Test Run No. 1 Run Date: 5/27/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet
Source Condition: N
Test Engineer: JM
Temp ID: E52
Meter ID: E52
Meter Calibration Factor: .999
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6 ft
Probe Liner Material: teflon
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4
Port Type: Nip
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.20
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.46
Sample Train Leak Check: Pre: .006 Post: .009 @ 10/12 in. Hg
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet

List Test Method Used: 2A
Test Run No. 1
Date: 5/27/01 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	850	.41	.94	68.00	.640	.605	3.024	—	290	252	N/A	68	83	83	2
2	855	.65	1.50	71.03	.806	.761	3.807	71.024	291	254		=	84	82	2
3	900	.37	.85	74.33	.608	.574	2.872	74.831	290	255			85	83	2
	905			77.126				77.703							
1	907	.25	.60	78.000	.50	.472	2.361	—	280	251			85	85	2
2	912	.25	.60	80.36	.50	.472	2.361	80.361	279	254			85	83	2
3	917	.25	.60	82.80	.50	.472	2.361	82.722	293	253			85	83	2
	922			85.123				85.083							
1	924	.33	.76	86.000	.574	.542	2.713	—	283	254			86	84	2
2	929	.28	.64	88.71	.529	.500	2.499	88.713	286	252			87	84	2
3	934	.22	.51	91.26	.469	.443	2.215	91.212	291	251			88	85	2
	939			93.571				93.427							
1	941	.33	.76	94.360	.574	.542	2.713	—	284	251			89	88	3
2	946	.37	.85	97.073	.608	.574	2.872	97.073	291	252			89	87	3
3	951	.25	.60	99.98	.50	.472	2.361	99.945	286	256			89	87	3
	956			102.38				102.306							
1	958	.37	.85	103.476	.608	.574	2.872	—	283	252			90	89	5
2	1013	.28	.64	106.40	.529	.500	2.499	106.341	292	251			91	89	5
3	1018	.22	.51	108.90	.469	.443	2.215	108.848	279	251			91	88	3
	1023			111.137				111.06							
1	1025	.28	.64	112.00	.529	.500	2.499	—	276	253			93	91	3
2	1030	.34	.78	114.50	.583	.551	2.753	114.499	281	249			94	90	3
3	1035	.26	.60	117.33	.51	.482	2.408	117.252	283	251			95	90	3
	1040			119.814				119.660							

= Data does not get entered in Excel

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet

List Test Method Used: 26A
Test Run No. 1
Date: 5/27/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1042	.25	.60	120.936	.50	.472	2.361	—	273	253	NA	68	93	92	2
2	1047	.25	.60	123.30	.50	.472	2.361	123.297	284	254		=	93	92	2
3	1052	.25	.60	125.67	.50	.472	2.361	125.658	291	251			93	92	2
	1057			128.143				128.019							
1	1100	.25	.60	129.100	.50	.472	2.361	—	281	252			93	92	2
2	1105	.25	.60	131.30	.50	.472	2.361	131.361	291	252			93	92	2
3	1110	.25	.60	133.73	.50	.472	2.361	133.722	281	252			94	92	2
	1115			136.124				136.0833							

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ISOKINETIC TEST DATA

List Method Used: 26A Test Run No. 2 Run Date: 5/27/04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet
Source Condition: N
Test Engineer: JM
Temp ID: ES2
Meter ID: ES2
Meter Calibration Factor: .999
Pitot ID:
Pitot Tube Coefficient: .840
Probe Length (ft.): 6
Probe Liner Material:
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft):
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4
Port Type: Nip
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): ~~[illegible]~~ 27.20
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 27.46
Sample Train Leak Check: Pre: .004 Post: .009 @ 10/23 in. Hg
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 12
Oxygen (%): 8
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet

List Test Method Used: 264
Test Run No. 2
Date: 5/27/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1140	.36	.83	40.40	.60	.567	2.833	—	283	253	NA	68	95	95	2
2	1145	.34	.78	43.20	.58	.551	2.753	43.233	291	251			96	93	2
3	1150	.27	.62	46.00	.52	.490	2.454	45.986	289	249			96	93	2
	1155			48.513				48.44							
1	1157	.36	.83	49.50	.60	.567	2.833	—	284	251			96	93	2
2	1202	.27	.62	52.30	.52	.490	2.454	52.333	283	247			97	93	2
3	1207	.25	.57	54.81	.50	.472	2.361	54.787	283	256			96	94	2
	1212			57.216				57.140							
1	1214	.32	.73	58.200	.57	.534	2.671	—	290	247			97	95	2
2	1219	.36	.83	60.90	.60	.567	2.833	60.871	289	253			97	95	2
3	1224	.25	.57	63.71	.50	.472	2.361	63.704	290	251			97	90	2
	1229			66.123				66.065							
1	1231	.32	.73	67.000	.57	.534	2.671	—	290	249			97	91	2
2	1236	.27	.62	69.60	.52	.490	2.454	69.671	287	251			97	95	2
3	1241	.34	.78	72.30	.50	.551	2.753	72.213	291	253			97	95	2
	1246			74.893				74.969							
1	1248	.36	.83	75.30	.60	.567	2.883	—	291	254			97	95	2
2	1253	.27	.62	78.17	.52	.490	2.454	78.183	280	252			97	95	2
3	1258	.25	.57	80.70	.50	.472	2.361	80.637	296	253			97	95	2
	1303			83.146				82.998							
1	1305	.36	.83	84.00	.60	.567	2.883	—	291	254			99	96	2
2	1310	.25	.57	86.90	.50	.472	2.361	86.888	291	252			99	96	2
3	1315	.25	.57	89.40	.50	.472	2.361	89.244	280	253			100	96	2
	1320			91.764				91.605							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Outlet

List Test Method Used: 26A
Test Run No. 2
Date: 5/27/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1323	.26	.60	92.160	.51	.482	2.408	—	291	252	NA	60	101	97	3
2	1328	.32	.73	94.59	.57	.531	2.671	94.508	278	253			101	97	3
3	1333	.27	.62	97.20	.52	.491	2.454	97.179	293	252			101	97	3
	1338			99.714				99.633							
1	1340	.32	.73	100.00	.57	.531	2.671	—	290	257			101	98	3
2	1345	.26	.60	102.20	.51	.482	2.408	102.171	286	249			101	97	3
3	1350	.27	.62	105.08	.52	.491	2.454	105.079	286	249			101	97	3
	1355			107.614				107.533							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 26A Test Run No. 3 Run Date: 5/27/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Out
Source Condition: N
Test Engineer: JM
Temp ID: ESL
Meter ID: ESL
Meter Calibration Factor: .999
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material:
Nozzle Diameter (in.):
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft):
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 6
Port Type: Nip
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.20
Static Pressure (in. H_2O): 1.0
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .001 Post: .007 @ 10/12 in. Hg
Pitot Leak Check: Pre ✓ Post
Carbon Dioxide (%): 14
Oxygen (%):
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 239.8 Silica Final Wt (g): 382
Impinger Initial Wt (mL): 212.7 Silica Initial Wt (g): 300
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air heater Inlet

List Test Method Used: M26A
Test Run No. 26A
Date: 5/27/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1415	.34	.78	7.741	.58	.551	2.753	—	270	251		68	103	101	3
2	1420	.29	.67	10.50	.54	.509	2.543	10.494	282	252			103	101	3
3	1425	.26	.60	13.10	.51	.482	2.408	13.069	291	254			103	101	3
	1430			15.516				15.477							
1	1433	.34	.78	16.200	.58	.551	2.753	—	293	250			102	102	3
2	1438	.29	.67	19.00	.54	.509	2.543	18.953	291	251			102	102	3
3	1443	.26	.60	21.51	.51	.482	2.408	21.496	290	256			102	102	3
	1448			23.968				23.904							
1	1453	.31	.71	24.513	.56	.526	2.629	—	290	254			103	103	3
2	1458	.25	.57	27.10	.50	.472	2.361	27.142	287	252			103	103	3
3	1503	.25	.57	29.41	.50	.472	2.361	29.503	276	251			108	103	3
	1508			31.76				31.864							
1	1511	.25	.57	32.40	.50	.47	2.361	—	279	252			104	103	2
2	1516	.29	.67	34.80	.54	.509	2.543	34.761	284	254			104	103	2
3	1521	.27	.62	37.30	.52	.491	2.454	37.304	293	246			104	103	2
	1526			40.836				39.758							
1	1528	.30	.69	41.700	.547	.517	2.581	—	291	251			105	104	2
2	1533	.27	.62	44.30	.52	.491	2.454	44.286	289	252			105	104	2
3	1538	.25	.57	46.80	.50	.472	2.361	41.74	274	250			105	104	2
	1543			49.193				49.101							
1	1545	.23	.53	50.00	.48	.453	2.265	—	293	251			105	103	2
2	1550	.25	.57	52.27	.50	.472	2.361	52.265	290	253			105	103	2
3	1555	.27	.62	54.70	.52	.491	2.454	54.626	291	247			105	103	—
	1600			57.103				57.008							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric
Plant: Holcomb
Test Location: Air Heater Inlet

List Test Method Used: 26A
Test Run No. 3
Date: 5/27/04
Traverse Sheet 2 of 3

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1602	.25	.57	57.613	.50	.472	2.361	—	293	251	NA	68	102	105	3
2	1607	.27	.62	60.00	.52	.491	2.451	60.004	291	252		=	106	105	3
3	1612	.23	.53	62.60	.49	.453	2.265	62.549	294	246			106	105	3
	1617			64.913				64.814							
1	1619	.25	.57	65.702	.50	.472	2.361	—	291	257			106	105	3
2	1624	.25	.57	68.10	.50	.472	2.361	68.061	286	252			106	105	3
3	1629	.25	.57	70.50	.50	.472	2.361	70.422	292	254			106	105	3
	1634			72.819				72.783							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 1264 Test Run No. #1 Run Date: 05-27-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER POWER
Plant: HOLCOM KANSAS
Test Location: STACK
Source Condition: HIGH (NORMAL)
Test Engineer: T. Kell / WZ
Temp ID: 251
Meter ID: 251
Meter Calibration Factor: 1.003
Pitot ID: 7224
Pitot Tube Coefficient: .836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): .150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16'4"
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 55
Port Size (diameter in.): ≈3"
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.0
Static Pressure (in. H_2O): -1.5
Flue Pressure (in. Hg Abs): 26.89
Sample Train Leak Check: Pre: .002 Post: .005 @ 10 in. Hg
Pitot Leak Check: Pre ✓ >4" Post ✓ >4"
Carbon Dioxide (%): 12.5
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: Hooper Ks
Test Location: BLACK

List Test Method Used: M204
Test Run No. #1
Date: 5-27-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.325 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.389 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	850	2.9	.94	10.985	1.70	.628	3.142		190	253	253	<68°	92	91	4
1	855	2.9	.94	14.125	1.70	.628	3.142	14.127	190	253	253	FULL	93	91	4
2	900	2.8	.91	17.285	1.67	.617	3.085	17.269	192	255	257	1.69	97	92	4
2	905	2.8	.91	20.348	1.67	.617	3.085	20.354	192	255	257		98	93	4
3	910	2.2	.72	23.416	1.48	.547	2.736	23.489	190	254	257		99	93	4
3	915	2.2	.72	26.158	1.48	.547	2.736	26.176	190	254	257		100	93	4
	920			28.914				28.912							
		158	514		970				1147				579	553	24
2-1	922	2.7	.88	28.914	1.64	.606	3.032		190	250	250		99	94	4
1	927	2.7	.86	31.939	1.64	.606	3.032	31.946	190	250	250		99	94	4
2	932	2.6	.85	34.977	1.61	.595	2.975	34.978	191	252	257		101	95	4
2	937	2.6	.85	37.963	1.61	.595	2.975	37.958	191	252	257		101	95	4
3	942	2.3	.75	40.950	1.52	.560	2.798	40.928	190	252	256		102	96	4
3	947	2.3	.75	43.710	1.52	.560	2.798	43.726	190	252	256		102	96	4
	952			46.494				46.524							
		152	496		954				1142				604	570	24
3-1	954	2.8	.91	46.494	1.67	.617	3.087		189	251	255		102	97	4
1	959	2.8	.91	49.595	1.67	.617	3.087	49.581	189	251	255		102	97	4
2	1004	2.7	.88	52.664	1.64	.606	3.032	52.608	190	253	255		104	98	4
2	1009	2.7	.88	55.709	1.64	.606	3.032	55.700	190	253	255		104	98	4
3	1014	2.4	.78	58.735	1.55	.572	2.858	58.732	190	251	253		105	99	4
3	1019	2.4	.78	61.602	1.55	.572	2.858	61.590	190	251	253		105	99	4
	1024			64.440				64.448							
		158	514		962				1137				1082	558	24

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB KS
Test Location: STACK

List Test Method Used: N26A
Test Run No. #1
Date: 3-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1026	2.8	.91	64.440	1.67	.617	3.087		190	251	252	≤68°	103	99	4
1	1031	2.8	.91	67.516	1.67	.617	3.087	67.527	190	251	252	FULL	103	99	4
2	1036	2.7	.88	70.620	1.64	.606	3.032	70.614	190	252	255	ICED	105	100	4
2	1041	2.7	.88	73.652	1.64	.606	3.032	73.646	190	252	255		105	100	4
3	1046	2.2	.72	76.700	1.48	.547	2.737	76.678	190	252	255		105	100	4
3	1051	2.2	.72	79.436	1.48	.547	2.737	79.415	190	252	255		105	100	4
	1056			82.158				82.152							
		154	502		958				1140				626	598	24
													2431	2309	
*	AVG	2.59	.844	71.153	1.606				190.17				98.75		4

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: NAQA Test Run No. #2 Run Date: 5-27-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower
Plant: Hooton KS
Test Location: Stack
Source Condition: High Normal
Test Engineer: T. Neil / WZ
Temp ID: 851
Meter ID: 851
Meter Calibration Factor: 1.003
Pitot ID: 788A
Pitot Tube Coefficient: .836
Probe Length (ft.): 6
Probe Liner Material: Glass
Nozzle Diameter (in.): .150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): ____ Diameter (ft): 16'4"
Width (ft): ____
Duct Area (Sq. Ft.): ____
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): x 3"
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.0
Static Pressure (in. H_2O): -1.5
Flue Pressure (in. Hg Abs): 26.89
Sample Train Leak Check: Pre: .000 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre √@ 4" Post √@ 4"
Carbon Dioxide (%): 12.5
Oxygen (%): 7.3
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): ~~9780 - Bituminous Coal~~ 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower
Plant: Hooker KS
Test Location: Stack

List Test Method Used: 1-26A
Test Run No. #2
Date: 5-27-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1141	2.8	.91	82.454	1.67	.617	3.087		190	254	263	≤68°	99	99	4
1	1146	2.8	.91	85.563	1.67	.617	3.087	85.541	190	254	260	Fully	100	99	4
2	1151	2.7	.88	88.630	1.64	.606	3.032	88.628	190	254	263	iced	103	99	4
2	1156	2.7	.88	91.650	1.64	.606	3.032	91.660	190	254	263		104	100	4
3	1201	2.2	.72	94.687	1.48	.547	2.737	94.692	189	255	265		104	100	4
3	1206	2.2	.72	97.410	1.48	.547	2.737	97.429	189	255	265		104	100	4
	1211			100.159				100.160							
		154	502		958				1158				64	57	24
2-1	1213	2.9	.94	100.159	1.70	.628	3.142		190	251	264		104	100	4
1	1218	2.9	.94	103.300	1.70	.628	3.142	103.301	190	251	264		104	100	4
2	1223	2.8	.91	106.420	1.67	.617	3.087	106.443	190	251	264		104	100	4
2	1228	2.8	.91	109.526	1.67	.617	3.087	109.530	190	253	262		105	100	4
3	1233	2.4	.78	112.615	1.55	.572	2.858	112.617	190	253	262		105	100	4
3	1238	2.4	.78	115.470	1.55	.572	2.858	115.475	190	254	260		105	100	4
	1243			118.335				118.333							
		162	556		984				1140				67	60	24
3-1	1245	2.8	.91	118.335	1.67	.617	3.087		190	254	261		106	101	5
1	1250	2.8	.91	121.422	1.67	.617	3.087	121.422	190	254	261		106	101	5
2	1255	2.7	.88	124.512	1.64	.606	3.032	124.509	190	254	260		106	101	5
2	1300	2.7	.88	127.536	1.64	.606	3.032	127.541	190	254	260		106	101	5
3	1305	2.3	.75	130.570	1.52	.560	2.798	130.573	188	254	259		109	103	5
3	1310	2.3	.75	133.368	1.52	.560	2.798	133.371	188	254	259		109	103	5
	1315			136.172				136.169							
		156	508		960				1136				62	60	30

= Data does not get entered in Excel

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflowers
Plant: Tarcoa KS
Test Location: STACK

List Test Method Used: M26A
Test Run No. #2
Date: 5-27-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1316	2.7	.88	136.172	1.64	.606	3.032		190	254	261	≤68°	109	104	5
1	1321	2.7	.88	139.194	1.64	.606	3.032	139.204	190	254	261	Fully	109	104	5
2	1326	2.6	.85	142.257	1.61	.595	2.975	142.236	196	257	262	iced	110	104	5
2	1331	2.6	.85	145.220	1.61	.595	2.975	145.211	196	257	262		110	104	5
3	1336	2.3	.75	148.191	1.52	.560	2.798	148.186	192	257	260		110	104	5
3	1341	2.3	.75	150.991	1.52	.560	2.797	150.984	192	257	260		110	104	5
	1346			153.775				153.782							
		152	296		154				1156				1658	1624	50
													2841	2431	
*	AVG	2.6	.847	71.321	1.628				190.2				103.58		4.5

[redacted] = Data does not get entered in Excel

ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M26A Test Run No. #3 Run Date: 05-07-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: Hoxie KS
Test Location: Stack
Source Condition: High (Normal)
Test Engineer: T. Neil / WZ
Temp ID: ESI
Meter ID: ESI
Meter Calibration Factor: 1.003
Pitot ID: 702A
Pitot Tube Coefficient: .836
Probe Length (ft.): 6
Probe Liner Material: GLASS
Nozzle Diameter (in.): .150
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16'4"
Width (ft):
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): ≈ 3"
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -1.5
Flue Pressure (in. Hg Abs): 26.89
Sample Train Leak Check: Pre: .001 Post: .002 @ 9 in. Hg
Pitot Leak Check: Pre 0 @ 3" Post 0 @ 4"
Carbon Dioxide (%): 12.5
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 479 Silica Final Wt (g): 252.9
Impinger Initial Wt (mL): 300 Silica Initial Wt (g): 216.7
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 215.2
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: Hdron KS
Test Location: STACK

List Test Method Used: M26A
Test Run No. #3
Date: 5-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
41	1548	2.8	.94	110.268	1.67	.634	3.171		189	256	260	≤68°	111	108	4
1	1553	2.8	.94	113.443	1.67	.634	3.171	113.439	189	256	260	Fixy	112	109	4
2	1558	2.7	.90	116.606	1.64	.623	3.114	116.620	190	258	261	160	114	110	4
2	1603	2.7	.90	119.727	1.64	.623	3.114	119.724	190	258	261		114	110	4
3	1608	2.3	.77	122.841	1.52	.575	2.874	122.838	188	258	263		115	110	4
3	1613	2.3	.77	125.723	1.52	.575	2.874	125.712	188	258	263		115	110	4
	1618			128.593				128.586							
		156	522		9666				1134				681	1657	24
													2685	2889	
*	AVG.	2.6	.803	72.810	1.609				191.33				109.875		4

[redacted] = Data does not get entered in Excel

APPENDIX G

Long-Term Source Test Results

GE Energy

Eric Ehlers
Project Manager

SDA SCRUBBER SPECIATED MERCURY, HCL, HF, HBr, AND TRACE METALS EMISSIONS LONGTERM STUDY

Performed At
Sunflower Electric Power Corporation
Holcomb, Kansas Facility
Unit 1
Holcomb, Kansas

Test Dates
July 27 through 29, 2004

Report No.
GE Energy Management Services, Inc. Report M22E0517D

Report Submittal Date
October 5, 2004

GE Energy Management Services, Inc
888 Industrial Drive
Elmhurst, IL 60126
USA

T 630-530-6600
F 630-530-6630

GE Energy

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GE Energy

CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

GE ENERGY MANAGEMENT SERVICES, INC.

Jeffrey M. Crivlare
Senior Project Manager

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GE Energy

1.0 INTRODUCTION

GE Energy Management Services, Inc., ("GE Energy") performed a long-term speciated mercury, HCl, HF, HBr, and trace metals emission test program on Unit 1 at the Holcomb, Kansas Facility of Sunflower Electric Power Corporation in Holcomb, Kansas on July 27 through 29, 2004. The tests were authorized by Sunflower Electric Power Corporation and performed for ADA-ES, Inc. Target metals for the test program include: antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), and thallium (Tl).

The purpose of this test program was to establish long-term emissions for the above parameters during normal operating conditions.

1.1 Project Contact Information

Location	Address	Contact
Test Facility	Sunflower Electric Power Corporation Holcomb, Kansas Facility Holcomb, Kansas	Mr. Wayne Penrod Plant Manager wepenrod@sunflower.net
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Travis Starns Project Engineer 303-734-1727 (phone) 303-734-0330 (fax) traviss@adaes.com
Testing Company Representative	GE Energy Management Services, Inc. 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Eric Ehlers Project Manager 630-530-6621 (phone) 630-530-6630 (fax) eric.ehlers@ps.ge.com

The tests were conducted by Messrs. M. Kielanowicz, T. Cassin, C. Hill, T. Mei, D. Tuider, J. Hamner, F. Gonzalez, M. Ebner, T. Barr, G. Rock and E. Ehlers of GE Energy.

2.0 SUMMARY OF RESULTS

The following table summarizes test results at each of the three test locations:

Parameter	Reference Method	Air Heater Outlet/SDA Inlet (Location 1)*	Baghouse Inlet/SDA Outlet (Location 2)*	Stack (Location 3)
Particle Bound Mercury (lbs/hr)	Ontario Hydro	0.00005	N/A	0.00003
Oxidized Mercury (lbs/hr)	Ontario Hydro	0.00352	N/A	0.00029
Elemental Mercury (lbs/hr)	Ontario Hydro	0.03356	N/A	0.00103
Total Mercury (lbs/hr)	Ontario Hydro	0.03713	N/A	0.00135
Antimony (lbs/hr)	Method 29	0.00981	N/A	< 0.00464
Arsenic (lbs/hr)	Method 29	0.27266	N/A	< 0.00178
Barium (lbs/hr)	Method 29	3.59139	N/A	0.05653
Beryllium (lbs/hr)	Method 29	< 0.00243	N/A	< 0.00108
Cadmium (lbs/hr)	Method 29	< 0.00193	N/A	< 0.00108
Chromium (lbs/hr)	Method 29	0.16183	N/A	0.00815
Cobalt (lbs/hr)	Method 29	0.06464	N/A	< 0.00217
Copper (lbs/hr)	Method 29	0.39179	N/A	0.00550
Lead (lbs/hr)	Method 29	0.04590	N/A	0.00088
Manganese (lbs/hr)	Method 29	0.17538**	N/A	0.00000
Mercury (lbs/hr)	Method 29	0.05976	N/A	0.00308
Nickel (lbs/hr)	Method 29	0.12502	N/A	0.00174
Selenium (lbs/hr)	Method 29	0.20663	N/A	0.01533
Silver (lbs/hr)	Method 29	0.07019	N/A	< 0.00650
Thallium (lbs/hr)	Method 29	0.04226	N/A	<0.00434
HCl (lbs/hr)	Method 26A	2.7023	0.4244	0.2569
HF (lbs/hr)	Method 26A	3.1441	0.2046	<0.1026
Br+ (lbs/hr)	Method 26A	0.9851	< 0.6504	<0.2930

*All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.
** Test #2 Manganese results not included in average (statistical outlier).

Complete test results for all test locations and parameters are in Section 6.0 of this report.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. The first and second Method 26A test runs were aborted at the Baghouse Inlet/SDA Outlet test location due to problems with the reference method sample trains. During the second test day one Method 26A test was run and on the third test day, two Method 26A tests were run at this location. All Method 26A results are based on these three tests.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, *Code of Federal Regulations*, Part 60 (40CFR60), Appendix A, Methods 1 through 4, 26A and 29 and the Ontario Hydro Method. Where applicable, the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/4-77-027b was used to determine the precise procedures.

4.1 Volumetric Flowrate Determination

In order to determine the emission rate on a lbs/hr basis, the gas velocities and volumetric flowrates were determined using Method 2, 40CFR60.

Velocity pressures were determined by traversing the test locations with S-type pitot tubes. An abbreviated traverse was performed at the Air Heater Outlet/SDA Inlet due to clearance restrictions of the particulate probe. Temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method collected samples in an integrated manner and analyzed the samples using a Hays Orsat gas analyzer. Several gas extractions were performed during each test run to ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Trace Metals Determination

The Method 29 trace metals sample train is one of the comprehensive sampling systems used to sample stack gas effluent. This system is based upon the design of units which are normally employed for sampling under Method 5, 40CFR60. The modified system consisted of a probe, a high-efficiency glass fiber filter stage, and five impingers.

The train consisted of the following components: a glass liner wrapped with heating wire and a stainless steel jacket. Samples were collected while the probe was heated to a gas temperature of 248°F ± 25°F. The filter holder was equipped with a Teflon® filter support and a tared glass fiber filter. The filter medium was a Pallflex 2500 QAT-UP filter exhibiting >99.99% efficiency on 0.3 micron DOP smoke particles. The filter holder was contained in an electrically heated enclosed box that was thermostatically maintained at a temperature of 248°F ± 25°F, which is sufficient to prevent water condensation in this portion of the train.

The first and second impingers were modified versions of the Greenburg-Smith design; initially, they were filled with 200 mls of 5% HNO_3/10% H_2O_2. The third and fourth impingers were also a Greenburg-Smith impinger. They were each filled with 100 mls of acidic $KMnO_4$. The fifth impinger was filled with silica gel to absorb any remaining moisture.

A total number of 8 points using 8 ports were utilized at the Air Heater Outlet/SDA Inlet test location, and a total of 12 points using 4 ports were utilized at the Stack test location. Point locations were selected in accordance with Methods 1 and 2, 40CFR60. Tests were performed for two hours.

All sample contact surfaces of the train were washed with 0.1 N nitric acid. The first two impingers were also washed with 0.1N nitric acid. The third and fourth impingers were rinsed with demineralized water and 8N HCl. The washes were placed in sealed and marked containers for analysis.

4.4 Speciated Mercury Determination

A total of 12 test points were sampled using four (4) ports at the stack test location. A total of 8 test points were sampled using eight (8) ports at the Air heater Outlet/SDA Inlet test location.

The speciated mercury sample train was manufactured by Nutech Corporation of Durham, North Carolina and meets all specifications required by The Ontario Hydro Method. A teflon-lined probe was used at the Air Heater Outlet/SDA Inlet location and a glass-lined probe was used at the Stack location. Drawings depicting the sampling ports, test point locations, and sample trains are

appended to this report. Velocity pressures were determined simultaneously during sampling with a calibrated S-type pitot tube and inclined manometer. All temperatures were measured using K-type thermocouples with calibrated digital temperature indicators.

The outlet filter media were quartz filters exhibiting a ≥99.97% efficiency on 0.3 micron DOP smoke particles in accordance with ASTM Standard Method D-2986-71. The inlet test employed a quartz-thimble prefilter. All sample contact surfaces of the train were washed with 0.1 N Nitric Acid. These washes were placed in sealed and marked containers for analysis. All sample recovery of impinger solutions was performed on site.

4.5 Hydrogen Chloride (HCl), Hydrogen Flouride (HF), and Hydrogen Bromide (HBr) Determination

Hydrogen chloride (HCl), hydrogen fluoride (HF), and hydrogen bromide (HBr) concentrations were determined using Method 26A, 40CFR60. An integrated sample was extracted from the gas stream and passed through dilute (0.1 N) sulfuric acid. In the dilute acid, the HCl, HF and HBr dissolved and formed chloride (Cl), fluoride (F) and bromide (Br) ions. The chloride, fluoride and bromide ions were then analyzed by ion chromatography. The sample train consisted of a heated glass probe liner, a heated optional filter, and four impingers. The first and second impingers contained the dilute sulfuric acid, the third impinger contained a 0.1 N sodium hydroxide (NaOH) scrubber solution to remove any remaining chlorine, bromine or fluorine, and the fourth impinger contained silica gel to absorb any remaining moisture. The train was leak checked prior to and after each run. The sample was then extracted isokinetically. The samples were recovered by quantitatively transferring the contents of the first two impingers and deionized water rinses to a sample jar. The samples were mixed and labeled, and the level marked for transfer to the laboratory. The samples were then analyzed by ion chromatography.

The test trains were weighed before and after each test for moisture determination.

5.0 QUALITY ASSURANCE PROCEDURES

GE Energy recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the GE Energy laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, all reagent standardizations were performed daily by the same person performing the analysis.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

GE Energy

HCL, HF, AND HBR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Unit: Stack

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	7/27/2004	7/28/2004	7/29/2004	
Start Time	8:55	8:30	8:30	
End Time	11:03	10:36	10:36	
HCl Emissions				
ppm:	0.102	0.064	0.019	0.062
ug/dscm	154.384	97.187	28.919	93.50
lb/hr	0.405	0.283	0.084	0.2569
tons/yr	1.7720	1.2379	0.3663	1.1254
lb/mmBtu	0.00015	0.00009	0.00003	0.00009
lb/TBtu	148.12035	86.72307	26.54810	87.13051
HF Emissions*				
ppm:	0.065	0.034	0.035	0.045
ug/dscm	54.034	28.346	28.919	37.10
lb/hr	0.142	0.082	0.084	0.1026
tons/yr	0.6202	0.3611	0.3663	0.4492
lb/mmBtu	0.00005	0.00003	0.00003	0.00003
lb/TBtu	51.84212	25.29423	26.54810	34.56148
HBr Emissions*				
ppm:	0.046	0.024	0.025	0.032
ug/dscm	154.384	80.989	82.626	106.00
lb/hr	0.405	0.236	0.239	0.2930
tons/yr	1.7720	1.0316	1.0467	1.2834
lb/mmBtu	0.00015	0.00007	0.00008	0.00010
lb/TBtu	148.12035	72.26922	75.85172	98.74710
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,132,321	1,272,032	1,250,933	1,218,429
Gas Volumetric Flow Rate, dscfm	699,603	776,382	772,144	749,376
Average Gas Temperature, °F	189.8	191.7	191.1	190.8
Average Gas Velocity, ft/sec	90.107	101.224	99.545	96.959
Flue Gas Moisture, percent by volume	15.1	16.0	14.5	15.2
Average Flue Pressure, in. Hg	26.78	26.84	26.63	
Barometric Pressure, in. Hg	26.99	26.94	26.73	
Average %CO_2 by volume, dry basis	11.6	12.2	12.0	11.9
Average %O_2 by volume, dry basis	7.6	6.6	7.0	7.1
Dry Molecular Wt. of Gas, lb/lb-mole	30.160	30.216	30.200	
Gas Sample Volume, dscf	45.749	87.209	85.481	
Isokinetic Variance	101.0	102.3	100.8	

*All HF and HBr emissions are less than detection limit.

GE Energy

HCL, HF, AND HBR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Unit: Baghouse Inlet

Test Run Number	**3**	**4**	**5**	**Average**
Source Condition	Normal	Normal	Normal	
Date	7/28/2004	7/29/2004	7/29/2004	
Start Time	11:15	8:10	10:45	
End Time	13:22	10:15	12:50	
HCl Emissions				
ppm:	0.042	0.192	0.043	0.092
ug/dscm	64.30	291.69	64.96	140.31
lb/hr*	0.2009	0.8793	0.1932	0.4244
tons/yr*	0.8798	3.8514	0.8461	1.8591
lb/mmBtu	0.00006	0.00025	0.00006	0.00012
lb/TBtu	56.97634	253.20102	56.38454	122.18730
HF Emissions				
ppm:	0.077	0.088	0.078	0.081
ug/dscm	64.30	72.92	64.96	67.39
lb/hr*	0.2009	0.2198	0.1932	0.2046
tons/yr*	0.8798	0.9628	0.8461	0.8962
lb/mmBtu	0.00006	0.00006	0.00006	0.00006
lb/TBtu	56.97634	63.30026	56.38454	58.88705
HBr Emissions**				
ppm:	0.055	0.054	0.083	0.064
ug/dscm	183.71	182.30	278.38	214.80
lb/hr*	0.5739	0.5496	0.8278	0.6504
tons/yr*	2.5136	2.4071	3.6260	2.8489
lb/mmBtu	0.00016	0.00016	0.00024	0.00019
lb/TBtu	162.78955	158.25064	241.64803	187.56274
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	677,777	660,883	656,590	665,083
Gas Volumetric Flow Rate, dscfm	417,006	402,407	396,967	405,460
Average Gas Temperature, °F	179.8	180.0	180.3	180.0
Average Gas Velocity, ft/sec	64.183	62.584	62.177	62.981
Flue Gas Moisture, percent by volume	15.0	15.2	15.8	15.3
Average Flue Pressure, in. Hg	26.24	26.04	26.04	
Barometric Pressure, in. Hg	27.21	27.00	27.00	
Average %CO_2 by volume, dry basis	12.5	12.4	13.0	12.6
Average %O_2 by volume, dry basis	6.5	6.2	6.2	6.3
Dry Molecular Wt. of Gas, lb/lb-mole	30.260	30.232	30.328	
Gas Sample Volume, dscf	38.447	38.742	38.057	
Isokinetic Variance	100.6	105.1	104.7	

* All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.
** All HBr emissions are less than detection limit.

GE Energy

HCL, HF, AND HBR TEST RESULTS SUMMARY

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Unit: Air Heater Outlet

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	7/27/2004	7/28/2004	7/29/2004	
Start Time	8:55	8:30	8:30	
End Time	11:30	11:05	11:05	
HCl Emissions:				
ppm:	0.47	0.23	0.61	0.43
ug/dscm	712.71	348.18	918.42	659.77
lb/hr*	2.7384	1.4838	3.8847	2.7023
tons/yr*	11.99417	6.49890	17.01519	11.83609
lb/mmBtu	0.00057	0.00027	0.00074	0.00053
lb/Tbtu	571.97953	272.57186	737.06561	527.20567
HF Emissions:				
ppm:	0.25	1.09	1.35	0.90
ug/dscm	206.31	909.37	1126.36	747.34
lb/hr*	0.7927	3.8753	4.7643	3.1441
tons/yr*	3.47200	16.97360	20.86768	13.77109
lb/mmBtu	0.00017	0.00071	0.00090	0.00059
lb/Tbtu	165.57302	711.89356	903.94839	593.80499
HBr Emissions:				
ppm:	0.06	0.08	0.07	0.07
ug/dscm	206.31	258.06	251.26	238.55
lb/hr*	0.7927	1.0997	1.0628	0.9851
tons/yr*	3.47200	4.81683	4.65510	4.31464
lb/mmBtu	0.00017	0.00020	0.00020	0.00019
lb/Tbtu	165.57302	202.02385	201.65003	189.74896
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	920,038	1,043,975	1,032,471	998,828
Gas Volumetric Flow Rate, dscfm	512,888	568,854	564,629	548,790
Average Gas Temperature, °F	284.2	280.7	286.7	283.9
Average Gas Velocity, ft/sec	52.876	59.999	59.337	57.404
Flue Gas Moisture, percent by volume	11.4	13.6	11.9	12.3
Average Flue Pressure, in. Hg	26.52	26.47	26.26	
Barometric Pressure, in. Hg	27.26	27.21	27.00	
Average %CO_2 by volume, dry basis	13.8	14.6	14.0	14.1
Average %O_2 by volume, dry basis	5.0	4.6	5.0	4.9
Dry Molecular Wt. of Gas, lb/lb-mole	30.408	30.520	30.440	
Gas Sample Volume, dscf	75.316	86.212	81.518	
Isokinetic Variance	101.7	105.0	102.4	

* All emission rates are doubled assuming equal emissions on the second "pant leg" of the system.

Sunflower Electric Power Corporation
Holcomb Station
Removal Efficiency Across Spray Dryer
July 27 through 29, 2004

HF Removal Efficiency			
Test No.	Air Heater Outlet HF Emissions, lbs/hr	Baghouse Inlet HF Emissions, lbs/hr	Efficiency, %
1	0.7927	0.2009	74.66
2	3.8753	0.2198	94.33
3	4.7643	0.1932	95.94
Average	3.1441	0.2046	88.31

HCL Removal Efficiency			
Test No.	Air Heater Outlet HCl Emissions, lbs/hr	Baghouse Inlet HCl Emissions, lbs/hr	Efficiency, %
1	2.7384	0.2009	92.66
2	1.4838	0.8793	40.74
3	3.8847	0.1932	95.03
Average	2.7023	0.4245	76.14

$$\text{Removal Efficiency (\%)} = \frac{\text{Air Heater Outlet (lbs/hr)} - \text{Baghouse Inlet (lbs/hr)}}{\text{Air Heater Outlet (lbs/hr)}} \times 100\%$$

Sunflower Electric Power Corporation
Stack
Trace Metals Summary
Tests 1 through 3 Averages
July 27 through 29, 2004

Parameter	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)	Emissions Rate (tons/yr)	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	< 1.03E-10	< 0.000326	< 0.00464	< 0.02030	< 7.20E-07	< 4.44E-07	< 1.33E-06	< 1.3319	< 1.648
Arsenic	< 3.9376E-11	< 0.000203	< 0.00178	< 0.00777	< 2.76E-07	< 1.70E-07	< 5.10E-07	< 0.5101	< 0.631
Barium	1.24E-09	0.003468	0.05653	0.24760	8.65E-06	5.32E-06	1.62E-05	16.2441	19.789
Beryllium	< 2.3896E-11	< 0.001023	< 0.00108	< 0.00475	< 1.67E-07	< 1.03E-07	< 3.12E-07	< 0.3115	< 0.383
Cadmium	< 2.3896E-11	< 0.000082	< 0.00108	< 0.00475	< 1.67E-07	< 1.03E-07	< 3.12E-07	< 0.3115	< 0.383
Chromium	1.7954E-10	0.001332	0.00815	0.03570	1.26E-06	7.75E-07	2.34E-06	2.3420	2.876
Cobalt	< 4.7791E-11	< 0.000313	< 0.00217	< 0.00950	< 3.35E-07	< 2.06E-07	< 6.23E-07	< 0.6231	< 0.766
Copper	1.1996E-10	0.000728	0.00550	0.02409	8.40E-07	5.17E-07	1.58E-06	1.5806	1.922
Lead	1.9338E-11	0.000036	0.00088	0.00386	1.35E-07	8.42E-08	2.53E-07	0.2533	0.310
Manganese	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Mercury	6.8122E-11	0.000131	0.00308	0.01350	4.77E-07	2.94E-07	8.86E-07	0.8855	1.091
Nickel	3.7656E-11	0.000247	0.00174	0.00760	2.64E-07	1.63E-07	4.99E-07	0.4987	0.603
Selenium	3.3428E-10	0.001632	0.01533	0.06713	2.34E-06	1.44E-06	4.40E-06	4.4043	5.355
Silver	< 1.4337E-10	< 0.000513	< 0.00650	< 0.02849	< 1.00E-06	< 6.19E-07	< 1.87E-06	< 1.8692	< 2.297
Thallium	< 9.5582E-11	< 0.000180	< 0.00434	< 0.01899	< 6.69E-07	< 4.12E-07	< 1.25E-06	< 1.2461	< 1.531

GE Energy

Sunflower Electric Power Corporation
Air Heater Outlet
Trace Metals Summary
Tests 1 through 3 Averages
July 27 through 29, 2004

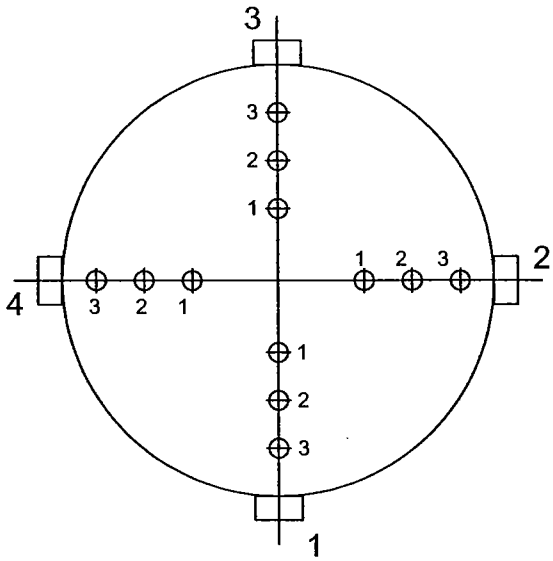
Parameter	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)*	Emissions Rate (tons/yr)*	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	1.5359E-10	0.000486	0.00981	0.04297	1.075E-06	5.831E-07	1.956E-06	1.9557	2.460
Arsenic	4.0898E-09	0.021049	0.27266	1.19423	2.863E-05	1.55E-05	5.203E-05	52.0312	65.512
Barium	5.3771E-08	0.150966	3.59139	15.73028	3.76E-04	2.04E-04	6.81E-04	681.3535	861.321
Beryllium	< 3.6811E-11	< 0.001575	< 0.00243	< 0.01065	< 2.577E-07	< 1.396E-07	< 4.674E-07	< 0.4674	< 0.590
Cadmium	< 2.8523E-11	< 0.000098	< 0.00193	< 0.00847	< 1.997E-07	< 1.08E-07	< 3.622E-07	< 0.3622	< 0.457
Chromium	2.4571E-09	0.018223	0.16183	0.70883	1.72E-05	9.32E-06	3.121E-05	31.2100	39.358
Cobalt	9.8084E-10	0.006418	0.06464	0.28312	6.866E-06	3.72E-06	1.246E-05	12.4630	15.711
Copper	5.9381E-09	0.036030	0.39179	1.71604	4.157E-05	2.252E-05	7.54E-05	75.4096	95.118
Lead	6.9298E-10	0.001290	0.04590	0.20102	4.851E-06	2.629E-06	8.79E-06	8.7901	11.100
Manganese	2.82E-09	0.019766	0.17538	0.76818	1.97E-05	1.07E-05	3.59E-05	35.8704	45.112
Mercury	9.0256E-10	0.001735	0.05976	0.26173	6.318E-06	3.422E-06	1.147E-05	11.4702	14.458
Nickel	1.8986E-09	0.012470	0.12502	0.54758	1.329E-05	7.202E-06	2.412E-05	24.1170	30.413
Selenium	3.1732E-09	0.015496	0.20663	0.90505	2.221E-05	1.206E-05	4.004E-05	40.0354	50.829
Silver	1.0217E-09	0.003652	0.07019	0.30743	7.152E-06	3.877E-06	1.285E-05	12.8489	16.366
Thallium	6.3395E-10	0.001196	0.04226	0.18511	4.438E-06	2.403E-06	8.05E-06	8.0503	10.155

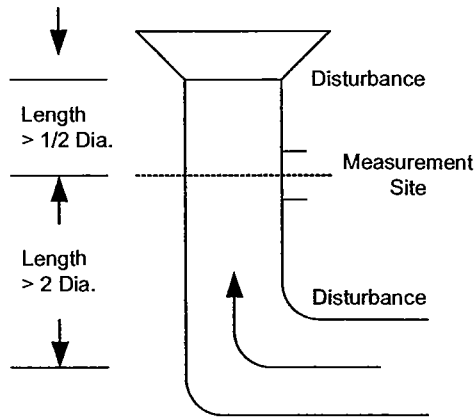
*All emissions rates are doubled assuming equal emissions on second "pant leg" of the system

GE Energy

APPENDIX

EQUAL AREA TRAVERSE FOR ROUND DUCTS





Job: Sunflower Electric Power Corporation

Date: July 27 through 29, 2004

Unit No: 1

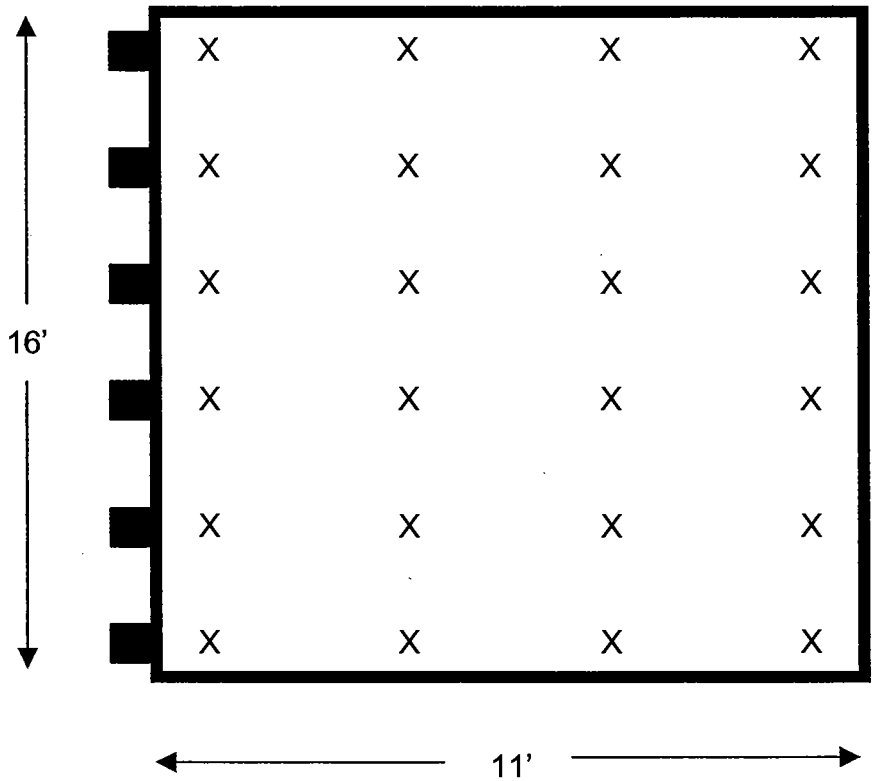
Location: Stack (Location 3)

Diameter: 16.333 feet

Area: 209.53 square feet

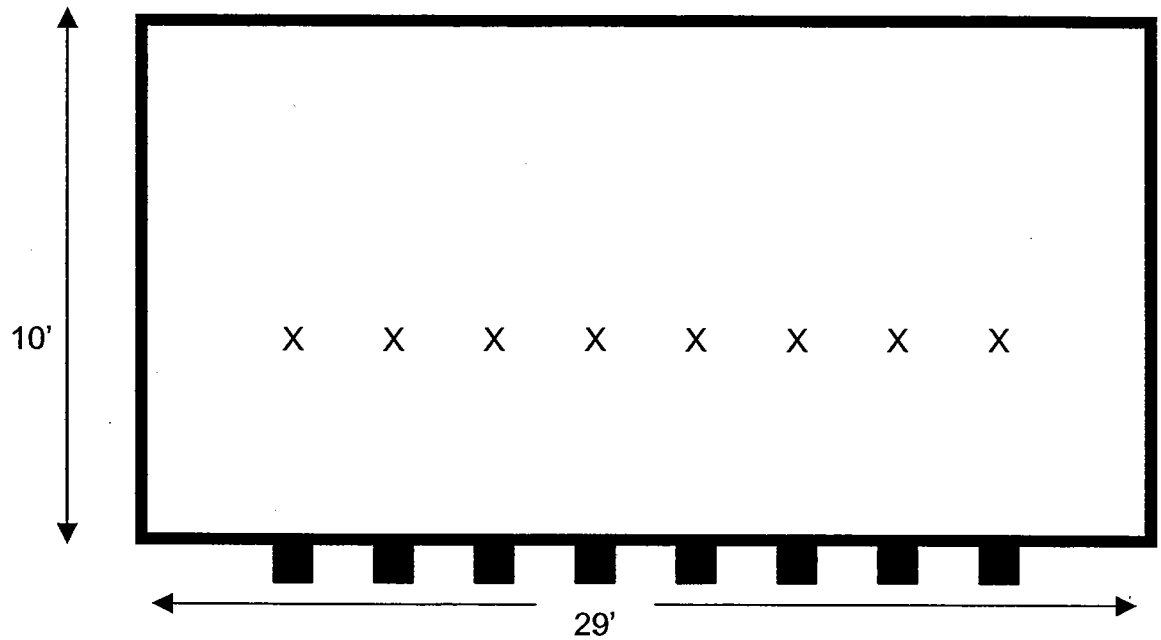
No. Sample Points: 12

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job:	Sunflower Electric Power Corporation Holcomb, Kansas		
Date:	July 27 through 29, 2004	Area:	176 Square Feet
Test Location:	Baghouse Inlet/SDA Outlet (Location 2)	No. Test Ports:	6
Length:	11 Feet	Tests Points per Port:	4
Width:	16 Feet		

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: Sunflower Electric Power Corporation
Holcomb, Kansas

Date: July 27 through 29, 2004

Area: 290 Square Feet

Test Location: Air Heater Outlet/SDA Inlet
(Location 1)

No. Test Ports: 8

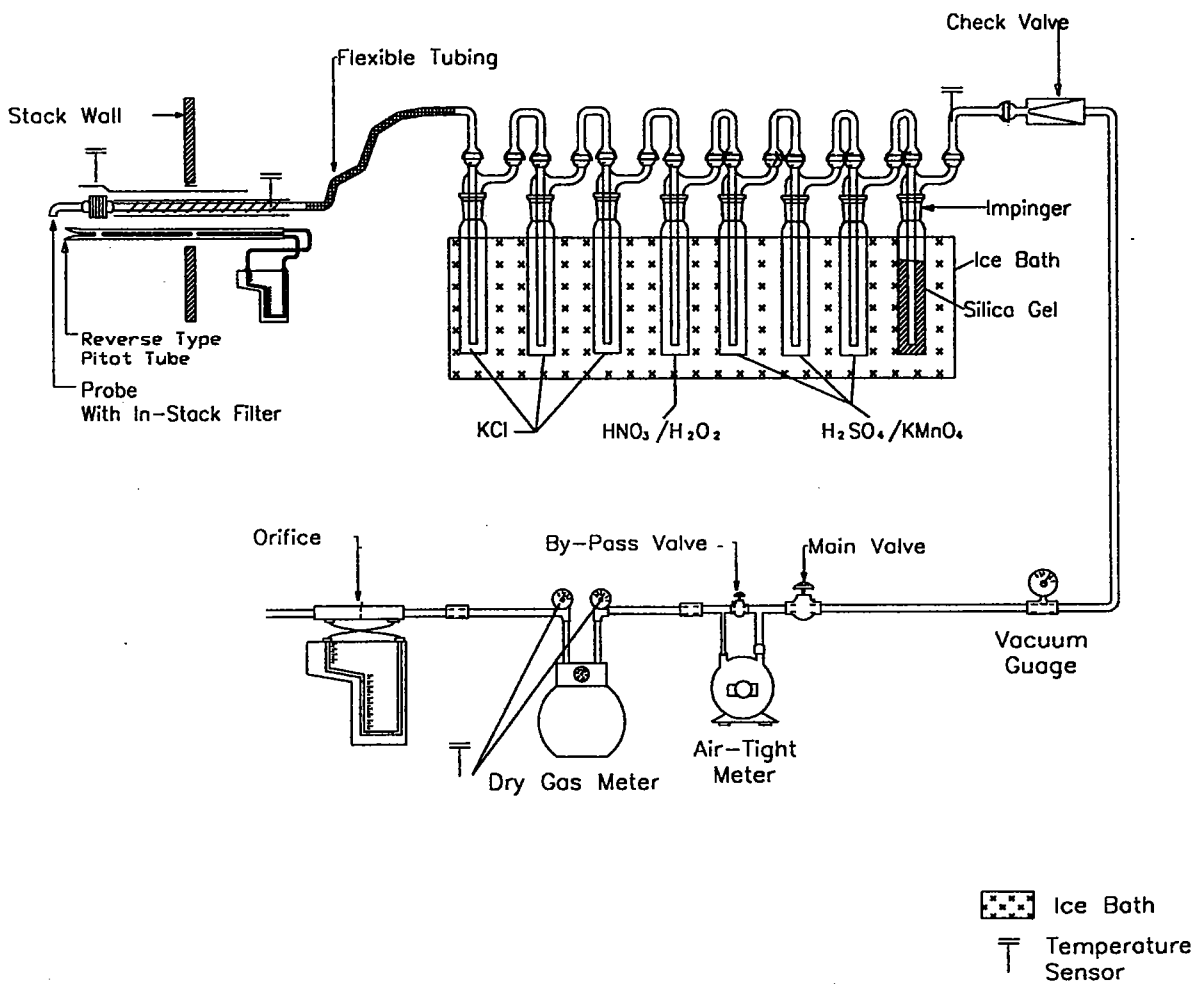
Length: 10 Feet

Tests Points per Port: 1

Width: 29 Feet

Speciated Mercury Sampling Train Equipped with In-Stack Filter

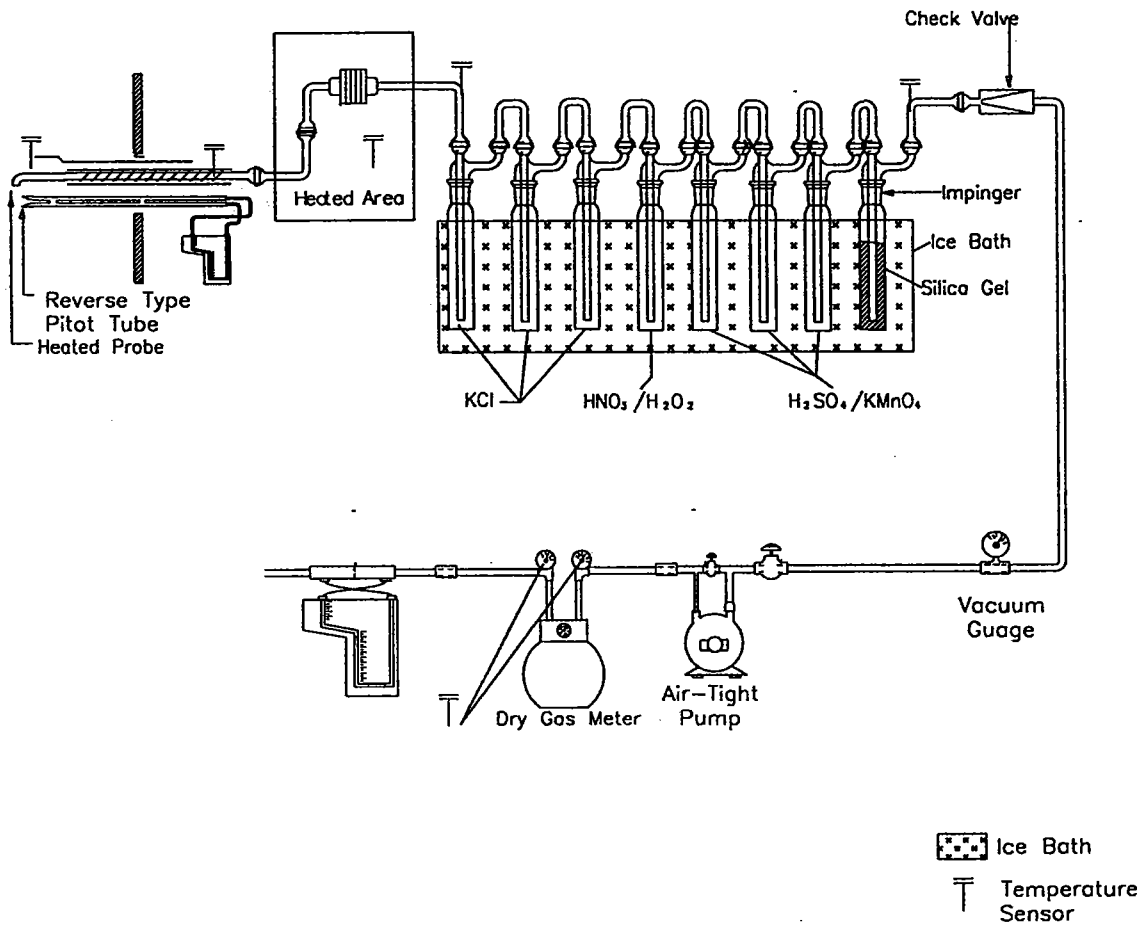
USEPA Ontario Hydro Method



Dwg – P1

Speciated Mercury Sampling Train Equipped With Out-of-Stack Filter

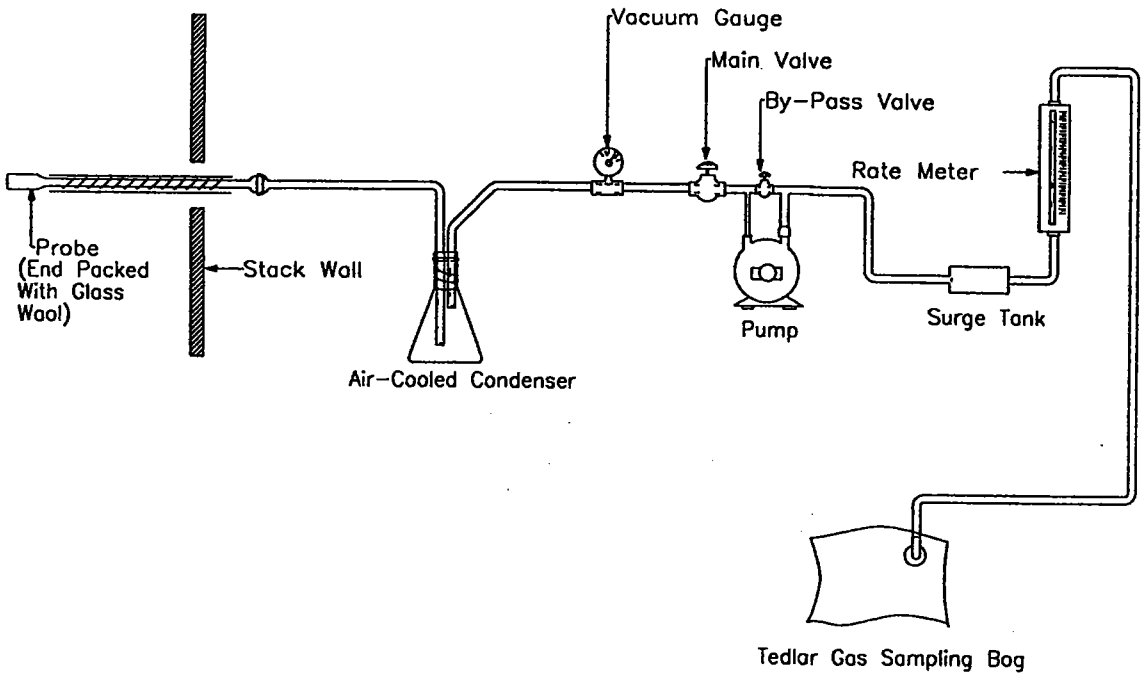
USEPA Ontario Hydro Method



Dwg – P2

Sampling Train for Integrated Gas Sampling

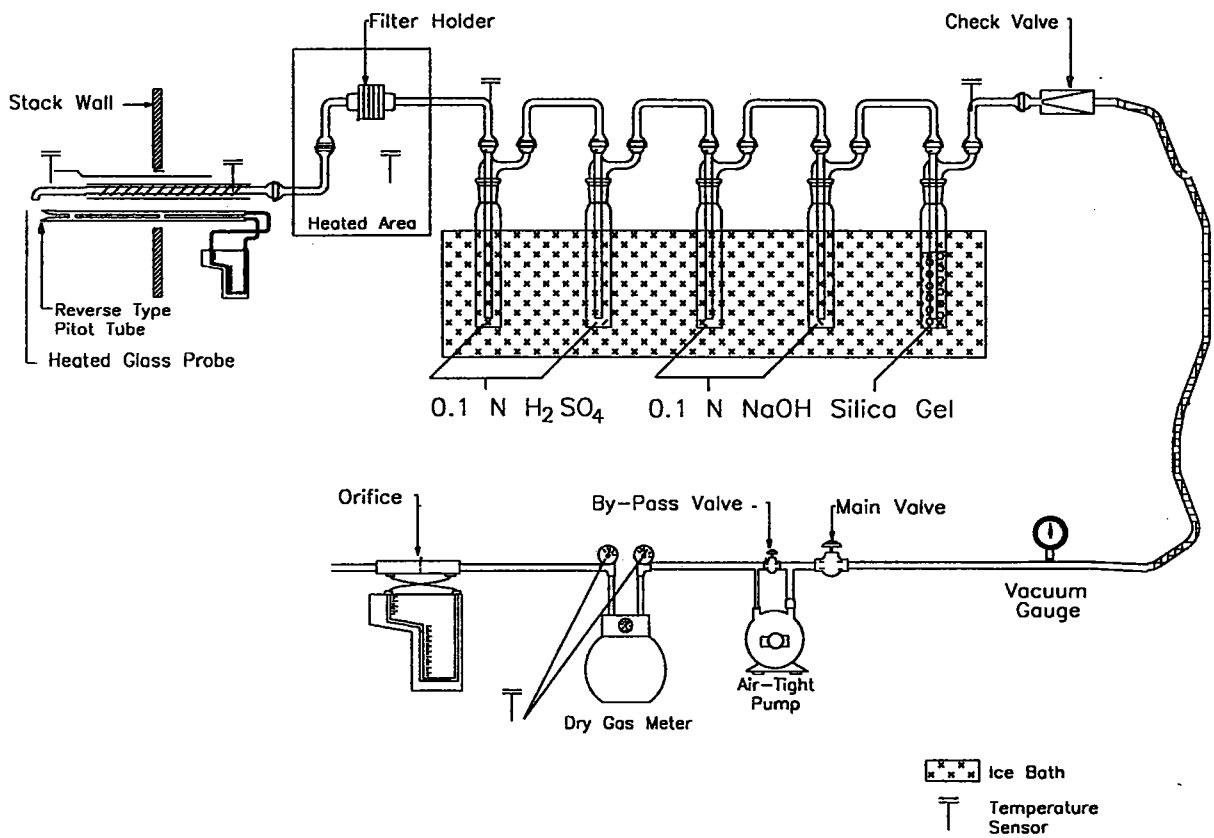
USEPA Method 3



Dwg - E

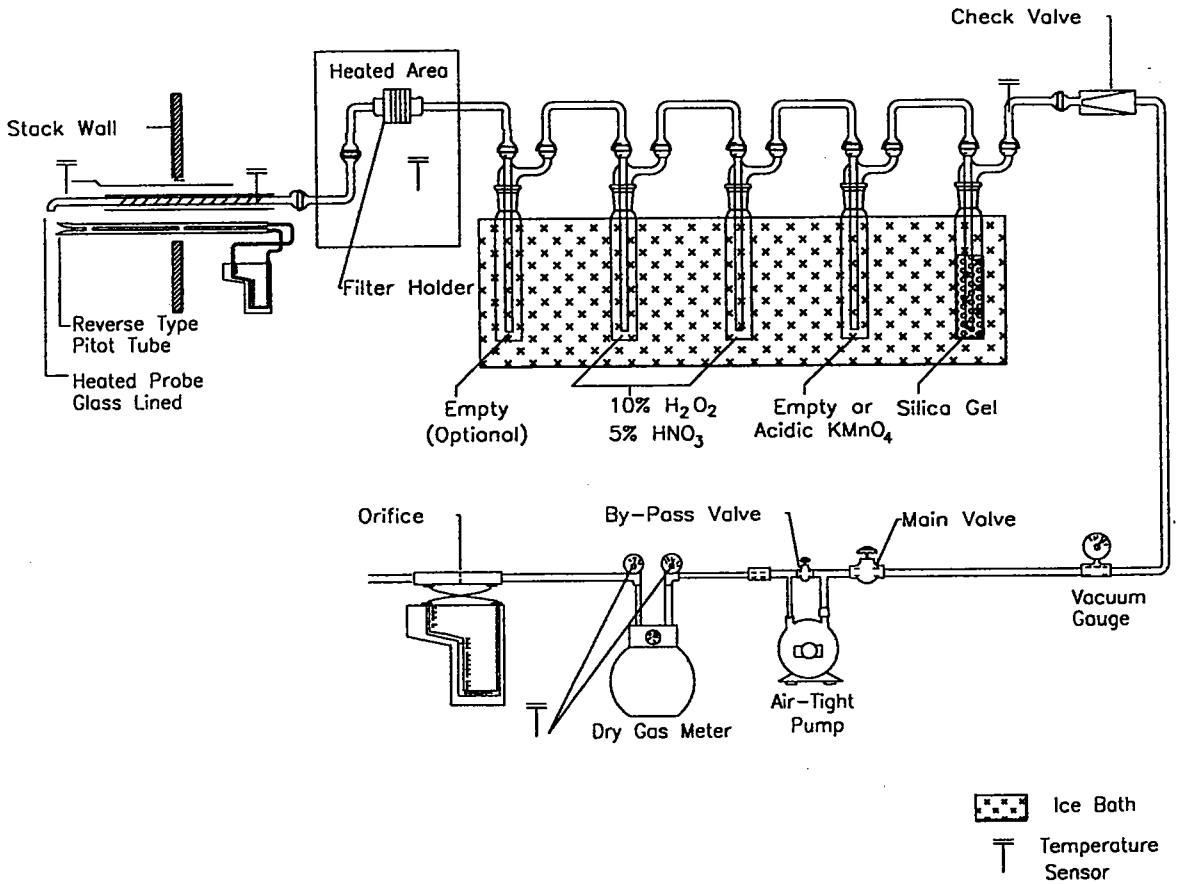
Determination of Hydrogen Chloride Emissions From Stationary Sources

USEPA Method 26A



Dwg - X

Determination of Trace Metal Concentrations in Emissions From Stationary Sources



Dwg - AQ

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65493 Sample: 050 M26 A Stack T1 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	8/17/2004
HCl (M26A)	0.20	mg	8/23/2004
HF (M26A)	<0.07	mg	8/23/2004

TEI Number: 65494 Sample: 051 M26 A Stack T2 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	8/17/2004
HCl (M26A)	0.24	mg	8/23/2004
HF (M26A)	<0.07	mg	8/23/2004

TEI Number: 65495 Sample: 052 M26 A Stack T3 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	8/17/2004
HCl (M26A)	<0.07	mg	8/23/2004
HF (M26A)	<0.07	mg	8/23/2004

g.e. O'Neill
Gayle E. O'Neill, Ph.D.

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7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65496 Sample: 053 M26A Air Heater Outlet T1 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	0.44	mg	8/17/2004
HCl (M26A)	1.52	mg	8/23/2004
HF (M26A)	0.44	mg	8/23/2004

TEI Number: 65497 Sample: 054 M26A Air Heater Outlet T2 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	0.63	mg	8/17/2004
HCl (M26A)	0.85	mg	8/23/2004
HF (M26A)	2.22	mg	8/23/2004

TEI Number: 65498 Sample: 055 M26A Air Heater Outlet T3 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	0.58	mg	8/17/2004
HCl (M26A)	2.12	mg	8/23/2004
HF (M26A)	2.60	mg	8/23/2004

g. e. O'Neill
Gayle E. O'Neill, Ph.D.

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7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65499 Sample: 056 M26A Baghouse Inlet T3 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	8/17/2004
HCl (M26A)	<0.07	mg	8/23/2004
HF (M26A)	<0.07	mg	8/23/2004

TEI Number: 65500 Sample: 057 M26A Baghouse Inlet T4 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	8/17/2004
HCl (M26A)	0.32	mg	8/23/2004
HF (M26A)	0.08	mg	8/23/2004

TEI Number: 65501 Sample: 058 M26A Baghouse Inlet T5 H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.3	mg	8/17/2004
HCl (M26A)	<0.07	mg	8/23/2004
HF (M26A)	<0.07	mg	8/23/2004

g. e. O'Neill
Gayle E. O'Neill, Ph.D.

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7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65502 Sample: 090 M26A Blank H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.05	mg	8/17/2004
HCl (M26A)	<0.02	mg	8/23/2004
HF (M26A)	<0.02	mg	8/23/2004

TEI Number: 65503 Sample: 059 M26 A Stack T1 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65504 Sample: 060 M26 A Stack T2 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65505 Sample: 061 M26 A Stack T3 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

g. e. O'Neill
Gayle E. O'Neill, Ph.D.

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Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65506 Sample: 062 M26A Air Heater Outlet T1 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65507 Sample: 063 M26A Air Heater Outlet T2 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65508 Sample: 064 M26A Air Heater Outlet T3 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65509 Sample: 065 M26A Baghouse Inlet T3 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65510 Sample: 066 M26A Baghouse Inlet T4 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

g. e. O'Neill
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Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65511 Sample: 067 M26A Baghouse Inlet T5 NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

TEI Number: 65512 Sample: 091 M26A Blank NaOH Fraction

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.04	mg	8/16/2004

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847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
8/4/04 15:38

M22E0517-03

TEI Number: 65513 Sample: 068 M29 Stack T1 Filter & HNO3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	42.0	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	6.3	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	<1	ug	8/13/2004
Lead (6010)	3.3	ug	8/13/2004
Manganese (6010)	1.5	ug	8/13/2004
Mercury (245.2)	<0.05	ug	8/13/2004
Nickel (6010)	2.3	ug	8/13/2004
Selenium (7740)	1.8	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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847-647-1345

PREPARED FOR:

Frank Jarke
GE Energy Management Services, Inc.
888 Industrial Dr.
Elmhurst, IL 60126

Report #: 65493
Report Date: 8/25/2004
Sample Received:
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M22E0517-03

TEI Number: 65514 Sample: 069 M29 Stack T2 Filter & HNO3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	1.0	ug	8/16/2004
Barium (6010)	85.9	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	4.7	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	3.0	ug	8/13/2004
Lead (6010)	<3	ug	8/13/2004
Manganese (6010)	2.4	ug	8/13/2004
Mercury (245.2)	0.15	ug	8/13/2004
Nickel (6010)	3.1	ug	8/13/2004
Selenium (7740)	4.3	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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M22E0517-03

TEI Number: 65515 Sample: 070 M29 Stack T3 Filter & HNO_3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	26.1	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	4.0	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	<1	ug	8/13/2004
Lead (6010)	<3	ug	8/13/2004
Manganese (6010)	1.7	ug	8/13/2004
Mercury (245.2)	0.35	ug	8/13/2004
Nickel (6010)	2.9	ug	8/13/2004
Selenium (7740)	2.0	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65516 Sample: 071 M29 Air Heater Outlet T1 Filter & HNO3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	7.2	ug	8/19/2004
Arsenic (7060)	126	ug	8/19/2004
Barium (6010)	1640	ug	8/19/2004
Beryllium (6010)	<1	ug	8/19/2004
Cadmium (6010)	<1	ug	8/19/2004
Chromium (6010)	95.8	ug	8/19/2004
Cobalt (6010)	39.9	ug	8/19/2004
Copper (6010)	236	ug	8/19/2004
Lead (6010)	23.6	ug	8/19/2004
Manganese (6010)	152	ug	8/19/2004
Mercury (245.2)	0.69	ug	8/13/2004
Nickel (6010)	69.6	ug	8/19/2004
Selenium (7740)	106	ug	8/19/2004
Silver (6010)	<6	ug	8/19/2004
Thallium (7841)	21	ug	8/19/2004

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TEI Number: 65517 Sample: 072 M29 Air Heater Outlet T2 Filter + HNO_3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<6	ug	8/19/2004
Arsenic (7060)	141	ug	8/19/2004
Barium (6010)	2900	ug	8/19/2004
Beryllium (6010)	<1	ug	8/19/2004
Cadmium (6010)	<1	ug	8/19/2004
Chromium (6010)	87.6	ug	8/19/2004
Cobalt (6010)	35.3	ug	8/19/2004
Copper (6010)	227	ug	8/19/2004
Lead (6010)	26.3	ug	8/19/2004
Manganese (6010)	136	ug	8/19/2004
Mercury (245.2)	0.63	ug	8/13/2004
Nickel (6010)	67.0	ug	8/19/2004
Selenium (7740)	154	ug	8/19/2004
Silver (6010)	<6	ug	8/19/2004
Thallium (7841)	28	ug	8/19/2004

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TEI Number: 65518 Sample: 073 M29 Air Heater Outlet TB Filter & HNO3 Rinse

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	6.4	ug	8/19/2004
Arsenic (7060)	227	ug	8/19/2004
Barium (6010)	1830	ug	8/19/2004
Beryllium (6010)	<1	ug	8/19/2004
Cadmium (6010)	<1	ug	8/19/2004
Chromium (6010)	103	ug	8/19/2004
Cobalt (6010)	43.2	ug	8/19/2004
Copper (6010)	243	ug	8/19/2004
Lead (6010)	23.2	ug	8/19/2004
Manganese (6010)	16	ug	8/19/2004
Mercury (245.2)	1.23	ug	8/13/2004
Nickel (6010)	77.2	ug	8/19/2004
Selenium (7740)	<60	ug	8/19/2004
Silver (6010)	<6	ug	8/19/2004
Thallium (7841)	29	ug	8/19/2004

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TEI Number: 65519 Sample: 074 M29 Stack T1 HNO_3/H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	0.87	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	2.2	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	2.4	ug	8/13/2004
Lead (6010)	<3	ug	8/13/2004
Manganese (6010)	<1	ug	8/13/2004
Mercury (245.2)	0.36	ug	8/9/2004
Nickel (6010)	<1	ug	8/13/2004
Selenium (7740)	3.5	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65520 Sample: 075 M29 Stack Tc2 HNO_3 / H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	3.4	ug	8/13/2004
Arsenic (7060)	<1	ug	8/18/2004
Barium (6010)	1.4	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	3.9	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	4.1	ug	8/13/2004
Lead (6010)	5.5	ug	8/13/2004
Manganese (6010)	3.0	ug	8/13/2004
Mercury (245.2)	0.32	ug	8/9/2004
Nickel (6010)	2.3	ug	8/13/2004
Selenium (7740)	13.3	ug	8/18/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65521 Sample: 076 M29 Stack T3 HNO_3 / H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	3.5	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	2.9	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	7.0	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	5.5	ug	8/13/2004
Lead (6010)	8.5	ug	8/13/2004
Manganese (6010)	3.6	ug	8/13/2004
Mercury (245.2)	0.30	ug	8/9/2004
Nickel (6010)	3.3	ug	8/13/2004
Selenium (7740)	17.3	ug	8/18/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65522 Sample: 077 M29 Air Heater Outlet T1 HNO_3/H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	2.9	ug	8/13/2004
Arsenic (7060)	5.1	ug	8/16/2004
Barium (6010)	130	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	0.55	ug	8/13/2004
Chromium (6010)	16.1	ug	8/13/2004
Cobalt (6010)	1.4	ug	8/13/2004
Copper (6010)	10.4	ug	8/13/2004
Lead (6010)	8.2	ug	8/13/2004
Manganese (6010)	10.0	ug	8/13/2004
Mercury (245.2)	9.8	ug	8/9/2004
Nickel (6010)	15.5	ug	8/13/2004
Selenium (7740)	70.7	ug	8/18/2004
Silver (6010)	14.0	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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M22E0517-03

TEI Number: 65523 Sample: 078 M29 Air Heater Outlet Ta HNO_3/H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	1.9	ug	8/13/2004
Arsenic (7060)	3.4	ug	8/16/2004
Barium (6010)	71.6	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	11.1	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	5.8	ug	8/13/2004
Lead (6010)	10.6	ug	8/13/2004
Manganese (6010)	51200	ug	8/19/2004
Mercury (245.2)	8.71	ug	8/9/2004
Nickel (6010)	7.1	ug	8/13/2004
Selenium (7740)	49.8	ug	8/18/2004
Silver (6010)	106	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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M22E0517-03

TEI Number: 65524 Sample: 079 M29 Air Heater Outlet HNO_3 / H_2O_2 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	1.5	ug	8/16/2004
Barium (6010)	57.2	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	6.7	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	3.3	ug	8/13/2004
Lead (6010)	7.0	ug	8/13/2004
Manganese (6010)	47.6	ug	8/13/2004
Mercury (245.2)	14.6	ug	8/13/2004
Nickel (6010)	5.8	ug	8/13/2004
Selenium (7740)	1.6	ug	8/17/2004
Silver (6010)	7.3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65525 Sample: 086 M29 Blank, Stack Filter & HNO3

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	2.5	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	1.8	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	<1	ug	8/13/2004
Lead (6010)	<3	ug	8/13/2004
Manganese (6010)	1.2	ug	8/13/2004
Mercury (245.2)	<0.05	ug	8/13/2004
Nickel (6010)	2.1	ug	8/13/2004
Selenium (7740)	<1	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65526 Sample: 087 M29 Blank, Air Heater Outlet Filter HNO3

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	6.6	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	5.5	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	6.8	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	<1	ug	8/13/2004
Lead (6010)	4.7	ug	8/13/2004
Manganese (6010)	2.2	ug	8/13/2004
Mercury (245.2)	0.22	ug	8/13/2004
Nickel (6010)	3.5	ug	8/13/2004
Selenium (7740)	<1	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65527 Sample: 088 M29, Blank HNO_3 / H_2O_2

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/10/2004
Antimony (6010)	<3	ug	8/13/2004
Arsenic (7060)	<1	ug	8/16/2004
Barium (6010)	<0.5	ug	8/13/2004
Beryllium (6010)	<0.5	ug	8/13/2004
Cadmium (6010)	<0.5	ug	8/13/2004
Chromium (6010)	<1	ug	8/13/2004
Cobalt (6010)	<1	ug	8/13/2004
Copper (6010)	<1	ug	8/13/2004
Lead (6010)	5.9	ug	8/13/2004
Manganese (6010)	10.4	ug	8/13/2004
Mercury (245.2)	0.01	ug	8/9/2004
Nickel (6010)	1.3	ug	8/13/2004
Selenium (7740)	<1	ug	8/17/2004
Silver (6010)	<3	ug	8/13/2004
Thallium (7841)	<2	ug	8/13/2004

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TEI Number: 65528 Sample: 080 M29 Stack T1 KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	3.60	ug	8/13/2004

TEI Number: 65529 Sample: 081 M29 Stack T2 KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	2.77	ug	8/13/2004

TEI Number: 65530 Sample: 082 M29 Stack T3 KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	2.81	ug	8/13/2004

TEI Number: 65531 Sample: 083 M29 Air Heater Outlet KMnO4 Fraction T1

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	24.3	ug	8/13/2004

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Report Date: 8/25/2004
Sample Received:
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TEI Number: 65532 Sample: 084 M29 Air Heater Outlet T2 KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	24.6	ug	8/13/2004

TEI Number: 65533 Sample: 085 M29 Air Heater Outlet T3 KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	26.7	ug	8/13/2004

TEI Number: 65534 Sample: 089 M29 Blank KMnO4 Fraction

TEST	RESULTS		DATE PERFORMED
Preparation (M29)			8/11/2004
Mercury (M29)	0.69	ug	8/13/2004

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PASC - Certificate of Analysis

	Client ID:		Method Blank	Blank Spike #1	Blank Spike #1	Blank Spike #2	Blank Spike #2	OHHG-0517-RB 7/27	OHHG-0517-RB 7/28
	Lab No.:		051078 04	051078 04	051078 04	051078 04	051078 04	051079 04	051080 04
	Date Sampled:		-	-	-	-	-	27-Jul-2004	28-Jul-2004
Component	**MDL**	**Units**			% Recoveries		% Recoveries		
Final volume measured - ash	0	ml	100	-	-	-	-	-	-
Final volume measured - bulk	0	"	100	-	-	-	-	-	-
Final volume measured - probe	0	"	100	-	-	-	-	-	-
Filter weight	1.0	mg	-	-	-	-	-	-	-
Filter weight	1.0	"	-	-	-	-	-	-	-
Filter weight	1.0	"	-	-	-	-	-	-	-
Impinger volume - KMnO4 - combined		ml	-	-	-	-	-	98	100
Impinger volume - hydroxylamine		"	-	-	-	-	-	-	-
Impinger volume - KCl - combined		"	-	-	-	-	-	-	-
Impinger volume - KMnO4 - combined		"	-	-	-	-	-	-	-
Weight of sample	0.0001	g	-	-	-	-	-	-	-
Mercury - filter	0.010	ug	<	0.10	100	0.10	100	-	-
Mercury - filter - ash	0.010	"	<	0.10	100	0.10	100	-	-
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	-	-
Mercury - KCl	0.050	"	<	0.51	100	0.52	100	-	-
Mercury - KMnO4	0.050	"	<	0.50	98	0.50	98	-	-
Mercury - H202	0.025	"	<	0.25	100	0.26	100	-	-
Mercury - probe rinse	0.010	"	<	0.10	100	0.10	100	-	-
Mercury - 5 percent KMnO4	0.010	"	-	-	-	-	-	<	<

PASC - Certificate of Analysis

			OHHG-0517-RB	OHHG	OHHG	OHHG	OHHG	OHHG
	Client ID:		7/29	0517-Stack-FB	0517-Inlet-FB	0517-Stack-T1	0517-Stack-T1	0517-Stack-T1
	Lab No.:		051081 04	051082 04	051083 04	051084 04	051084 04	051084 04
	Date Sampled:		29-Jul-2004	29-Jul-2004	29-Jul-2004	27-Jul-2004	27-Jul-2004	27-Jul-2004
Component	**MDL**	**Units**					Duplicate	M. Spike
Final volume measured - ash	0	ml	-	-	-	-	-	-
Final volume measured - bulk	0	"	100	-	-	100	-	-
Final volume measured - probe	0	"	-	-	-	-	-	-
Filter weight	1.0	mg	2800	-	-	-	-	-
Filter weight	1.0	"	2800	-	-	640	-	-
Filter weight	1.0	"	2800	-	-	-	-	-
Impinger volume - KMnO4 - combined		ml	-	-	-	-	-	-
Impinger volume - hydroxylamine		"	100	-	-	-	-	-
Impinger volume - KCl - combined		"	50	1000	1000	1000	-	-
Impinger volume - KMnO4 - combined		"	90	1000	1000	1000	-	-
Weight of sample	0.0001	g	-	-	-	-	-	-
			(1)	(1)	(1)	(1)(2)(3)		
Mercury - filter	0.010	ug	<	-	-	<0.020	-	-
Mercury - filter - ash	0.010	"	-	-	-	-	-	-
Mercury - hydroxylamine	0.010	"	<0.10	-	-	-	-	-
Mercury - KCl	0.050	"	<	<0.10	<0.10	<0.10	<0.10	1.0
Mercury - KMnO4	0.050	"	<	<0.10	<0.10	0.82	0.84	1.8
Mercury - H202	0.025	"	<0.052	<0.25	<0.25	<0.25	<0.25	2.6
Mercury - probe rinse	0.010	"	-	-	-	-	-	-
Mercury - 5 percent KMnO4	0.010	"	-	-	-	-	-	-

PASC - Certificate of Analysis

	Client ID:		OHHG 0517-Stack-T1	OHHG 0517-Stack-T1	OHHG 0517-Stack-T1	OHHG 0517-Stack-T2	OHHG 0517-Stack-T2	OHHG 0517-Stack-T2	OHHG 0517-Stack-T2
	Lab No.:		051084 04	051084 04	051084 04	051085 04	051085 04	051085 04	051085 04
	Date Sampled:		27-Jul-2004	27-Jul-2004	27-Jul-2004	28-Jul-2004	28-Jul-2004	28-Jul-2004	28-Jul-2004
Component	**MDL**	**Units**	MS % Rec.	MS Dup	MSD % Rec.		Duplicate	M. Spike	MS % Rec.
						(5)(7)			
Final volume measured - ash	0	ml	-	-	-	-	-	-	-
Final volume measured - bulk	0	"	-	-	-	100	-	-	-
Final volume measured - probe	0	"	-	-	-	-	-	-	-
Filter weight	1.0	mg	-	-	-	-	-	-	-
Filter weight	1.0	"	-	-	-	650	-	-	-
Filter weight	1.0	"	-	-	-	-	-	-	-
Impinger volume - KMnO4 - combined		ml	-	-	-	-	-	-	-
Impinger volume - hydroxylamine		"	-	-	-	-	-	-	-
Impinger volume - KCl - combined		"	-	-	-	1000	-	-	-
Impinger volume - KMnO4 - combined		"	-	-	-	1000	-	-	-
Weight of sample	0.0001	g	-	-	-	-	-	-	-
						(4)(1)			
Mercury - filter	0.010	ug	-	-	-	<	<	0.11	100
Mercury - filter - ash	0.010	"	-	-	-	-	-	-	-
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	-	-
Mercury - KCl	0.050	"	95	1.1	97	0.12	-	-	-
Mercury - KMnO4	0.050	"	95	1.8	93	0.57	-	-	-
Mercury - H202	0.025	"	100	2.6	100	<0.25	-	-	-
Mercury - probe rinse	0.010	"	-	-	-	-	-	-	-
Mercury - 5 percent KMnO4	0.010	"	-	-	-	-	-	-	-

PASC - Certificate of Analysis

			OHHG	OHHG	OHHG	OHHG	OHHG	OHHG	OHHG
	Client ID:		0517-Stack-T3	0517-Inlet-T1	0517-Inlet-T2	0517-Inlet-T3	0517-Inlet-T3	0517-Inlet-T3	0517-Inlet-T3
	Lab No.:		051086 04	051087 04	051088 04	051089 04	051089 04	051089 04	051089 04
	Date Sampled:		29-Jul-2004	27-Jul-2004	28-Jul-2004	29-Jul-2004	29-Jul-2004	29-Jul-2004	29-Jul-2004
Component	**MDL**	**Units**					Duplicate	M. Spike	MS % Rec.
			(5)						
Final volume measured - ash	0	ml	-	100	100	100	-	-	-
Final volume measured - bulk	0	"	100	-	-	-	-	-	-
Final volume measured - probe	0	"	-	100	100	100	-	-	-
Filter weight	1.0	mg	-	7600	16000	12000	-	-	-
Filter weight	1.0	"	680	-	-	-	-	-	-
Filter weight	1.0	"	-	7600	16000	12000	-	-	-
Impinger volume - KMnO4 - combined		ml	-	-	-	-	-	-	-
Impinger volume - hydroxylamine		"	-	-	-	-	-	-	-
Impinger volume - KCl - combined		"	1000	1000	1000	1000	-	-	-
Impinger volume - KMnO4 - combined		"	1000	1000	1000	1000	-	-	-
Weight of sample	0.0001	g	-	4.8	13	9.5	-	-	-
			(1)	(2)(1)(3)(6)	(6)	(4)(6)			
Mercury - filter	0.010	ug	<	-	-	-	-	-	-
Mercury - filter - ash	0.010	"	-	0.031	0.024	0.021	0.020	0.13	110
Mercury - hydroxylamine	0.010	"	-	-	-	-	-	-	-
Mercury - KCl	0.050	"	0.12	2.3	2.5	0.73	-	-	-
Mercury - KMnO4	0.050	"	0.50	15	18	17	-	-	-
Mercury - H202	0.025	"	<0.25	0.31	0.64	0.52	-	-	-
Mercury - probe rinse	0.010	"	-	<0.020	<	<	<	0.10	100
Mercury - 5 percent KMnO4	0.010	"	-	-	-	-	-	-	-

GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number: 1372ZE0519-03	Date Results Required:
Client: AOA ES	TAT Required:
Plant/Location: Sunflower Electric / Holcomb, KS	PO Number: M86001264-PSC M86001226-TEI
Project Supervisor: EZK	LIMS Entry: E. V.

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
001	7/27/04	Test #1 Stack Filter 1020	1		Hg by Ont. Hydro	
002	7/28/04	2 1031				
003	7/29/04	3 1036				
004	7/27/04	1 Front ½ Nitric Rinse				
005	7/28/04	2				
006	7/29/04	3				
007	7/27/04	1 KCl Impes 1-3				
008	7/28/04	2				
009	7/29/04	3				
010	7/27/04	1 HNO3/H2O2 Imp 4				
011	7/28/04	2				
012	7/29/04	3				
013	7/27/04	1 H2SO4/KMnO4 Imp 5-7				
014	7/28/04	2				
015	7/29/04	3				
016	7/27/04	Test #1 AHO/SDA Inlet Thimble 2260				

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:
JH	07/30/04 9 p.m.	DJS 08/3/04		

Special Instructions:

-2-

GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number: M22ED517-03	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
017	7/28/04	Test #2 AlHO/SDA Tank Initial 251	1		Hg by Dist. Hydro	
018	7/29/04	3 258				
019	7/27/04	1 Front ½ Nitric Rinse				
020	7/28/04	2				
021	7/29/04	3				
022	7/27/04	1 KCl Imp 1-3	1			
023	7/28/04	2	1			
024	7/29/04	3	1			
025	7/27/04	1 $AgNO_3/H_2O_2$ Imp 4	1			
026	7/28/04	2				
027	7/29/04	3				
028	7/27/04	1 $H_2SO_4/KMnO_4$ Imp 5-7				
029	7/28/04	2				
030	7/29/04	3				
031	7/27/04	$H_2SO_4/KMnO_4$ Reagent Blank				
032	7/28/04					

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

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GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number: M22E0517-03	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
033	7/28/04	H_2SO_4/Icm Reagent Blank	1		Hg by Unf. Hydra	
034	7/28/04	Filter Reagent Blank #1 1034				
035		#2 1035				
036		#3 1033				
037		Thimble Reagent Blank #1 269				
038		#2 262				
039		#3 268				
040		0.1 N Nitric Reagent Blank				
041		Hydroxamine Reagent Blank				
042		KCl Reagent Blank				
043		HNO3/H_2O_2 Reagent Blank				
044		Field Blank Stock KCl				
045		HNO3/H_2O_2				
046		H_2SO_4-KMnO4				
047		Field Blank HNO3/SDA and KCl				
048		HNO3/H_2O_2				

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number: M22E0517-03	Date Results Required:
Client: ADA	TAT Required:
Plant/Location: Sunflower Electric	PO Number: M86001226
Project Supervisor: ELE	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
049	7/29/04	Field Blank AAO As_2SO_4/ $KMnO_4$	1		Hg by Cont. Hydr.	
050	7/27/04	Test #1 (2CA) Stock H_2O_2 Fraction	1		HCl, HF, $NaBr$ (2CA)	
051	7/28/04	2	2			
052	7/29/04	3	1			
053	7/28/04	1 AAO	2			
054	7/29/04	2	3			
055	7/29/04	3	2			
056	7/28/04	3 BHI				
057	7/28/04	4				
058	7/29/04	5				
059	7/27/04	1 Stock NaOH Fraction	1		Br^+ (2CA)	
060	7/28/04	2				
061	7/29/04	3				
062	7/27/04	1 AAO				
063	7/28/04	2				
064	7/29/04	3				

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

- M2E4 Tests #1 2 & 3 @ the BHI were aborted due to sample train problems. No analysis will be performed.

GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number:	M22E0517-03	Date Results Required:	
Client:	ADA	TAT Required:	
Plant/Location:		PO Number:	
Project Supervisor:		LIMS Entry:	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
065	7/28/04	Test #3 BHI (26A) NaOH Fraction	1		Br+ (26A)	
066	7/29/04	4				
067	7/29/04	5				
068	7/27/04	Test 1 Stack (29) 1038 Filter & HNO3 Rinse	2		M29 (Antimony, Arsenic, Barium,	(*)
069	7/28/04	2 1032			Beryllium, Cadmium, Chromium,	
070	7/29/04	3 1037			Cobalt, Copper, Lead, Manganese,	
071	7/27/04	1 249 (29) Thimble & ARO/DI Rinse Nozzle Rinse			Mercury, Nickel, Selenium, Silver,	
072	7/28/04	2 250			Thallium)	
073	7/29/04	3 264				
074	7/27/04	Test 1 Stack (29) HNO3/H2O2 Fraction	1			
075	7/28/04	2				
076	7/29/04	3				
077	7/27/04	1 ARO (29)	2			
078	7/28/04	2				
079	7/29/04	3				
080	7/27/04	Test 1 Stack (29) KMnO4 Fraction	2		5) M29 (Hg Only)	

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

M26A tests 1-2 @ the BHI were aborted due to sample train problems. No analysis will be performed.

(*) M29 (Metals): Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium

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GE Energy

Read Instructions on Reverse Side Before Completing Form!

Project Number: M22E0517-03	Date Results Required:
Client: ADA	TAT Required:
Plant/Location:	PO Number:
Project Supervisor:	LIMS Entry:

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Sub Lab
081	7/29/04	Test 2 Stack(29) $KMnO_4$	2		M29 - Mercury	
082	7/29/04	3				
083	7/27/04	1 AHo				
084	7/28/04	2				
085	7/29/04	3				
086	7/29/04	Blank, Stack Filter 1 HNO_3 1039	2		M29 (see List of Metals - page 5)	
087		Blank AHo, Thimble 1 HNO_3 265	2			
088		Blank, HNO_3/H_2O_2	1			
089	7/28/04	Blank, $KMnO_4$	1		M29 - Mercury	
090		Blank 0.1 N H_2SO_4	1		26A - HCl, HF, HBr	
091		Blank 0.1 N NaOH	1		26A - Br_2	
092						
093						
094						
095						
096						

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

CALCULATIONS FOR HCl
METHOD 26

$$M = \frac{(S - B)}{4.53592 \times 10^8}$$

Where: Total

M = Mass of HCl in sample, lbs

S = Concentration of sample, micrograms HCl

B = Blank concentration micrograms HCl

4.53592×10^8 = Micrograms per Pound

C = M/Vmstd

Where:

C = Concentration of HCl in flue gas lbs/dscf
M = Mass of HCl in Sample, lbs.
Vmstd = Sample volume measured by dry gas meter, corrected to standard conditions.

E = C × dscfm × 60 min/hr

Where:

E = Emission rate HCl in lbs/hr

C = Concentration of HCl in lbs/DSCF

dscfm = Volumetric flow rate of stack gas, dry standard cubic feet per minute.

CALCULATIONS FOR HYDROGEN CHLORIDE (HCl)

Concentration of Hydrogen Chloride:

$$\frac{\text{lbs HCl}}{\text{dscf}} = \frac{\mu\text{g HCl in sample}}{4.536 \times 10^8 \times \text{dscf}}$$

where:

$4.536 \times 10^8 = \mu\text{g/lb}$

dscf = Volume of gas sampled

$$\mu\text{g/lb HCl} = \mu\text{g Cl} \times \frac{36.453}{35.453}$$

Parts Per Million v/v- Hydrogen Chloride

$$\text{ppm HCl} = \frac{\text{lbs HCl}}{\text{dscf}} \div \frac{36.453}{385 \times 10^6}$$

where:

385 = Volume of 1 lb mole of gas at 68F and 29.92 in. Hg

10^6 = Conversion of ppm v/v

METAL SAMPLE CALCULATION

Concentration

$$\frac{\mu g}{m^3} = \frac{\mu g \text{ of sample}}{\text{dscf volume sampled} \times 0.02832 \frac{m^3}{ft^3}}$$

Emission Rate

$$\frac{\mu g \text{ of sample} \times \frac{1 \times 10^{-6} \text{ grams}}{\mu g}}{453.6 \text{ gr/lb}} = \text{lbs of sample}$$

$$\frac{\text{lbs/sample}}{\text{Vm (std) sample}} \times \text{dscfm} \times 60 \frac{\text{min}}{\text{hr}} = \text{lbs/hr}$$

EMISSION RATE CALCULATIONS

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

1. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
   c_s = pollutant concentration, grains/dscf

2. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd}C}{\text{fuel flow rate (lb / hr) GCV}} \times 10^6$$

where, E = lbs per million Btu
GCV = gross calorific value, Btu / lb
Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

3. If an integrated gas sample is taken during the test and analyzed for $\%CO_2$ or $\%O_2$, dry basis by volume, with an Orsat gas analyzer, then

$$E = C\,F_c \frac{100}{(\%CO_2)} \text{ or, } E = C\,F \frac{20.9}{(20.9 - \%O_2)} \quad \text{where,}$$

$\%CO_2$ and $\%O_2$ are expressed as percent; and, for example, for subbituminous and bituminous coals:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO_2/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

4. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \quad \text{where, } \%C = \text{carbon content by weight expressed as percent}$$

$$F = \frac{[3.64\,(\%H) + 1.53\,(\%C) + 0.57\,(\%S) + 0.14\,(\%N) - 0.46\,(\%O_2)]}{GVC} \times 10^6$$

where, H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively.

5. If fuels other than subbituminous and bituminous coals are fired, other F-factors than those above will apply; and, if combinations of different fuels are fired, the F-factors must be prorated according to the fraction of the total heat input derived from each type of fuel.

VOLUMETRIC AIR FLOW CALCULATIONS

$$Vm\,(std) = 17.647 \times Vm \times \left[\frac{P_{bar} + \frac{DH}{13.6}}{(460 + Tm)}\right] \times Y$$

$$Vw\,(std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\,(std)}{Vw\,(std) + Vm\,(std)}\right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\ (of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right] \times (1 - Bws)$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

NOMENCLATURE - PARTICULATES

A = Cross-sectional area of stack or duct, ft^2
A_n = Cross-sectional area of nozzle, ft^2
B_{ws} = Water vapor in gas stream, proportion by volume
C_a = Acetone blank residue concentration, g/g
C_{acf} = Concentration of particulate matter in gas stream at actual conditions, gr/acf
C_p = Pitot tube coefficient, dimensionless
C_s = Concentration of particulate matter in gas stream, dry basis, corrected to standard conditions, gr/dscf
IKV = Isokinetic sampling variance, must be $.90 \leq IKV \leq 1.10$
M_d = Dry molecular weight of gas, lb/lb-mole
m_n = Total amount of particulate matter collected, grams
M_s = Molecular weight of gas, wet basis, lb/lb-mole
M_w = Molecular weight of water, 18.0 lb/lb-mole
m_a = Mass of residue of acetone after evaporation, grams
P_{bar} = Barometric pressure at testing site, in. Hg
P_g = Static pressure of gas, in. Hg (in. H_2O/13.6)
P_s = Absolute pressure of gas, in. Hg = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 in. Hg
Q_{acfm} = Actual volumetric gas flow rate, acfm
Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, dscf/hr
R = Ideal gas constant, 21.85 in. Hg-ft^3/°R-lb-mole
T_m = Absolute dry gas meter temperature, °R
T_s = Absolute gas temperature, °R
T_{std} = Standard absolute temperature, 528°R
V_a = Volume of acetone blank, ml
V_{aw} = Volume of acetone used in wash, ml
V_{1c} = Total volume of liquid collected in impingers and silica gel, ml
V_m = Volume of gas sample as measured by dry gas meter, dcf
$V_{m(std)}$ = Volume of gas sample measured by dry gas meter, corrected to standard conditions, dscf
v_s = Gas velocity, ft/sec
$V_{w(std)}$ = Volume of water vapor in gas sample, corrected to standard conditions, scf
W_a = Weight of residue in acetone wash, grams
Y = Dry gas meter calibration factor
ΔH = Average pressure differential across the orifice meter, in. H_2O
Δp = Velocity head of gas, in. H_2O
ρ_a = Density of acetone, 0.7855 g/ml (average)
ρ_w = Density of water, 0.002201 lb/ml
θ = Total sampling time, minutes
K_1 = 17.64 °R/in. Hg
K_2 = 0.04707 ft^3/ml
K_4 = 0.09450/100 = 0.000945
K_p = Pitot tube constant, $85.49 \frac{ft}{sec}\left[\frac{(lb/lb-mole)(in.Hg)}{(°R)(in.H_2O)}\right]^{1/2}$
%EA = Percent excess air
$\%CO_2$ = Percent carbon dioxide by volume, dry basis
$\%O_2$ = Percent oxygen by volume, dry basis
%CO = Percent carbon monoxide by volume, dry basis
$\%N_2$ = Percent nitrogen by volume, dry basis
0.264 = Ratio of O_2 to N_2 in air, v/v
0.28 = Molecular weight of N_2 or CO, divided by 100
0.32 = Molecular weight of O_2 divided by 100
0.44 = Molecular weight of CO_2 divided by 100
13.6 = Specific gravity of mercury (Hg)

Example Calculations - Method 29 Test

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Test Location: Air Heater Outlet
Run: 1
Date: 7/27/2004

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 14.0 $\%O_2$ = 4.8 $\%N_2$ = 81.2

Md = 30.43

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md = 30.43 Bws = 0.133

Ms = 28.78

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 0.998 Vm = 84.234 Pbar = 27.26
ΔH = 1.40 Tm = 555.6

Vm(std) = 73.061

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 238.2

Vw(std) = 11.219

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 11.219 Vm(std) = 73.061

Bws = 0.133

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P \text{ (avg)} \times (Ts \text{ (avg)} / (Ps \times Ms))^{1/2}$$

Cp = 0.840 Ts (avg) = 745.5 Sqrt ΔP (avg): 0.744
Ps = 26.52 Ms = 28.78

Vs = 52.80

Example Calculations - Method 29 Test

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs = 52.80 A = 290.000

Q = 918791

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 918791 Ps = 26.52 Ts (avg) = 745.5

Qstd = 576887

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1-Bws)$$

Qstd = 576887 Bws = 0.133

Qstd(dry) = 500092

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1-Bws)}$$

Ts = 745.5 Vm(std) = 11.219 Vs = 52.804
An = 0.000 θ = 120.0 Ps = 26.52
Bws = 0.133

%ISO = 103.6

Example Calculations - Ontario Hydro Test

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Test Location: Air Heater Outlet
Run: 1
Date: 7/27/2004

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 13.8 $\%O_2$ = 5.0 $\%N_2$ = 81.2

Md = 30.41

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md = 30.41 Bws = 0.124

Ms = 28.87

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 0.998 Vm = 85.453 Pbar = 27.26
ΔH = 1.44 Tm = 551.8

Vm(std) = 74.635

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 224.0

Vw(std) = 10.550

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 10.550 Vm(std) = 74.635

Bws = 0.124

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P \text{ (avg)} \times (Ts \text{ (avg)}/ (Ps \times Ms))^{1/2}$$

Cp = 0.840 Ts (avg) = 741.4 Sqrt ΔP (avg): 0.755
Ps = 26.52 Ms = 28.87

Vs = 53.32

Example Calculations - Ontario Hydro Test

Volumetric Flow Rate (Actual Basis)

Q = Vs x A x 60

Vs = 53.32 A = 290.000

Q = 927782

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 927782 Ps = 26.52 Ts (avg) = 741.4

Qstd = 585740

Volumetric Flow Rate (Standard Dry Basis)

Qstd(dry) = Qstd x (1-Bws)

Qstd = 585740 Bws = 0.124

Qstd(dry) = 513195

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1-Bws)}$$

Ts = 741.4 Vm(std) = 10.550 Vs = 53.321
An = 0.000 θ = 120.0 Ps = 26.52
Bws = 0.124

%ISO = 103.2

Example Calculations - Method 26A Test

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Test Location: Air Heater Outlet
Run: 1
Date: 7/27/2004

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 13.8 $\%O_2$ = 5.0 $\%N_2$ = 81.2

Md = 30.41

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md = 30.41 Bws = 0.114

Ms = 29.00

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 1.008 Vm = 85.423 Pbar = 27.26
ΔH = 1.47 Tm = 552.2

Vm(std) = 75.316

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 205.1

Vw(std) = 9.660

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 9.660 Vm(std) = 75.316

Bws = 0.114

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P \text{ (avg)} \times (Ts \text{ (avg)} / (Ps \times Ms))^{1/2}$$

Cp = 0.841 Ts (avg) = 744.2 Sqrt ΔP (avg): 0.748
Ps = 26.52 Ms = 29.00

Vs = 52.88

Example Calculations - Method 26A Test

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs = 52.88 A = 290.000

Q = 920038

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 920038 Ps = 26.52 Ts (avg) = 744.2

Qstd = 578672

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1-Bws)$$

Qstd = 578672 Bws = 0.114

Qstd(dry) = 512888

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1-Bws)}$$

Ts = 744.2 Vm(std) = 9.660 Vs = 52.876
An = 0.000 θ = 120.0 Ps = 26.52
Bws = 0.114

%ISO = 101.7

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	N		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E15		**Sample Plane:**	Horizontal	
Meter ID:	E15		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.005		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	501B		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.837		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.99	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-2.80	**in. H_2O**	**Final Impinger Content:**	172.30	**mls.**
Flue Pressure (Ps):	26.78	**in. Hg. abs.**	**Difference:**	172.30	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	11.6	**%**	**Total Water Gain:**	172.30	
Oxygen:	7.6	**%**			
Nitrogen:	80.8	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.47	**Inches H_2O**	**Gas Weight dry, Md:**	30.160	**lb/lb mole**
Meter Temperature, Tm:	96.6	**°F**	**Gas Weight wet, Ms:**	28.328	**lb/lb mole**
Sqrt ΔP:	1.361	**Inches H_2O**	**Excess Air:**	55.348	**%**
Stack Temperature, Ts:	189.8	**°F**	**Gas Velocity, Vs:**	90.107	
Meter Volume, Vm:	53.125	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,132,321	
Meter Volume, Vmstd:	45.749	**dscf**	**Volumetric Flow, DSCFM:**	699,603	
Meter Volume, Vwstd:	8.115	**wscf**	**Volumetric Flow, SCFM:**	823,704	
Moisture, Bws:	0.151		**Isokinetic Variance, %I:**	101.0	

EMISSION DATA

Type of Fuel Firing:	Coal	
Fuel Factor F_d (dscf/mmBtu):	9780	
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006
	80.900	

	Filterable	**Condensible**
HCl		
mg (net) collected:	0.20	---
ppm:	0.10	---
ug/dscm:	154.38	---
lb/hr:	0.4046	---
lb/mmBtu (based on Fd):	0.0001481	---
HF		
mg (net) collected:	0.07	
ppm:	0.06	
ug/dscm:	54.03	
lb/hr:	0.1416	
lb/mmBtu (based on Fd):	0.0000518	
HBr		
mg (net) collected:	0.20	
ppm:	0.05	
ug/dscm:	154.38	
lb/hr:	0.4046	
lb/mmBtu (based on Fd):	0.0001481	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 8:55
End Time: 11:03

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:55:00	1.80	0.46	27.18	1.342	190	95	92	1.0	2.192	88.86
1-1	9:00:00	1.90	0.49	29.37	1.378	190	96	92	1.0	2.217	91.29
1-2	9:05:00	1.80	0.46	31.58	1.342	190	96	93	1.0	2.152	88.86
1-2	9:10:00	1.80	0.46	33.74	1.342	190	97	93	1.0	2.210	88.86
1-3	9:15:00	1.60	0.41	35.95	1.265	189	98	93	1.0	2.026	83.71
1-3	9:20:00	1.60	0.41	37.97	1.265	189	98	93	1.0	2.057	83.71
	9:25:00			40.03							
2-1	9:27:00	1.90	0.48	40.03	1.378	190	98	93	1.0	2.245	91.29
2-1	9:32:00	1.90	0.48	42.27	1.378	190	98	93	1.0	2.219	91.29
2-2	9:37:00	1.90	0.48	44.49	1.378	190	99	94	1.0	2.266	91.29
2-2	9:42:00	1.90	0.48	46.76	1.378	190	99	94	1.0	2.252	91.29
2-3	9:47:00	1.90	0.48	49.01	1.378	190	100	94	1.0	2.219	91.29
2-3	9:52:00	1.90	0.48	51.23	1.378	190	100	94	1.0	2.261	91.29
	9:57:00			53.49							
3-1	10:00:00	1.90	0.48	53.49	1.378	190	97	94	1.0	2.229	91.29
3-1	10:05:00	1.90	0.48	55.72	1.378	190	99	94	1.0	2.243	91.29
3-2	10:10:00	2.00	0.51	57.96	1.414	190	100	94	1.0	2.305	93.66
3-2	10:15:00	2.00	0.51	60.27	1.414	190	100	94	1.0	2.287	93.66
3-3	10:20:00	1.80	0.46	62.56	1.342	189	101	95	1.0	2.199	88.79
3-3	10:25:00	1.80	0.46	64.75	1.342	189	101	95	1.0	2.189	88.79
	10:30:00			66.94							
4-1	10:33:00	2.00	0.51	66.94	1.414	190	99	95	1.0	2.302	93.66
4-1	10:38:00	2.00	0.51	69.25	1.414	190	100	95	1.0	2.295	93.66
4-2	10:43:00	2.00	0.51	71.54	1.414	190	101	96	1.0	2.333	93.66
4-2	10:48:00	2.00	0.51	73.87	1.414	190	101	96	1.0	2.289	93.66
4-3	10:53:00	1.60	0.41	76.16	1.265	189	102	96	1.0	2.084	83.71
4-3	10:58:00	1.60	0.41	78.25	1.265	189	102	96	1.0	2.054	83.71
	11:03:00			80.30							
			0.47	53.125	1.361	190	99	94		53.125	
							96.56				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	N		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E46		**Sample Plane:**	Horizontal	
Meter ID:	E46		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.994		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	799A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.188	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.94	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.30	**in. H_2O**	**Final Impinger Content:**	353.70	**mls.**
Flue Pressure (Ps):	26.84	**in. Hg. abs.**	**Difference:**	353.70	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.2	**%**	**Total Water Gain:**	353.70	
Oxygen:	6.6	**%**			
Nitrogen:	81.2	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.85	**Inches H_2O**	**Gas Weight dry, Md:**	30.216	**lb/lb mole**
Meter Temperature, Tm:	97.8	**°F**	**Gas Weight wet, Ms:**	28.257	**lb/lb mole**
Sqrt ΔP:	1.521	**Inches H_2O**	**Excess Air:**	44.484	**%**
Stack Temperature, Ts:	191.7	**°F**	**Gas Velocity, Vs:**	101.224	
Meter Volume, Vm:	102.425	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,272,032	
Meter Volume, Vmstd:	87.209	**dscf**	**Volumetric Flow, DSCFM:**	776,382	
Meter Volume, Vwstd:	16.659	**wscf**	**Volumetric Flow, SCFM:**	924,692	
Moisture, Bws:	0.160		**Isokinetic Variance, %I:**	102.3	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		

	Filterable	**Condensible**
HCl		
mg (net) collected:	0.24	---
ppm:	0.06	---
ug/dscm:	97.19	---
lb/hr:	0.2826	---
lb/mmBtu (based on Fd):	0.0000867	---
HF		
mg (net) collected:	0.07	
ppm:	0.03	
ug/dscm:	28.35	
lb/hr:	0.0824	
lb/mmBtu (based on Fd):	0.0000253	
HBr		
mg (net) collected:	0.20	
ppm:	0.02	
ug/dscm:	80.99	
lb/hr:	0.2355	
lb/mmBtu (based on Fd):	0.0000723	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 8:30
End Time: 10:36

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:30:00	2.40	1.90	92.72	1.549	192	94	93	1.0	4.325	102.76
1-1	8:35:00	2.40	1.90	97.05	1.549	192	95	93	1.0	4.308	102.76
1-2	8:40:00	2.40	1.90	101.35	1.549	193	99	94	1.0	4.339	102.84
1-2	8:45:00	2.40	1.90	105.69	1.549	193	99	94	1.0	4.335	102.84
1-3	8:50:00	1.90	1.50	110.03	1.378	191	100	94	1.0	3.863	91.36
1-3	8:55:00	1.90	1.50	113.89	1.378	191	100	94	1.0	3.838	91.36
	9:00:00			117.73							
2-1	9:02:00	2.50	2.00	117.73	1.581	192	99	94	1.0	4.419	104.88
2-1	9:07:00	2.50	2.00	122.15	1.581	192	100	94	1.0	4.441	104.88
2-2	9:12:00	2.40	1.90	126.59	1.549	192	102	95	1.0	4.363	102.76
2-2	9:17:00	2.40	1.90	130.95	1.549	192	102	95	1.0	4.350	102.76
2-3	9:22:00	2.10	1.70	135.30	1.449	191	102	95	1.0	4.063	96.05
2-3	9:27:00	2.10	1.70	139.37	1.449	191	102	95	1.0	4.074	96.05
	9:32:00			143.44							
3-1	9:34:00	2.50	2.00	143.44	1.581	191	97	95	1.0	4.409	104.80
3-1	9:39:00	2.50	2.00	147.85	1.581	191	100	95	1.0	4.439	104.80
3-2	9:44:00	2.40	1.90	152.29	1.549	192	102	96	1.0	4.363	102.76
3-2	9:49:00	2.40	1.90	156.65	1.549	192	102	96	1.0	4.350	102.76
3-3	9:54:00	2.20	1.80	161.00	1.483	191	103	96	1.0	4.201	98.31
3-3	9:59:00	2.20	1.80	165.20	1.483	191	103	96	1.0	4.173	98.31
	10:04:00			169.37							
4-1	10:06:00	2.50	2.00	169.37	1.581	192	99	96	1.0	4.421	104.88
4-1	10:11:00	2.50	2.00	173.80	1.581	192	101	96	1.0	4.467	104.88
4-2	10:16:00	2.40	1.90	178.26	1.549	192	102	96	1.0	4.348	102.76
4-2	10:21:00	2.40	1.90	182.61	1.549	192	102	96	1.0	4.355	102.76
4-3	10:26:00	2.10	1.70	186.97	1.449	191	104	97	1.0	4.063	96.05
4-3	10:31:00	2.10	1.70	191.03	1.449	191	104	97	1.0	4.118	96.05
	10:36:00			195.15							
			1.85	102.425	1.521	192	101	95		102.425	
							97.81				

Field Notes/Comments:

TEST DATA	- Method 26A	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	N		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E46		**Sample Plane:**	Horizontal	
Meter ID:	E46		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.994		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	799A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.188	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.73	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.40	**in. H_2O**	**Final Impinger Content:**	307.10	**mls.**
Flue Pressure (Ps):	26.63	**in. Hg. abs.**	**Difference:**	307.10	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	307.10	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.78	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	96.1	**°F**	**Gas Weight wet, Ms:**	28.434	**lb/lb mole**
Sqrt ΔP:	1.495	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	191.1	**°F**	**Gas Velocity, Vs:**	99.545	
Meter Volume, Vm:	100.889	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,250,933	
Meter Volume, Vmstd:	85.481	**dscf**	**Volumetric Flow, DSCFM:**	772,144	
Meter Volume, Vwstd:	14.464	**wscf**	**Volumetric Flow, SCFM:**	902,800	
Moisture, Bws:	0.145		**Isokinetic Variance, %I:**	100.8	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	79.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	0.07	---	
ppm:	0.02	---	
ug/dscm:	28.92	---	
lb/hr:	0.0836	---	
lb/mmBtu (based on Fd):	0.0000265	---	
HF			
mg (net) collected:	0.07		
ppm:	0.03		
ug/dscm:	28.92		
lb/hr:	0.0836		
lb/mmBtu (based on Fd):	0.0000265		
HBr			
mg (net) collected:	0.20		
ppm:	0.02		
ug/dscm:	82.63		
lb/hr:	0.2390		
lb/mmBtu (based on Fd):	0.0000759		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 8:30
End Time: 10:36

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:30:00	2.20	1.70	23.05	1.483	191	94	91	1.0	4.138	98.31
1-1	8:35:00	2.20	1.70	27.19	1.483	191	95	91	1.0	4.167	98.31
1-2	8:40:00	2.20	1.70	31.36	1.483	191	96	91	1.0	4.162	98.31
1-2	8:45:00	2.20	1.70	35.52	1.483	191	96	91	1.0	4.146	98.31
1-3	8:50:00	1.60	1.30	39.67	1.265	190	97	91	1.0	3.551	83.77
1-3	8:55:00	1.60	1.30	43.22	1.265	190	97	91	1.0	3.524	83.77
	9:00:00			46.74							
2-1	9:02:00	2.20	1.70	46.74	1.483	191	96	91	1.0	4.165	98.31
2-1	9:07:00	2.20	1.70	50.91	1.483	191	97	91	1.0	4.157	98.31
2-2	9:12:00	2.40	1.90	55.06	1.549	191	98	92	1.0	4.363	102.68
2-2	9:17:00	2.40	1.90	59.43	1.549	191	98	92	1.0	4.322	102.68
2-3	9:22:00	2.10	1.70	63.75	1.449	189	99	92	1.0	4.068	95.90
2-3	9:27:00	2.10	1.70	67.82	1.449	189	99	92	1.0	4.075	95.90
	9:32:00			71.89							
3-1	9:34:00	2.40	1.90	71.89	1.549	192	100	93	1.0	4.342	102.76
3-1	9:39:00	2.40	1.90	76.23	1.549	192	101	93	1.0	4.398	102.76
3-2	9:44:00	2.50	2.00	80.63	1.581	192	102	93	1.0	4.429	104.88
3-2	9:49:00	2.50	2.00	85.06	1.581	192	102	93	1.0	4.481	104.88
3-3	9:54:00	2.20	1.80	89.54	1.483	191	103	94	1.0	4.187	98.31
3-3	9:59:00	2.20	1.80	93.73	1.483	191	103	94	1.0	4.172	98.31
	10:04:00			97.90							
4-1	10:06:00	2.50	2.00	97.90	1.581	192	101	95	1.0	4.446	104.88
4-1	10:11:00	2.50	2.00	102.35	1.581	192	101	95	1.0	4.491	104.88
4-2	10:16:00	2.50	2.00	106.84	1.581	192	102	96	1.0	4.475	104.88
4-2	10:21:00	2.50	2.00	111.31	1.581	192	102	96	1.0	4.441	104.88
4-3	10:26:00	2.10	1.70	115.75	1.449	191	102	96	1.0	4.111	96.05
4-3	10:31:00	2.10	1.70	119.86	1.449	191	102	96	1.0	4.078	96.05
	10:36:00			123.94							
			1.78	100.889	1.495	191	99	93		100.889	
							96.10				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	JPH				
Temp ID:	E-75		**Sample Plane:**	Horizontal	
Meter ID:	E-75		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	6	
Probe Length:	11.5	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.21	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-13.20	**in. H_2O**	**Final Impinger Content:**	144.00	**mls.**
Flue Pressure (Ps):	26.24	**in. Hg. abs.**	**Difference:**	144.00	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	15/15	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.5	**%**	**Total Water Gain:**	144.00	
Oxygen:	6.5	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.36	**Inches H_2O**	**Gas Weight dry, Md:**	30.260	**lb/lb mole**
Meter Temperature, Tm:	77.5	**°F**	**Gas Weight wet, Ms:**	28.422	**lb/lb mole**
Sqrt ΔP:	0.970	**Inches H_2O**	**Excess Air:**	43.671	**%**
Stack Temperature, Ts:	179.8	**°F**	**Gas Velocity, Vs:**	64.183	
Meter Volume, Vm:	42.650	**Cubic Feet**	**Volumetric Flow, ACFM:**	677,777	
Meter Volume, Vmstd:	38.447	**dscf**	**Volumetric Flow, DSCFM:**	417,006	
Meter Volume, Vwstd:	6.782	**wscf**	**Volumetric Flow, SCFM:**	490,570	
Moisture, Bws:	0.150		**Isokinetic Variance, %I:**	100.6	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	0.07	---	
ppm:	0.04	---	
ug/dscm:	64.30	---	
lb/hr:	0.1004	---	
lb/mmBtu (based on Fd):	0.0000570	---	
HF			
mg (net) collected:	0.07		
ppm:	0.08		
ug/dscm:	64.30		
lb/hr:	0.1004		
lb/mmBtu (based on Fd):	0.0000570		
HBr			
mg (net) collected:	0.20		
ppm:	0.05		
ug/dscm:	183.71		
lb/hr:	0.2869		
lb/mmBtu (based on Fd):	0.0001628		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 3 **Test Date:** 7/28/2004
Start Time: 11:15
End Time: 13:22

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:15:00	1.30	0.52	1.31	1.140	180	76	75	5.0	2.150	75.49
1-2	11:20:00	1.00	0.40	3.46	1.000	180	76	75	5.0	1.850	66.21
1-3	11:25:00	0.94	0.38	5.31	0.970	179	76	75	6.0	1.850	64.14
1-4	11:30:00	0.87	0.35	7.16	0.933	180	76	75	6.0	1.770	61.75
	11:35:00			8.93							
2-1	11:36:00	1.20	0.48	9.42	1.095	181	76	75	6.0	2.070	72.58
2-2	11:41:00	0.90	0.36	11.49	0.949	181	76	76	6.0	1.790	62.86
2-3	11:46:00	0.85	0.34	13.28	0.922	181	76	76	6.0	1.750	61.09
2-4	11:51:00	0.79	0.32	15.03	0.889	176	76	76	6.0	1.500	58.66
	11:56:00			16.53							
3-1	11:57:00	1.10	0.44	17.21	1.049	179	77	76	6.0	1.980	69.39
3-2	12:02:00	0.99	0.40	19.19	0.995	180	77	76	6.0	1.880	65.88
3-3	12:07:00	0.73	0.29	21.07	0.854	182	78	77	6.0	1.610	56.66
3-4	12:12:00	0.68	0.27	22.68	0.825	177	77	76	6.0	1.520	54.47
	12:17:00			24.20							
4-1	12:20:00	0.95	0.38	25.46	0.975	181	78	77	7.0	1.760	64.58
4-2	12:25:00	0.83	0.33	27.22	0.911	181	78	77	7.0	1.740	60.37
4-3	12:30:00	0.79	0.32	28.96	0.889	180	78	77	7.0	1.640	58.85
4-4	12:35:00	0.79	0.32	30.60	0.889	178	79	77	7.0	1.710	58.75
	12:40:00			32.31							
5-1	12:41:00	1.20	0.48	33.16	1.095	180	79	78	8.0	2.080	72.53
5-2	12:46:00	0.89	0.36	35.24	0.943	180	80	78	8.0	1.730	62.46
5-3	12:51:00	0.72	0.29	36.97	0.849	179	80	79	8.0	1.650	56.14
5-4	12:56:00	0.68	0.27	38.62	0.825	177	80	79	8.0	1.550	54.47
	13:01:00			40.17							
6-1	13:02:00	1.00	0.40	40.74	1.517	181	80	80	8.0	1.910	100.52
6-2	13:07:00	0.93	0.37	42.65	0.964	180	80	79	8.0	1.880	63.85
6-3	13:12:00	0.85	0.34	44.53	0.922	181	80	79	9.0	1.650	61.09
6-4	13:17:00	0.76	0.31	46.18	0.872	180	81	80	10.0	1.630	57.72
	13:22:00			47.81							
			0.36	42.650	0.970	180	78	77		42.650	
							77.46				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 4

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	JPH				
Temp ID:	E-75		**Sample Plane:**	Horizontal	
Meter ID:	E-75		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	6	
Probe Length:	11.5	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-13.00	**in. H_2O**	**Final Impinger Content:**	147.50	**mls.**
Flue Pressure (Ps):	26.04	**in. Hg. abs.**	**Difference:**	147.50	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	15/15	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.4	**%**	**Total Water Gain:**	147.50	
Oxygen:	6.2	**%**			
Nitrogen:	81.4	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.36	**Inches H_2O**	**Gas Weight dry, Md:**	30.232	**lb/lb mole**
Meter Temperature, Tm:	70.2	**°F**	**Gas Weight wet, Ms:**	28.372	**lb/lb mole**
Sqrt ΔP:	0.941	**Inches H_2O**	**Excess Air:**	40.550	**%**
Stack Temperature, Ts:	180.0	**°F**	**Gas Velocity, Vs:**	62.584	
Meter Volume, Vm:	42.730	**Cubic Feet**	**Volumetric Flow, ACFM:**	660,883	
Meter Volume, Vmstd:	38.742	**dscf**	**Volumetric Flow, DSCFM:**	402,407	
Meter Volume, Vwstd:	6.947	**wscf**	**Volumetric Flow, SCFM:**	474,566	
Moisture, Bws:	0.152		**Isokinetic Variance, %I:**	105.1	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	0.32	---	
ppm:	0.19	---	
ug/dscm:	291.69	---	
lb/hr:	0.4397	---	
lb/mmBtu (based on Fd):	0.0002532	---	
HF			
mg (net) collected:	0.08		
ppm:	0.09		
ug/dscm:	72.92		
lb/hr:	0.1099		
lb/mmBtu (based on Fd):	0.0000633		
HBr			
mg (net) collected:	0.20		
ppm:	0.05		
ug/dscm:	182.30		
lb/hr:	0.2748		
lb/mmBtu (based on Fd):	0.0001583		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 4 **Test Date:** 7/29/2004
Start Time: 8:10
End Time: 10:15

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:10:00	1.00	0.40	0.68	1.000	180	66	65	6.0	1.910	66.21
1-2	8:15:00	0.88	0.35	2.59	0.938	180	66	65	6.0	1.780	62.11
1-3	8:20:00	0.74	0.30	4.37	0.860	181	67	65	6.0	1.640	57.00
1-4	8:25:00	0.72	0.29	6.01	0.849	177	68	66	5.0	1.590	56.05
	8:30:00			7.60							
2-1	8:31:00	1.00	0.40	8.04	1.000	180	70	67	6.0	1.920	66.21
2-2	8:36:00	0.89	0.36	9.96	0.943	181	70	67	5.0	1.780	62.51
2-3	8:41:00	0.81	0.33	11.74	0.900	181	70	67	5.0	1.710	59.63
2-4	8:46:00	0.76	0.31	13.45	0.872	176	70	67	5.0	1.640	57.54
	8:51:00			15.09							
3-1	8:52:00	1.10	0.44	15.78	1.049	180	71	68	5.0	1.970	69.44
3-2	8:57:00	0.94	0.38	17.75	0.970	182	71	68	5.0	1.820	64.29
3-3	9:02:00	0.85	0.34	19.57	0.922	181	71	69	5.0	1.790	61.09
3-4	9:07:00	0.78	0.31	21.36	0.883	182	72	69	6.0	1.610	58.56
	9:12:00			22.97							
4-1	9:13:00	0.97	0.39	23.58	0.985	182	72	69	6.0	1.880	65.31
4-2	9:18:00	0.93	0.37	25.46	0.964	181	72	69	6.0	1.790	63.90
4-3	9:23:00	0.87	0.35	27.25	0.933	181	72	69	6.0	1.790	61.80
4-4	9:28:00	0.72	0.29	29.04	0.849	178	73	70	6.0	1.570	56.09
	9:33:00			30.61							
5-1	9:34:00	1.20	0.48	31.24	1.095	181	73	71	6.0	2.110	72.58
5-2	9:39:00	0.98	0.39	33.35	0.990	181	73	71	6.0	1.840	65.59
5-3	9:44:00	0.81	0.33	35.19	0.900	181	74	71	6.0	1.730	59.63
5-4	9:49:00	0.76	0.31	36.92	0.872	178	75	72	7.0	1.630	57.63
	9:54:00			38.55							
6-1	9:55:00	1.00	0.40	39.02	1.000	180	75	72	7.0	1.920	66.21
6-2	10:00:00	0.93	0.37	40.94	0.964	180	75	72	7.0	1.770	63.85
6-3	10:05:00	0.88	0.35	42.71	0.938	181	75	73	8.0	1.820	62.16
6-4	10:10:00	0.82	0.33	44.53	0.906	176	75	73	10.0	1.720	59.77
	10:15:00			46.25							
			0.36	42.730	0.941	180	72	69		42.730	
							70.23				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 5

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Station		**Length:**	11.00	**Feet**
Test Location:	Baghouse Inlet		**Width:**	16.00	**Feet**
Source Condition:	Normal		**Duct Area:**	176.000	**Sq. Ft.**
Test Engineer:	JPH				
Temp ID:	E-75		**Sample Plane:**	Horizontal	
Meter ID:	E-75		**Port Length:**	7.00	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.836		**Number of Ports Sampled:**	6	
Probe Length:	11.5	**ft.**	**Number of Points per Port:**	4	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.157	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-13.00	**in. H_2O**	**Final Impinger Content:**	151.30	**mls.**
Flue Pressure (Ps):	26.04	**in. Hg. abs.**	**Difference:**	151.30	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	15/15	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.0	**%**	**Total Water Gain:**	151.30	
Oxygen:	6.2	**%**			
Nitrogen:	80.8	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.35	**Inches H_2O**	**Gas Weight dry, Md:**	30.328	**lb/lb mole**
Meter Temperature, Tm:	76.1	**°F**	**Gas Weight wet, Ms:**	28.384	**lb/lb mole**
Sqrt ΔP:	0.935	**Inches H_2O**	**Excess Air:**	40.975	**%**
Stack Temperature, Ts:	180.3	**°F**	**Gas Velocity, Vs:**	62.177	
Meter Volume, Vm:	42.440	**Cubic Feet**	**Volumetric Flow, ACFM:**	656,590	
Meter Volume, Vmstd:	38.057	**dscf**	**Volumetric Flow, DSCFM:**	396,967	
Meter Volume, Vwstd:	7.126	**wscf**	**Volumetric Flow, SCFM:**	471,299	
Moisture, Bws:	0.158		**Isokinetic Variance, %I:**	104.7	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	0.07	---	
ppm:	0.04	---	
ug/dscm:	64.96	---	
lb/hr:	0.0966	---	
lb/mmBtu (based on Fd):	0.0000564	---	
HF			
mg (net) collected:	0.07		
ppm:	0.08		
ug/dscm:	64.96		
lb/hr:	0.0966		
lb/mmBtu (based on Fd):	0.0000564		
HBr			
mg (net) collected:	0.30		
ppm:	0.08		
ug/dscm:	278.38		
lb/hr:	0.4139		
lb/mmBtu (based on Fd):	0.0002416		

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Baghouse Inlet

Test Run: 5 **Test Date:** 7/29/2004
Start Time: 10:45
End Time: 12:50

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	10:45:00	1.20	0.48	8.75	1.095	179	74	73	5.0	2.090	72.47
1-2	10:50:00	0.95	0.38	10.84	0.975	180	74	73	5.0	1.770	64.53
1-3	10:55:00	0.74	0.30	12.61	0.860	181	75	73	5.0	1.710	57.00
1-4	11:00:00	0.68	0.27	14.32	0.825	180	76	74	5.0	1.550	54.60
	11:05:00			15.87							
2-1	11:06:00	1.30	0.52	16.43	1.140	180	76	74	5.0	2.200	75.49
2-2	11:11:00	0.89	0.36	18.63	0.943	181	77	74	5.0	1.740	62.51
2-3	11:16:00	0.75	0.30	20.37	0.866	181	77	75	5.0	1.680	57.38
2-4	11:21:00	0.70	0.28	22.05	0.837	180	77	75	6.0	1.520	55.39
	11:26:00			23.57							
3-1	11:27:00	1.10	0.44	23.85	1.049	181	78	75	6.0	1.960	69.49
3-2	11:32:00	0.85	0.34	25.81	0.922	181	77	76	6.0	1.780	61.09
3-3	11:37:00	0.79	0.32	27.59	0.889	180	77	76	6.0	1.690	58.85
3-4	11:42:00	0.77	0.31	29.28	0.877	176	77	76	6.0	1.620	57.92
	11:47:00			30.90							
4-1	11:48:00	1.00	0.40	31.45	1.000	180	78	76	6.0	1.910	66.21
4-2	11:53:00	0.91	0.37	33.36	0.954	181	77	76	6.0	1.770	63.21
4-3	11:58:00	0.86	0.35	35.13	0.927	181	77	76	6.0	1.810	61.45
4-4	12:03:00	0.73	0.29	36.94	0.854	179	77	76	6.0	1.570	56.52
	12:08:00			38.51							
5-1	12:09:00	1.20	0.48	39.03	1.095	181	77	76	6.0	2.060	72.58
5-2	12:14:00	0.90	0.36	41.09	0.949	180	77	76	6.0	1.820	62.81
5-3	12:19:00	0.87	0.35	42.91	0.933	181	77	76	7.0	1.760	61.80
5-4	12:24:00	0.69	0.28	44.67	0.831	180	78	76	7.0	1.570	55.00
	12:29:00			46.24							
6-1	12:30:00	0.97	0.39	46.83	0.985	180	78	76	8.0	1.840	65.21
6-2	12:35:00	0.89	0.36	48.67	0.943	182	78	76	8.0	1.790	62.56
6-3	12:40:00	0.74	0.30	50.46	0.860	181	78	77	10.0	1.620	57.00
6-4	12:45:00	0.68	0.27	52.08	0.825	181	78	77	10.0	1.610	54.64
	12:50:00			53.69							
			0.35	42.440	0.935	180	77	75		42.440	
							76.10				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E-74		**Sample Plane:**	Vertical	
Meter ID:	E-74		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.253	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.26	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	205.10	**mls.**
Flue Pressure (Ps):	26.52	**in. Hg. abs.**	**Difference:**	205.10	
Sample Train Pre:	0.005		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.008		**Silica Final Wt.**	0.00	**grams**
@	11	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.8	**%**	**Total Water Gain:**	205.10	
Oxygen:	5.0	**%**			
Nitrogen:	81.2	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.47	**Inches H_2O**	**Gas Weight dry, Md:**	30.408	**lb/lb mole**
Meter Temperature, Tm:	92.2	**°F**	**Gas Weight wet, Ms:**	28.997	**lb/lb mole**
Sqrt ΔP:	0.748	**Inches H_2O**	**Excess Air:**	30.420	**%**
Stack Temperature, Ts:	284.2	**°F**	**Gas Velocity, Vs:**	52.876	
Meter Volume, Vm:	85.423	**Cubic Feet**	**Volumetric Flow, ACFM:**	920,038	
Meter Volume, Vmstd:	75.316	**dscf**	**Volumetric Flow, DSCFM:**	512,888	
Meter Volume, Vwstd:	9.660	**wscf**	**Volumetric Flow, SCFM:**	578,672	
Moisture, Bws:	0.114		**Isokinetic Variance, %I:**	101.7	

EMISSION DATA

Type of Fuel Firing:	Coal		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	1.52	---	
ppm:	0.47	---	
ug/dscm:	712.71	---	
lb/hr:	1.3692	---	
lb/mmBtu (based on Fd):	0.0005720	---	
HF			
mg (net) collected:	0.44	---	
ppm:	0.25	---	
ug/dscm:	206.31	---	
lb/hr:	0.3963	---	
lb/mmBtu (based on Fd):	0.0001656	---	
HBr			
mg (net) collected:	0.44	---	
ppm:	0.06	---	
ug/dscm:	206.31	---	
lb/hr:	0.3963	---	
lb/mmBtu (based on Fd):	0.0001656	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 8:55
End Time: 11:30

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:55:00	0.29	0.76	46.67	0.539	285	83	84	1.0	2.446	38.11
1-2	9:00:00	0.35	0.92	49.12	0.592	283	85	89	1.0	2.894	41.81
1-3	9:05:00	0.52	1.40	52.01	0.721	284	86	90	1.0	3.478	50.99
	9:10:00			55.49							
2-1	9:15:00	0.56	1.50	55.49	0.748	285	86	90	1.0	3.498	52.95
2-2	9:20:00	0.60	1.60	58.99	0.775	285	87	90	1.0	3.738	54.81
2-3	9:25:00	0.51	1.30	62.73	0.714	286	87	91	1.0	3.412	50.57
	9:30:00			66.14							
3-1	9:35:00	0.59	1.50	66.14	0.768	284	87	91	2.0	3.491	54.31
3-2	9:40:00	0.77	2.00	69.63	0.877	280	87	93	2.0	4.373	61.88
3-3	9:45:00	0.45	1.20	74.00	0.671	281	87	93	2.0	3.167	47.34
	9:50:00			77.17							
4-1	9:55:00	0.70	1.80	77.17	0.837	279	88	95	2.0	3.980	58.96
4-2	10:00:00	0.63	1.60	81.15	0.794	281	88	97	2.0	3.783	56.01
4-3	10:05:00	0.65	1.70	84.93	0.806	283	89	98	2.0	3.850	56.97
	10:10:00			88.78							
5-1	10:15:00	0.79	2.10	88.78	0.889	278	90	99	2.0	4.196	62.60
5-2	10:20:00	0.59	1.50	92.98	0.768	283	91	98	3.0	3.651	54.28
5-3	10:25:00	0.57	1.50	96.63	0.755	287	91	98	3.0	3.659	53.49
	10:30:00			100.29							
6-1	10:35:00	0.53	1.40	100.29	0.728	283	91	97	3.0	3.420	51.44
6-2	10:40:00	0.50	1.30	103.71	0.707	283	91	97	3.0	3.370	49.97
6-3	10:45:00	0.47	1.20	107.08	0.686	285	91	97	3.0	3.290	48.51
	10:50:00			110.37							
7-1	10:55:00	0.70	1.80	110.37	0.837	283	93	99	3.0	3.950	59.12
7-2	11:00:00	0.73	1.90	114.32	0.854	286	93	99	3.0	4.071	60.50
7-3	11:05:00	0.69	1.80	118.39	0.831	287	93	99	3.0	3.955	58.86
	11:10:00			122.35							
8-1	11:15:00	0.51	1.30	122.35	0.714	289	93	99	3.0	3.433	50.67
8-2	11:20:00	0.43	1.10	125.78	0.656	290	93	99	3.0	3.088	46.56
8-3	11:25:00	0.46	1.20	128.87	0.678	291	93	99	3.0	3.230	48.18
	11:30:00			132.10							
			1.47	85.423	0.748	284	89	95		85.423	
							92.17				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.253	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.21	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	288.40	**mls.**
Flue Pressure (Ps):	26.47	**in. Hg. abs.**	**Difference:**	288.40	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	13	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	14.6	**%**	**Total Water Gain:**	288.40	
Oxygen:	4.6	**%**			
Nitrogen:	80.8	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.84	**Inches H_2O**	**Gas Weight dry, Md:**	30.520	**lb/lb mole**
Meter Temperature, Tm:	92.9	**°F**	**Gas Weight wet, Ms:**	28.816	**lb/lb mole**
Sqrt ΔP:	0.847	**Inches H_2O**	**Excess Air:**	27.494	**%**
Stack Temperature, Ts:	280.7	**°F**	**Gas Velocity, Vs:**	59.999	
Meter Volume, Vm:	98.969	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,043,975	
Meter Volume, Vmstd:	86.212	**dscf**	**Volumetric Flow, DSCFM:**	568,854	
Meter Volume, Vwstd:	13.584	**wscf**	**Volumetric Flow, SCFM:**	658,483	
Moisture, Bws:	0.136		**Isokinetic Variance, %I:**	105.0	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	0.85	---	
ppm:	0.23	---	
ug/dscm:	348.18	---	
lb/hr:	0.7419	---	
lb/mmBtu (based on Fd):	0.0002726	---	
HF			
mg (net) collected:	2.22	---	
ppm:	1.09	---	
ug/dscm:	909.37	---	
lb/hr:	1.9376	---	
lb/mmBtu (based on Fd):	0.0007119	---	
HBr			
mg (net) collected:	0.63	---	
ppm:	0.08	---	
ug/dscm:	258.06	---	
lb/hr:	0.5499	---	
lb/mmBtu (based on Fd):	0.0002020	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 8:30
End Time: 11:05

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:30:00	0.88	2.20	55.58	0.938	286	86	87	2.0	4.503	66.42
1-2	8:35:00	0.78	2.00	60.08	0.883	289	88	90	2.0	4.160	62.66
1-3	8:40:00	0.85	2.20	64.24	0.922	284	88	91	2.0	4.391	65.19
	8:45:00			68.63							
2-1	8:50:00	0.93	2.40	68.63	0.964	285	87	89	2.0	4.567	68.24
2-2	8:55:00	0.80	2.00	73.20	0.894	288	87	89	3.0	4.258	63.42
2-3	9:00:00	0.79	2.00	77.46	0.889	287	87	89	3.0	4.236	62.98
	9:05:00			81.69							
3-1	9:10:00	0.64	1.60	81.69	0.800	290	87	91	3.0	3.764	56.80
3-2	9:15:00	0.73	1.90	85.46	0.854	287	87	93	3.0	4.111	60.54
3-3	9:20:00	0.59	1.50	89.57	0.768	287	88	93	3.0	3.591	54.42
	9:25:00			93.16							
4-1	9:30:00	0.69	1.80	93.16	0.831	282	89	95	3.0	3.922	58.66
4-2	9:35:00	0.53	1.30	97.08	0.728	278	89	95	3.0	3.487	51.27
4-3	9:40:00	0.70	1.80	100.57	0.837	279	89	95	3.0	3.964	58.96
	9:45:00			104.53							
5-1	9:50:00	0.88	2.20	104.53	0.938	275	90	96	3.0	4.545	65.93
5-2	9:55:00	0.58	1.50	109.08	0.762	277	91	97	3.0	3.555	53.60
5-3	10:00:00	0.66	1.70	112.63	0.812	273	91	98	3.0	3.854	57.02
	10:05:00			116.48							
6-1	10:10:00	0.77	2.00	116.48	0.877	275	92	98	3.0	4.194	61.67
6-2	10:15:00	0.82	2.10	120.68	0.906	282	93	99	3.0	4.327	63.95
6-3	10:20:00	0.64	1.60	125.01	0.800	270	93	99	3.0	3.778	56.03
	10:25:00			128.78							
7-1	10:30:00	0.80	2.00	128.78	0.894	276	94	100	3.0	4.232	62.91
7-2	10:35:00	0.74	1.90	133.02	0.860	275	94	100	3.0	4.110	60.46
7-3	10:40:00	0.78	2.00	137.13	0.883	279	94	101	3.0	4.164	62.24
	10:45:00			141.29							
8-1	10:50:00	0.55	1.40	141.29	0.742	275	95	101	3.0	3.530	52.12
8-2	10:55:00	0.61	1.50	144.82	0.781	277	95	101	3.0	4.144	54.97
8-3	11:00:00	0.58	1.50	148.96	0.762	281	95	101	3.0	5.582	53.74
	11:05:00			154.55							
			1.84	98.969	0.847	281	90	95		98.969	
							92.85				

Field Notes/Comments:

TEST DATA	-	Method 26A	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MRE				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**		
Static Pressure:	-10.00	**in. H_2O**		
Flue Pressure (Ps):	26.26	**in. Hg. abs.**		
Sample Train Pre:	0.000			
Leak Check Post:	0.000			
@	15	**in. Hg.**		
Carbon Dioxide:	14.0	**%**		
Oxygen:	5.0	**%**		
Nitrogen:	81.0	**%**		

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	233.70	**mls.**
Difference:	233.70	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	233.70	

STACK PARAMETERS

Delta H:	1.65	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	87.9	**°F**	**Gas Weight wet, Ms:**	28.960	**lb/lb mole**
Sqrt ΔP:	0.833	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	286.7	**°F**	**Gas Velocity, Vs:**	59.337	
Meter Volume, Vm:	93.501	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,032,471	
Meter Volume, Vmstd:	81.518	**dscf**	**Volumetric Flow, DSCFM:**	564,629	
Meter Volume, Vwstd:	11.007	**wscf**	**Volumetric Flow, SCFM:**	640,870	
Moisture, Bws:	0.119		**Isokinetic Variance, %I:**	102.4	

EMISSION DATA

Type of Fuel Firing:	N/A		
Fuel Factor F_d (dscf/mmBtu):	9780		
List Mol. Wt. of Analyte if ppm needed:	36.461	20.006	
	80.900		
	Filterable	**Condensible**	
HCl			
mg (net) collected:	2.12	---	
ppm:	0.61	---	
ug/dscm:	918.42	---	
lb/hr:	1.9424	---	
lb/mmBtu (based on Fd):	0.0007371	---	
HF			
mg (net) collected:	2.60	---	
ppm:	1.35	---	
ug/dscm:	1126.36	---	
lb/hr:	2.3822	---	
lb/mmBtu (based on Fd):	0.0009039	---	
HBr			
mg (net) collected:	0.58	---	
ppm:	0.07	---	
ug/dscm:	251.26	---	
lb/hr:	0.5314	---	
lb/mmBtu (based on Fd):	0.0002017	---	

TRAVERSE DATA: Method 26A

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 8:30
End Time: 11:05

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:30:00	0.69	1.60	53.28	0.831	279	81	82	2.0	3.841	58.54
1-2	8:35:00	0.73	1.70	57.12	0.854	285	82	83	2.0	3.964	60.46
1-3	8:40:00	0.58	1.40	61.08	0.762	287	82	84	2.0	3.478	53.96
	8:45:00			64.56							
2-1	8:50:00	0.67	1.60	64.56	0.819	288	83	84	2.0	3.995	58.04
2-2	8:55:00	0.70	1.70	68.56	0.837	290	83	85	3.0	3.813	59.40
2-3	9:00:00	0.76	1.80	72.37	0.872	289	83	85	3.0	4.016	61.85
	9:05:00			76.39							
3-1	9:10:00	0.73	1.70	76.39	0.854	290	83	86	3.0	4.120	60.66
3-2	9:15:00	0.84	2.00	80.51	0.917	292	83	87	3.0	4.125	65.16
3-3	9:20:00	0.80	1.90	84.63	0.894	287	83	88	3.0	4.148	63.37
	9:25:00			88.78							
4-1	9:30:00	0.86	2.00	88.78	0.927	289	84	89	3.0	4.511	65.80
4-2	9:35:00	0.80	1.90	93.29	0.894	293	85	90	3.0	4.030	63.63
4-3	9:40:00	0.77	1.80	97.32	0.877	286	86	91	3.0	4.106	62.13
	9:45:00			101.43							
5-1	9:50:00	0.66	1.60	101.43	0.812	287	87	91	4.0	3.988	57.56
5-2	9:55:00	0.63	1.50	105.41	0.794	286	87	92	4.0	3.700	56.20
5-3	10:00:00	0.64	1.50	109.11	0.800	287	88	93	4.0	3.670	56.68
	10:05:00			112.78							
6-1	10:10:00	0.68	1.60	112.78	0.825	288	89	93	5.0	3.995	58.47
6-2	10:15:00	0.70	1.70	116.78	0.837	284	89	94	5.0	3.826	59.16
6-3	10:20:00	0.62	1.50	120.60	0.787	279	90	94	5.0	3.685	55.49
	10:25:00			124.29							
7-1	10:30:00	0.70	1.70	124.29	0.837	283	90	94	5.0	4.148	59.12
7-2	10:35:00	0.65	1.50	128.44	0.806	283	90	94	5.0	3.727	56.97
7-3	10:40:00	0.66	1.60	132.16	0.812	286	90	94	5.0	3.713	57.52
	10:45:00			135.88							
8-1	10:50:00	0.59	1.40	135.88	0.768	287	90	93	6.0	3.679	54.42
8-2	10:55:00	0.63	1.50	139.56	0.794	287	89	93	6.0	3.633	56.24
8-3	11:00:00	0.61	1.50	143.19	0.781	289	89	93	6.0	3.590	55.41
	11:05:00			146.78							
			1.65	93.501	0.833	287	86	90		93.501	
							87.88				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	DT				
Temp ID:	E51		**Sample Plane:**	Horizontal	
Meter ID:	E51		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	799A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.188	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.99	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-2.80	**in. H_2O**	**Final Impinger Content:**	307.20	**mls.**
Flue Pressure (Ps):	26.78	**in. Hg. abs.**	**Difference:**	307.20	
Sample Train Pre:	0.010		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.005		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.2	**%**	**Total Water Gain:**	307.20	
Oxygen:	7.0	**%**			
Nitrogen:	80.8	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.54	**Inches H_2O**	**Gas Weight dry, Md:**	30.232	**lb/lb mole**
Meter Temperature, Tm:	91.0	**°F**	**Gas Weight wet, Ms:**	28.400	**lb/lb mole**
Sqrt ΔP:	1.412	**Inches H_2O**	**Excess Air:**	48.844	**%**
Stack Temperature, Ts:	190.8	**°F**	**Gas Velocity, Vs:**	93.810	
Meter Volume, Vm:	93.863	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,178,858	
Meter Volume, Vmstd:	82.129	**dscf**	**Volumetric Flow, DSCFM:**	727,986	
Meter Volume, Vwstd:	14.469	**wscf**	**Volumetric Flow, SCFM:**	856,240	
Moisture, Bws:	0.150		**Isokinetic Variance, %I:**	102.8	
			Meter Volume, Vmstd:	76.530	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury			0.00
mg (net) collected:	0.000020	---	
ppm	0.000001	---	
ug/dncm:	0.01	---	
lb/hr:	0.0000	---	
lb/TBtu (based on Fd):	0.0000000	---	
Elemental Mercury			
mg (net) collected:	0.00082	---	
ppm	0.000042	---	
ug/dncm:	0.38	---	
lb/hr:	0.0010	---	
lb/mmBtu (based on Fd):	0.0000003	---	
Oxidized Mercury			
mg (net) collected:	0.00010	---	
ppm	0.000005	---	
ug/dncm:	0.05	---	
lb/hr:	0.0001	---	
lb/mmBtu (based on Fd):	0.0000000	---	
Total Mercury			
mg (net) collected:	0.00094		
ppm	0.000048		
ug/dncm:	0.43		
lb/hr:	0.00110		
lb/mmBtu (based on Fd):	0.0000004	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 9:50
End Time: 12:03

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:50:00	2.10	1.60	29.69	1.449	191	85	85	8.0	4.017	96.27
1-1	9:55:00	2.10	1.60	33.71	1.449	191	87	85	9.0	3.990	96.27
1-2	10:00:00	2.00	1.55	37.70	1.414	191	88	85	9.0	3.900	93.95
1-2	10:05:00	2.00	1.55	41.60	1.414	191	89	85	9.0	3.910	93.95
1-3	10:10:00	1.90	1.47	45.51	1.378	190	90	86	9.0	3.800	91.50
1-3	10:15:00	1.80	1.39	49.31	1.342	190	91	86	9.0	3.810	89.06
	10:20:00			53.12							
2-1	10:24:00	2.10	1.60	53.12	1.449	191	91	87	6.0	4.010	96.27
2-1	10:29:00	2.00	1.55	57.13	1.414	191	92	87	6.0	3.990	93.95
2-2	10:34:00	2.00	1.55	61.12	1.414	191	93	87	6.0	3.820	93.95
2-2	10:39:00	2.00	1.55	64.94	1.414	191	94	88	6.0	3.890	93.95
2-3	10:44:00	1.90	1.47	68.83	1.378	190	94	88	6.0	3.810	91.50
2-3	10:49:00	1.90	1.47	72.64	1.378	190	94	88	6.0	3.829	91.50
	10:54:00			76.47							
3-1	10:59:00	2.20	1.70	76.47	1.483	191	93	89	6.0	4.111	98.54
3-1	11:04:00	2.10	1.60	80.58	1.449	191	94	89	6.0	4.000	96.27
3-2	11:09:00	2.00	1.55	84.58	1.414	191	95	90	6.0	3.890	93.95
3-2	11:14:00	2.00	1.55	88.47	1.414	191	96	90	6.0	3.920	93.95
3-3	11:19:00	1.90	1.47	92.39	1.378	191	97	90	6.0	3.810	91.57
3-3	11:24:00	1.90	1.47	96.20	1.378	191	97	91	6.0	3.897	91.57
	11:29:00			100.10							
4-1	11:33:00	2.10	1.60	100.10	1.449	191	97	91	6.0	4.013	96.27
4-1	11:38:00	2.10	1.60	104.11	1.449	191	97	91	6.0	3.990	96.27
4-2	11:43:00	2.00	1.55	108.10	1.414	191	97	91	6.0	3.920	93.95
4-2	11:48:00	2.00	1.55	112.02	1.414	191	97	91	6.0	3.890	93.95
4-3	11:53:00	1.90	1.47	115.91	1.378	190	98	92	6.0	3.810	91.50
4-3	11:58:00	1.90	1.47	119.72	1.378	190	98	92	6.0	3.836	91.50
	12:03:00			123.56							
			1.54	93.863	1.412	191	94	89		93.863	
							91.00				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	DT				
Temp ID:	E15		**Sample Plane:**	Horizontal	
Meter ID:	E15		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.005		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	541B		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.837		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.94	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.30	**in. H_2O**	**Final Impinger Content:**	178.60	**mls.**
Flue Pressure (Ps):	26.84	**in. Hg. abs.**	**Difference:**	178.60	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.4	**%**	**Total Water Gain:**	178.60	
Oxygen:	6.6	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	0.59	**Inches H_2O**	**Gas Weight dry, Md:**	30.248	**lb/lb mole**
Meter Temperature, Tm:	94.9	**°F**	**Gas Weight wet, Ms:**	28.531	**lb/lb mole**
Sqrt ΔP:	1.516	**Inches H_2O**	**Excess Air:**	44.643	**%**
Stack Temperature, Ts:	193.1	**°F**	**Gas Velocity, Vs:**	100.149	
Meter Volume, Vm:	59.814	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,258,513	
Meter Volume, Vmstd:	51.581	**dscf**	**Volumetric Flow, DSCFM:**	784,879	
Meter Volume, Vwstd:	8.412	**wscf**	**Volumetric Flow, SCFM:**	912,880	
Moisture, Bws:	0.140		**Isokinetic Variance, %I:**	101.5	
			Meter Volume, Vmstd:	48.065	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.000020	---	
ppm	0.000002	---	
ug/dncm:	0.01	---	
lb/hr:	0.0000	---	
lb/TBtu (based on Fd):	0.0000000	---	
Elemental Mercury			
mg (net) collected:	0.00057	---	
ppm	0.000047	---	
ug/dncm:	0.42	---	
lb/hr:	0.0011	---	
lb/mmBtu (based on Fd):	0.0000003	---	
Oxidized Mercury			
mg (net) collected:	0.00025	---	
ppm	0.000021	---	
ug/dncm:	0.18	---	
lb/hr:	0.0005	---	
lb/mmBtu (based on Fd):	0.0000002	---	
Total Mercury			
mg (net) collected:	0.00084		
ppm	0.000069		
ug/dncm:	0.62		
lb/hr:	0.00169		
lb/mmBtu (based on Fd):	0.0000005	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 9:30
End Time: 11:41

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:30:00	2.40	0.61	89.82	1.549	193	89	88	3.0	2.556	103.08
1-1	9:35:00	2.40	0.61	92.38	1.549	193	90	88	3.0	2.540	103.08
1-2	9:40:00	2.40	0.61	94.92	1.549	193	91	89	3.0	2.550	103.08
1-2	9:45:00	2.40	0.61	97.47	1.549	193	92	89	3.0	2.520	103.08
1-3	9:50:00	2.00	0.51	99.99	1.414	192	93	89	3.0	2.340	94.02
1-3	9:55:00	2.00	0.51	102.33	1.414	192	94	89	3.0	2.357	94.02
	10:00:00			104.69							
2-1	10:03:00	2.30	0.59	104.69	1.517	193	95	90	3.0	2.503	100.91
2-1	10:08:00	2.30	0.59	107.19	1.517	193	96	90	3.0	2.490	100.91
2-2	10:13:00	2.30	0.59	109.68	1.517	193	97	91	3.0	2.490	100.91
2-2	10:18:00	2.30	0.59	112.17	1.517	193	98	91	3.0	2.480	100.91
2-3	10:23:00	2.10	0.54	114.65	1.449	192	98	92	3.0	2.390	96.35
2-3	10:28:00	2.10	0.54	117.04	1.449	192	99	92	3.0	2.383	96.35
	10:33:00			119.42							
3-1	10:38:00	2.50	0.64	119.42	1.581	193	99	93	3.0	2.627	105.20
3-1	10:43:00	2.50	0.64	122.05	1.581	193	99	93	3.0	2.590	105.20
3-2	10:48:00	2.40	0.61	124.64	1.549	194	100	94	3.0	2.550	103.16
3-2	10:53:00	2.40	0.61	127.19	1.549	194	100	94	3.0	2.530	103.16
3-3	10:58:00	2.20	0.56	129.72	1.483	193	101	94	3.0	2.440	98.69
3-3	11:03:00	2.20	0.56	132.16	1.483	193	101	94	3.0	2.430	98.69
	11:08:00			134.59							
4-1	11:11:00	2.50	0.64	134.59	1.581	194	100	95	3.0	2.620	105.28
4-1	11:16:00	2.50	0.64	137.21	1.581	194	101	95	3.0	2.590	105.28
4-2	11:21:00	2.40	0.61	139.80	1.549	194	102	96	3.0	2.540	103.16
4-2	11:26:00	2.40	0.61	142.34	1.549	194	102	96	3.0	2.540	103.16
4-3	11:31:00	2.10	0.54	144.88	1.449	193	103	96	3.0	2.380	96.42
4-3	11:36:00	2.10	0.54	147.26	1.449	193	103	96	3.0	2.378	96.42
	11:41:00			149.64							
			0.59	59.814	1.516	193	98	92		59.814	
							94.94				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	DT				
Temp ID:	E15		**Sample Plane:**	Horizontal	
Meter ID:	E15		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.005		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	541B		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.837		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.144	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.73	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-1.30	**in. H_2O**	**Final Impinger Content:**	201.60	**mls.**
Flue Pressure (Ps):	26.63	**in. Hg. abs.**	**Difference:**	201.60	
Sample Train Pre:	0.008		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	201.60	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.60	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	92.6	**°F**	**Gas Weight wet, Ms:**	28.325	**lb/lb mole**
Sqrt ΔP:	1.530	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	192.6	**°F**	**Gas Velocity, Vs:**	101.791	
Meter Volume, Vm:	60.835	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,279,151	
Meter Volume, Vmstd:	52.272	**dscf**	**Volumetric Flow, DSCFM:**	779,669	
Meter Volume, Vwstd:	9.495	**wscf**	**Volumetric Flow, SCFM:**	921,297	
Moisture, Bws:	0.154		**Isokinetic Variance, %I:**	103.5	
			Meter Volume, Vmstd:	48.709	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.000020	---	
ppm	0.000002	---	
ug/dncm:	0.01	---	
lb/hr:	0.0000	---	
lb/TBtu (based on Fd):	0.0000000	---	
Elemental Mercury			
mg (net) collected:	0.0005	---	
ppm	0.000040	---	
ug/dncm:	0.36	---	
lb/hr:	0.0010	---	
lb/mmBtu (based on Fd):	0.0000003	---	
Oxidized Mercury			
mg (net) collected:	0.00012	---	
ppm	0.000010	---	
ug/dncm:	0.09	---	
lb/hr:	0.0002	---	
lb/mmBtu (based on Fd):	0.0000001	---	
Total Mercury			
mg (net) collected:	0.00064		
ppm	0.000052		
ug/dncm:	0.46		
lb/hr:	0.00126		
lb/mmBtu (based on Fd):	0.0000004	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 9:30
End Time: 11:36

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:30:00	2.40	0.61	3.98	1.549	192	91	90	3.0	2.572	103.00
1-1	9:35:00	2.40	0.61	6.55	1.549	192	93	90	3.0	2.560	103.00
1-2	9:40:00	2.40	0.61	9.11	1.549	193	96	91	3.0	2.560	103.08
1-2	9:45:00	2.40	0.61	11.67	1.549	193	97	91	3.0	2.560	103.08
1-3	9:50:00	2.10	0.54	14.23	1.449	192	97	91	3.0	2.380	96.35
1-3	9:55:00	2.10	0.54	16.61	1.449	192	97	91	3.0	2.440	96.35
	10:00:00			19.05							
2-1	10:02:00	2.50	0.64	19.05	1.581	193	95	91	3.0	2.630	105.20
2-1	10:07:00	2.50	0.64	21.68	1.581	193	95	91	3.0	2.610	105.20
2-2	10:12:00	2.40	0.61	24.29	1.549	193	94	90	3.0	2.560	103.08
2-2	10:17:00	2.40	0.61	26.85	1.549	193	93	89	3.0	2.560	103.08
2-3	10:22:00	2.20	0.56	29.41	1.483	192	93	89	3.0	2.430	98.61
2-3	10:27:00	2.20	0.56	31.84	1.483	192	93	89	3.0	2.508	98.61
	10:32:00			34.35							
3-1	10:34:00	2.50	0.64	34.35	1.581	193	94	89	3.0	2.632	105.20
3-1	10:39:00	2.50	0.64	36.98	1.581	193	94	89	3.0	2.610	105.20
3-2	10:44:00	2.50	0.64	39.59	1.581	193	95	89	3.0	2.610	105.20
3-2	10:49:00	2.50	0.64	42.20	1.581	193	96	89	3.0	2.610	105.20
3-3	10:54:00	2.20	0.56	44.81	1.483	192	96	89	3.0	2.460	98.61
3-3	10:59:00	2.20	0.56	47.27	1.483	192	96	89	3.0	2.474	98.61
	11:04:00			49.74							
4-1	11:06:00	2.40	0.61	49.74	1.549	193	96	90	3.0	2.586	103.08
4-1	11:11:00	2.40	0.61	52.33	1.549	193	96	90	3.0	2.540	103.08
4-2	11:16:00	2.40	0.61	54.87	1.549	193	96	90	3.0	2.560	103.08
4-2	11:21:00	2.40	0.61	57.43	1.549	193	97	91	3.0	2.580	103.08
4-3	11:26:00	2.10	0.54	60.01	1.449	192	98	91	3.0	2.370	96.35
4-3	11:31:00	2.10	0.54	62.38	1.449	192	98	91	3.0	2.433	96.35
	11:36:00			64.81							
			0.60	60.835	1.530	193	95	90		60.835	
							92.63				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	T. Barr				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.26	**in. Hg.**		
Static Pressure:	-10.00	**in. H_2O**		
Flue Pressure (Ps):	26.52	**in. Hg. abs.**		
Sample Train Leak Check Pre:	0.008			
Post:	0.004			
@	10/10	**in. Hg.**		
Carbon Dioxide:	13.8	**%**		
Oxygen:	5.0	**%**		
Nitrogen:	81.2	**%**		

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	224.00	**mls.**
Difference:	224.00	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	224.00	

STACK PARAMETERS

Delta H:	1.44	**Inches H_2O**	**Gas Weight dry, Md:**	30.408	**lb/lb mole**
Meter Temperature, Tm:	91.8	**°F**	**Gas Weight wet, Ms:**	28.871	**lb/lb mole**
Sqrt ΔP:	0.755	**Inches H_2O**	**Excess Air:**	30.420	**%**
Stack Temperature, Ts:	281.4	**°F**	**Gas Velocity, Vs:**	53.321	
Meter Volume, Vm:	85.453	**Cubic Feet**	**Volumetric Flow, ACFM:**	927,782	
Meter Volume, Vmstd:	74.635	**dscf**	**Volumetric Flow, DSCFM:**	513,195	
Meter Volume, Vwstd:	10.550	**wscf**	**Volumetric Flow, SCFM:**	585,740	
Moisture, Bws:	0.124		**Isokinetic Variance, %I:**	103.2	
			Meter Volume, Vmstd:	69.548	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible	Total
Speciated Mercury			
Particle Bound Mercury			0.00
mg (net) collected:	0.000031	---	
ppm	0.000002	---	
ug/dncm:	0.02	---	
lb/hr:	0.000028	---	
lb/TBtu (based on Fd):	0.00000001	---	
Elemental Mercury			
mg (net) collected:	0.01531	---	
ppm	0.000868	---	
ug/dncm:	7.77	---	
lb/hr:	0.0139	---	
lb/mmBtu (based on Fd):	0.0000058	---	
Oxidized Mercury			
mg (net) collected:	0.00230	---	
ppm	0.000130	---	
ug/dncm:	1.17	---	
lb/hr:	0.0021	---	
lb/mmBtu (based on Fd):	0.0000009	---	
Total Mercury			
mg (net) collected:	0.01764		
ppm	0.001000		
ug/dncm:	8.96		
lb/hr:	0.01605		
lb/mmBtu (based on Fd):	0.0000067	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 9:50
End Time: 12:23

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:50:00	0.75	1.88	84.90	0.866	278	91	88	2.0	4.080	61.05
1-2	9:55:00	0.60	1.51	88.98	0.775	283	92	87	2.0	3.660	54.79
1-3	10:00:00	0.65	1.63	92.64	0.806	280	92	87	2.0	3.787	56.91
	10:05:00			96.43							
2-1	10:08:00	0.55	1.38	96.43	0.742	285	93	88	2.0	3.503	52.53
2-2	10:13:00	0.40	1.00	99.93	0.632	285	95	88	2.0	2.970	44.80
2-3	10:18:00	0.48	1.20	102.90	0.693	284	95	89	2.0	3.253	49.04
	10:23:00			106.15							
3-1	10:28:00	0.70	1.76	106.15	0.837	281	94	89	2.0	3.937	59.10
3-2	10:33:00	0.55	1.38	110.09	0.742	279	94	89	2.0	3.500	52.32
3-3	10:38:00	0.60	1.51	113.59	0.775	282	93	89	2.0	3.652	54.75
	10:43:00			117.24							
4-1	10:47:00	0.62	1.56	117.24	0.787	279	93	89	3.0	3.828	55.55
4-2	10:52:00	0.50	1.26	121.07	0.707	279	93	89	3.0	3.330	49.88
4-3	10:57:00	0.53	1.33	124.40	0.728	280	93	89	3.0	3.436	51.39
	11:02:00			127.84							
5-1	11:10:00	0.55	1.38	127.84	0.742	286	94	89	3.0	3.504	52.56
5-2	11:15:00	0.60	1.51	131.34	0.775	285	94	89	3.0	3.640	54.86
5-3	11:20:00	0.63	1.58	134.98	0.794	285	95	89	3.0	3.743	56.22
	11:25:00			138.72							
6-1	11:28:00	0.48	1.20	138.72	0.693	283	97	89	3.0	3.247	49.01
6-2	11:33:00	0.45	1.13	141.97	0.671	283	97	89	3.0	3.190	47.45
6-3	11:38:00	0.50	1.26	145.16	0.707	280	97	89	3.0	3.321	49.92
	11:43:00			148.48							
7-1	11:48:00	0.68	1.71	148.48	0.825	277	97	89	3.0	3.889	58.09
7-2	11:53:00	0.73	1.83	152.37	0.854	280	97	89	3.0	4.020	60.31
7-3	11:58:00	0.65	1.63	156.39	0.806	281	98	89	3.0	3.802	56.95
	12:03:00			160.19							
8-1	12:08:00	0.50	1.26	160.19	0.707	280	98	89	3.0	3.328	49.92
8-2	12:13:00	0.55	1.38	163.52	0.742	278	98	89	3.0	3.500	52.28
8-3	12:18:00	0.50	1.26	167.02	0.707	281	98	89	3.0	3.333	49.95
	12:23:00			170.35							
			1.44	85.453	0.755	281	95	89		85.453	
							91.81				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MJK				
Temp ID:	E74		**Sample Plane:**	Vertical	
Meter ID:	E74		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.21	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	278.10	**mls.**
Flue Pressure (Ps):	26.47	**in. Hg. abs.**	**Difference:**	278.10	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.001		**Silica Final Wt.**	0.00	**grams**
@	10/12	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	14.4	**%**	**Total Water Gain:**	278.10	
Oxygen:	4.4	**%**			
Nitrogen:	81.2	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.97	**Inches H_2O**	**Gas Weight dry, Md:**	30.480	**lb/lb mole**
Meter Temperature, Tm:	98.1	**°F**	**Gas Weight wet, Ms:**	28.768	**lb/lb mole**
Sqrt ΔP:	0.902	**Inches H_2O**	**Excess Air:**	25.826	**%**
Stack Temperature, Ts:	281.0	**°F**	**Gas Velocity, Vs:**	63.944	
Meter Volume, Vm:	94.490	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,112,624	
Meter Volume, Vmstd:	82.379	**dscf**	**Volumetric Flow, DSCFM:**	605,234	
Meter Volume, Vwstd:	13.099	**wscf**	**Volumetric Flow, SCFM:**	701,468	
Moisture, Bws:	0.137		**Isokinetic Variance, %I:**	96.6	
			Meter Volume, Vmstd:	76.763	

EMISSION DATA

Type of Fuel Firing:	Coal	
Fuel Factor F_d (dscf/mmBtu):	9780	
List Mol. Wt. of Analyte if ppm needed:	200.590	

Speciated Mercury

Particle Bound Mercury			0.00
mg (net) collected:	0.000024	---	
ppm	0.000001	---	
ug/dncm:	0.01	---	
lb/hr:	0.0000	---	
lb/TBtu (based on Fd):	0.0000000	---	
Elemental Mercury			
mg (net) collected:	0.01864	---	
ppm	0.000957	---	
ug/dncm:	8.58	---	
lb/hr:	0.0181	---	
lb/mmBtu (based on Fd):	0.0000062	---	
Oxidized Mercury			
mg (net) collected:	0.00250	---	
ppm	0.000128	---	
ug/dncm:	1.15	---	
lb/hr:	0.0024	---	
lb/mmBtu (based on Fd):	0.0000008	---	
Total Mercury			
mg (net) collected:	0.02116		
ppm	0.001087		
ug/dncm:	9.74		
lb/hr:	0.02057		
lb/mmBtu (based on Fd):	0.0000070	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 9:30
End Time: 12:06

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:30:00	0.90	2.17	50.81	0.949	280	91	90	4.0	4.500	66.97
1-2	9:35:00	0.81	1.95	55.31	0.900	280	96	91	3.0	3.790	63.53
1-3	9:40:00	0.87	2.10	59.10	0.933	281	99	91	3.0	4.300	65.89
	9:45:00			63.40							
2-1	9:51:00	0.93	2.24	63.90	0.964	281	100	91	4.0	3.850	68.12
2-2	9:56:00	0.80	1.93	67.75	0.894	283	101	91	3.0	4.250	63.27
2-3	10:01:00	0.75	1.81	72.00	0.866	280	103	92	2.5	4.190	61.13
	10:06:00			76.19							
3-1	10:10:00	0.80	1.93	76.40	0.894	279	100	92	5.0	3.750	63.10
3-2	10:15:00	0.90	2.17	80.15	0.949	281	101	92	5.0	4.050	67.01
3-3	10:20:00	0.75	1.81	84.20	0.866	283	102	93	5.0	4.150	61.26
	10:25:00			88.35							
4-1	10:30:00	0.78	1.88	88.80	0.883	282	99	93	7.0	3.650	62.43
4-2	10:35:00	0.90	2.19	92.45	0.949	281	103	94	8.0	4.680	67.01
4-3	10:40:00	0.84	2.03	97.13	0.917	279	104	94	8.0	4.070	64.65
	10:45:00			101.20							
5-1	10:50:00	0.60	1.45	102.91	0.775	275	100	95	7.0	1.520	54.49
5-2	10:55:00	0.73	1.76	104.43	0.854	281	102	95	8.5	4.110	60.35
5-3	11:00:00	0.87	2.10	108.54	0.933	280	104	96	10.0	4.560	65.84
	11:05:00			113.10							
6-1	11:12:00	0.75	1.81	113.79	0.866	280	101	97	3.0	2.960	61.13
6-2	11:17:00	0.86	2.07	116.75	0.927	280	103	97	4.0	4.350	65.46
6-3	11:22:00	0.90	2.17	121.10	0.949	281	104	97	4.0	4.290	67.01
	11:27:00			125.39							
7-1	11:31:00	0.80	1.93	125.85	0.894	280	104	97	5.0	3.600	63.14
7-2	11:36:00	0.73	1.76	129.45	0.854	283	105	97	4.5	4.250	60.44
7-3	11:41:00	0.87	2.10	133.70	0.933	285	107	98	6.5	4.110	66.07
	11:46:00			137.81							
8-1	11:51:00	0.83	2.00	138.54	0.911	281	103	98	7.0	3.760	64.36
8-2	11:56:00	0.90	2.17	142.30	0.949	284	104	98	7.5	3.910	67.15
8-3	12:01:00	0.69	1.66	146.21	0.831	285	106	99	5.5	3.840	58.84
	12:06:00			150.05							
			1.97	94.490	0.902	281	102	95		94.490	
							98.13				

Field Notes/Comments:

TEST DATA	-	Ontario Hydro	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MJK				
Temp ID:	E-74		**Sample Plane:**	Vertical	
Meter ID:	E-74		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.008		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.241	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	201.60	**mls.**
Flue Pressure (Ps):	26.26	**in. Hg. abs.**	**Difference:**	201.60	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/12	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	201.60	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.81	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	94.3	**°F**	**Gas Weight wet, Ms:**	29.004	**lb/lb mole**
Sqrt ΔP:	0.848	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	289.0	**°F**	**Gas Velocity, Vs:**	60.354	
Meter Volume, Vm:	83.595	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,050,157	
Meter Volume, Vmstd:	72.791	**dscf**	**Volumetric Flow, DSCFM:**	574,897	
Meter Volume, Vwstd:	9.495	**wscf**	**Volumetric Flow, SCFM:**	649,890	
Moisture, Bws:	0.115		**Isokinetic Variance, %I:**	96.7	
			Meter Volume, Vmstd:	67.829	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury			0.00
mg (net) collected:	0.000021	---	
ppm	0.000001	---	
ug/dncm:	0.01	---	
lb/hr:	0.0000	---	
lb/TBtu (based on Fd):	0.0000000	---	
Elemental Mercury			
mg (net) collected:	0.01752	---	
ppm	0.001018	---	
ug/dncm:	9.12	---	
lb/hr:	0.0183	---	
lb/mmBtu (based on Fd):	0.0000068	---	
Oxidized Mercury			
mg (net) collected:	0.00073	---	
ppm	0.000042	---	
ug/dncm:	0.38	---	
lb/hr:	0.0008	---	
lb/mmBtu (based on Fd):	0.0000003	---	
Total Mercury			
mg (net) collected:	0.01827		
ppm	0.001062		
ug/dncm:	9.51		
lb/hr:	0.01909		
lb/mmBtu (based on Fd):	0.0000071	#VALUE!	

TRAVERSE DATA: Ontario Hydro

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 9:30
End Time: 12:02

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	9:30:00	0.75	1.88	73.45	0.866	285	87	84	3.0	3.950	61.34
1-2	9:35:00	0.87	2.18	77.40	0.933	287	90	84	3.0	4.350	66.15
1-3	9:40:00	0.92	2.30	81.75	0.959	287	95	86	3.5	4.450	68.03
	9:45:00			86.20							
2-1	9:49:00	0.60	1.50	87.80	0.775	290	95	86	3.0	2.500	55.05
2-2	9:54:00	0.75	1.88	90.30	0.866	290	96	87	4.0	4.000	61.55
2-3	9:59:00	0.69	1.73	94.30	0.831	287	97	87	4.0	3.700	58.91
	10:04:00			98.00							
3-1	10:09:00	0.80	2.00	100.09	0.894	285	96	88	4.0	2.510	63.35
3-2	10:14:00	0.72	1.80	102.60	0.849	287	98	89	4.0	3.900	60.18
3-3	10:19:00	0.69	1.73	106.50	0.831	287	98	89	4.0	3.750	58.91
	10:24:00			110.25							
4-1	10:28:00	0.90	2.25	111.68	0.949	293	98	90	6.0	3.570	67.55
4-2	10:33:00	0.83	2.08	115.25	0.911	290	99	90	5.0	3.950	64.74
4-3	10:38:00	0.68	1.70	119.20	0.825	290	100	91	4.0	3.650	58.60
	10:43:00			122.85							
5-1	10:47:00	0.85	2.13	124.00	0.922	289	100	92	5.0	3.450	65.48
5-2	10:52:00	0.90	2.25	127.45	0.949	291	100	92	6.0	4.300	67.46
5-3	10:57:00	0.77	1.93	131.75	0.877	291	101	92	4.0	3.860	62.40
	11:02:00			135.61							
6-1	11:09:00	0.45	1.12	138.75	0.671	285	101	93	2.0	3.250	47.51
6-2	11:14:00	0.65	1.63	142.00	0.806	290	101	93	3.0	1.860	57.30
6-3	11:19:00	0.81	2.03	143.86	0.900	287	100	94	5.0	3.340	63.83
	11:24:00			147.20							
7-1	11:28:00	0.78	1.95	148.20	0.883	286	100	94	5.0	3.170	62.60
7-2	11:33:00	0.62	1.55	151.37	0.787	287	100	94	3.0	3.630	55.85
7-3	11:38:00	0.53	1.33	155.00	0.728	290	100	94	2.0	3.205	51.74
	11:43:00			158.21							
8-1	11:47:00	0.55	1.38	160.00	0.742	293	101	94	4.0	2.000	52.81
8-2	11:52:00	0.50	1.25	162.00	0.707	295	101	94	4.0	3.230	50.42
8-3	11:57:00	0.78	1.95	165.23	0.883	293	101	94	5.0	4.020	62.89
	12:02:00			169.25							
			1.81	83.595	0.848	289	98	90		83.595	
							94.29				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E15		**Sample Plane:**	Horizontal	
Meter ID:	E15		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	1.005		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	501B		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.837		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.200	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	26.99	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-2.80	**in. H_2O**	**Final Impinger Content:**	349.20	**mls.**
Flue Pressure (Ps):	26.78	**in. Hg. abs.**	**Difference:**	349.20	
Sample Train Pre:	0.003		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.003		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.4	**%**	**Total Water Gain:**	349.20	
Oxygen:	6.6	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.92	**Inches H_2O**	**Gas Weight dry, Md:**	30.248	**lb/lb mole**
Meter Temperature, Tm:	103.2	**°F**	**Gas Weight wet, Ms:**	28.397	**lb/lb mole**
Sqrt ΔP:	1.419	**Inches H_2O**	**Excess Air:**	44.643	**%**
Stack Temperature, Ts:	190.8	**°F**	**Gas Velocity, Vs:**	93.954	
Meter Volume, Vm:	108.136	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,180,670	
Meter Volume, Vmstd:	92.385	**dscf**	**Volumetric Flow, DSCFM:**	727,865	
Meter Volume, Vwstd:	16.447	**wscf**	**Volumetric Flow, SCFM:**	857,446	
Moisture, Bws:	0.151		**Isokinetic Variance, %I:**	101.6	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 12:30
End Time: 14:38

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	12:30:00	2.10	2.00	80.90	1.449	191	99	97	3.0	4.541	95.93
1-1	12:35:00	2.10	2.00	85.44	1.449	191	100	97	3.0	4.585	95.93
1-2	12:40:00	2.10	2.00	90.03	1.449	191	107	98	4.0	4.606	95.93
1-2	12:45:00	2.10	2.00	94.63	1.449	191	107	98	4.0	4.555	95.93
1-3	12:50:00	1.80	1.70	99.19	1.342	190	110	99	3.0	4.299	88.75
1-3	12:55:00	1.80	1.70	103.49	1.342	190	110	99	3.0	4.275	88.75
	13:00:00			107.76							
2-1	13:03:00	2.10	2.00	107.76	1.449	191	107	100	4.0	4.611	95.93
2-1	13:08:00	2.10	2.00	112.37	1.449	191	108	100	4.0	4.580	95.93
2-2	13:13:00	2.10	2.00	116.95	1.449	190	111	101	4.0	4.656	95.86
2-2	13:18:00	2.10	2.00	121.61	1.449	190	111	101	4.0	4.606	95.86
2-3	13:23:00	1.90	1.80	126.21	1.378	189	112	101	4.0	4.427	91.11
2-3	13:28:00	1.90	1.80	130.64	1.378	189	112	101	4.0	4.379	91.11
	13:33:00			135.02							
3-1	13:35:00	2.10	2.00	135.02	1.449	192	104	101	4.0	4.580	96.01
3-1	13:40:00	2.10	2.00	139.60	1.449	192	104	101	4.0	4.588	96.01
3-2	13:45:00	2.10	2.00	144.19	1.449	193	103	101	4.0	4.585	96.08
3-2	13:50:00	2.10	2.00	148.77	1.449	193	103	101	4.0	4.601	96.08
3-3	13:55:00	1.80	1.70	153.37	1.342	191	103	101	4.0	4.257	88.82
3-3	14:00:00	1.80	1.70	157.63	1.342	191	103	101	4.0	4.223	88.82
	14:05:00			161.85							
4-1	14:08:00	2.10	2.00	161.85	1.449	191	107	99	4.0	4.577	95.93
4-1	14:13:00	2.10	2.00	166.43	1.449	191	107	99	4.0	4.634	95.93
4-2	14:18:00	2.10	2.00	171.07	1.449	191	108	99	4.0	4.601	95.93
4-2	14:23:00	2.10	2.00	175.67	1.449	191	108	99	4.0	4.566	95.93
4-3	14:28:00	1.90	1.80	180.23	1.378	190	109	99	4.0	4.419	91.18
4-3	14:33:00	1.90	1.80	184.65	1.378	190	109	99	4.0	4.385	91.18
	14:38:00			189.04							
			1.92	108.136	1.419	191	107	100		108.136	
							103.21				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E46		**Sample Plane:**	Horizontal	
Meter ID:	E46		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.994		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	799A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.188	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS			**MOISTURE DETERMINATION**		
Barometric Pressure (Pb):	26.94	**in. Hg.**	**Initial Impinger Content:**	3389.40	**mls.**
Static Pressure:	-1.30	**in. H_2O**	**Final Impinger Content:**	3734.50	**mls.**
Flue Pressure (Ps):	26.84	**in. Hg. abs.**	**Difference:**	345.10	
Sample Train Pre:	0.008		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.008		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.2	**%**	**Total Water Gain:**	345.10	
Oxygen:	7.0	**%**			
Nitrogen:	80.8	**%**			

STACK PARAMETERS

Delta H:	1.85	**Inches H_2O**	**Gas Weight dry, Md:**	30.232	**lb/lb mole**
Meter Temperature, Tm:	103.4	**°F**	**Gas Weight wet, Ms:**	28.313	**lb/lb mole**
Sqrt ΔP:	1.521	**Inches H_2O**	**Excess Air:**	48.844	**%**
Stack Temperature, Ts:	192.2	**°F**	**Gas Velocity, Vs:**	101.168	
Meter Volume, Vm:	103.597	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,271,326	
Meter Volume, Vmstd:	87.326	**dscf**	**Volumetric Flow, DSCFM:**	778,556	
Meter Volume, Vwstd:	16.254	**wscf**	**Volumetric Flow, SCFM:**	923,471	
Moisture, Bws:	0.157		**Isokinetic Variance, %I:**	102.2	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 11:50
End Time: 13:56

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:50:00	2.40	1.90	95.79	1.549	193	99	98	2.0	4.369	102.71
1-1	11:55:00	2.40	1.90	100.16	1.549	193	100	98	2.0	4.329	102.71
1-2	12:00:00	2.40	1.90	104.49	1.549	193	102	98	2.0	4.378	102.71
1-2	12:05:00	2.40	1.90	108.87	1.549	193	102	98	2.0	4.380	102.71
1-3	12:10:00	2.00	1.60	113.25	1.414	191	104	98	2.0	4.010	93.62
1-3	12:15:00	2.00	1.60	117.26	1.414	191	104	98	2.0	3.974	93.62
	12:20:00			121.23							
2-1	12:22:00	2.50	2.00	121.23	1.581	192	103	99	3.0	4.486	104.75
2-1	12:27:00	2.50	2.00	125.72	1.581	192	104	99	3.0	4.440	104.75
2-2	12:32:00	2.40	1.90	130.16	1.549	192	106	99	3.0	4.405	102.63
2-2	12:37:00	2.40	1.90	134.57	1.549	192	106	99	3.0	4.398	102.63
2-3	12:42:00	2.10	1.70	138.96	1.449	191	108	100	3.0	4.099	95.93
2-3	12:47:00	2.10	1.70	143.06	1.449	191	108	100	3.0	4.148	95.93
	12:52:00			147.21							
3-1	12:54:00	2.50	2.00	147.21	1.581	193	107	100	3.0	4.500	104.83
3-1	12:59:00	2.50	2.00	151.71	1.581	193	108	101	3.0	4.488	104.83
3-2	13:04:00	2.40	1.90	156.20	1.549	193	109	101	3.0	4.406	102.71
3-2	13:09:00	2.40	1.90	160.60	1.549	193	109	101	3.0	4.404	102.71
3-3	13:14:00	2.20	1.80	165.01	1.483	192	110	102	3.0	4.227	98.27
3-3	13:19:00	2.20	1.80	169.24	1.483	192	110	102	3.0	4.230	98.27
	13:24:00			173.47							
4-1	13:26:00	2.50	2.00	173.47	1.581	193	108	102	3.0	4.513	104.83
4-1	13:31:00	2.50	2.00	177.98	1.581	193	109	102	3.0	4.473	104.83
4-2	13:36:00	2.40	1.90	182.45	1.549	192	110	103	3.0	4.429	102.63
4-2	13:41:00	2.40	1.90	186.88	1.549	192	110	103	3.0	4.440	102.63
4-3	13:46:00	2.00	1.60	191.32	1.414	191	111	103	3.0	4.010	93.62
4-3	13:51:00	2.00	1.60	195.33	1.414	191	111	103	3.0	4.061	93.62
	13:56:00			199.39							
			1.85	103.597	1.521	192	107	100		103.597	
							103.44				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Circular	
Plant:	Holcomb Station		**Diameter:**	16.33	**Feet**
Test Location:	Stack				
Source Condition:	Normal		**Duct Area:**	209.441	**Sq. Ft.**
Test Engineer:	T.Mei/CH				
Temp ID:	E46		**Sample Plane:**	Horizontal	
Meter ID:	E46		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.994		**Port Size (diameter):**	3.50	**in.**
Pitot ID:	799A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	4	
Probe Length:	7.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Glass		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.188	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Anderson Box		**Test Length:**	120	**min.**

STACK CONDITIONS			**MOISTURE DETERMINATION**		
Barometric Pressure (Pb):	26.73	**in. Hg.**	**Initial Impinger Content:**	3411.20	**mls.**
Static Pressure:	-1.40	**in. H_2O**	**Final Impinger Content:**	3691.70	**mls.**
Flue Pressure (Ps):	26.63	**in. Hg. abs.**	**Difference:**	280.50	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.3	**%**	**Total Water Gain:**	280.50	
Oxygen:	6.6	**%**			
Nitrogen:	81.1	**%**			

STACK PARAMETERS

Delta H:	1.71	**Inches H_2O**	**Gas Weight dry, Md:**	30.232	**lb/lb mole**
Meter Temperature, Tm:	100.6	**°F**	**Gas Weight wet, Ms:**	28.553	**lb/lb mole**
Sqrt ΔP:	1.462	**Inches H_2O**	**Excess Air:**	44.563	**%**
Stack Temperature, Ts:	191.7	**°F**	**Gas Velocity, Vs:**	97.174	
Meter Volume, Vm:	98.805	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,221,130	
Meter Volume, Vmstd:	83.023	**dscf**	**Volumetric Flow, DSCFM:**	759,623	
Meter Volume, Vwstd:	13.212	**wscf**	**Volumetric Flow, SCFM:**	880,502	
Moisture, Bws:	0.137		**Isokinetic Variance, %I:**	99.5	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Station
Location: Stack

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 11:30
End Time: 13:36

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:30:00	2.40	1.90	24.24	1.549	193	95	94	1.0	4.325	102.71
1-1	11:35:00	2.40	1.90	28.56	1.549	193	96	94	1.0	4.289	102.71
1-2	11:40:00	2.40	1.90	32.85	1.549	193	98	95	1.0	4.355	102.71
1-2	11:45:00	2.40	1.90	37.21	1.549	193	98	95	1.0	4.323	102.71
1-3	11:50:00	2.10	1.70	41.53	1.449	192	99	96	1.0	4.045	96.01
1-3	11:55:00	2.10	1.70	45.57	1.449	192	99	96	1.0	4.051	96.01
	12:00:00			49.63							
2-1	12:02:00	2.40	1.90	49.63	1.549	193	102	96	1.0	4.359	102.71
2-1	12:07:00	2.40	1.90	53.98	1.549	193	103	96	1.0	4.336	102.71
2-2	12:12:00	2.40	1.90	58.32	1.549	193	104	97	1.0	4.366	102.71
2-2	12:17:00	2.40	1.90	62.69	1.549	193	104	97	1.0	4.335	102.71
2-3	12:22:00	2.10	1.70	67.02	1.449	191	105	98	1.0	4.117	95.93
2-3	12:27:00	2.10	1.70	71.14	1.449	191	105	98	1.0	4.091	95.93
	12:32:00			75.23							
3-1	12:34:00	2.00	1.60	75.23	1.414	191	104	98	1.0	3.981	93.62
3-1	12:39:00	2.00	1.60	79.21	1.414	191	105	98	1.0	3.986	93.62
3-2	12:44:00	2.00	1.60	83.20	1.414	191	105	98	1.0	4.016	93.62
3-2	12:49:00	2.00	1.60	87.21	1.414	191	105	98	1.0	3.993	93.62
3-3	12:54:00	1.80	1.40	91.21	1.342	190	106	99	1.0	3.803	88.75
3-3	12:59:00	1.80	1.40	95.01	1.342	190	106	99	1.0	3.786	88.75
	13:04:00			98.79							
4-1	13:06:00	2.20	1.80	98.79	1.483	191	106	100	1.0	4.216	98.19
4-1	13:11:00	2.20	1.80	103.01	1.483	191	107	100	1.0	4.194	98.19
4-2	13:16:00	2.10	1.70	107.20	1.449	191	108	101	1.0	4.108	95.93
4-2	13:21:00	2.10	1.70	111.31	1.449	191	108	101	1.0	4.120	95.93
4-3	13:26:00	1.80	1.40	115.43	1.342	191	108	101	1.0	3.804	88.82
4-3	13:31:00	1.80	1.40	119.24	1.342	191	108	101	1.0	3.806	88.82
	13:36:00			123.04							
			1.71	98.805	1.462	192	104	98		98.805	
							100.63				

Field Notes/Comments:

Sunflower Electric Power Corporation

Trace Metals Emissions

Stack

Test #1

27-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)	Emissions Rate (tons/yr)	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	< 6	< 1.45E-10	< 0.000458	< 0.00634	< 0.02775	< 1.01E-06	< 6.24E-07	< 1.82E-06	< 1.8207	< 2.319
Arsenic	< 2	< 4.83E-11	< 0.000248	< 0.00211	< 0.00925	< 3.38E-07	< 2.08E-07	< 6.07E-07	< 0.6069	< 0.773
Barium	40.37	9.74E-10	0.002735	0.04263	0.18673	6.82E-06	4.20E-06	1.23E-05	12.2506	15.602
Beryllium	< 1	< 2.41E-11	< 0.001033	< 0.00106	< 0.00463	< 1.69E-07	< 1.04E-07	< 3.03E-07	< 0.3035	< 0.386
Cadmium	< 1	< 2.41E-11	< 0.000083	< 0.00106	< 0.00463	< 1.69E-07	< 1.04E-07	< 3.03E-07	< 0.3035	< 0.386
Chromium	6.7	1.62E-10	0.001199	0.00708	0.03099	1.13E-06	6.96E-07	2.03E-06	2.0332	2.589
Cobalt	< 2	< 4.83E-11	< 0.000316	< 0.00211	< 0.00925	< 3.38E-07	< 2.08E-07	< 6.07E-07	< 0.6069	< 0.773
Copper	2.4	5.79E-11	0.000351	0.00253	0.01110	4.05E-07	2.49E-07	7.28E-07	0.7283	0.928
Lead	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Manganese	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Mercury	3.260	7.87E-11	0.000151	0.00344	0.01508	5.51E-07	3.39E-07	9.89E-07	0.9893	1.260
Nickel	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Selenium	5.3	1.28E-10	0.000624	0.00560	0.02451	8.95E-07	5.51E-07	1.61E-06	1.6083	2.048
Silver	< 6	< 1.45E-10	< 0.000517	< 0.00634	< 0.02775	< 1.01E-06	< 6.24E-07	< 1.82E-06	< 1.8207	< 2.319
Thallium	< 4	< 9.65E-11	< 0.000182	< 0.00422	< 0.01850	< 6.76E-07	< 4.16E-07	< 1.21E-06	< 1.2138	< 1.546

Test Support Data	
Sample Volume (Vmstd)	91.374
Volumetric Flowrate (acfm)	1,185,264
Volumetric Flowrate (dscfm)	729,477
%O2	6.6
%CO2	12.4
Fuel Factor	9,780

Sunflower Electric Power Corporation

Trace Metals Emissions
Stack
Test #2
28-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)	Emissions Rate (tons/yr)	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	3.4	8.58E-11	0.000272	0.00401	0.01756	6.01E-07	3.68E-07	1.15E-06	1.1522	1.375
Arsenic	1	2.52E-11	0.000130	0.00118	0.00517	1.77E-07	1.08E-07	3.39E-07	0.3389	0.404
Barium	84.8	2.14E-09	0.006011	0.10001	0.43803	1.50E-05	9.18E-06	2.87E-05	28.7376	34.293
Beryllium	< 1	< 2.52E-11	< 0.001080	< 0.00118	< 0.00517	< 1.77E-07	< 1.08E-07	< 3.39E-07	< 0.3389	< 0.404
Cadmium	< 1	< 2.52E-11	< 0.000087	< 0.00118	< 0.00517	< 1.77E-07	< 1.08E-07	< 3.39E-07	< 0.3389	< 0.404
Chromium	6.8	1.72E-10	0.001273	0.00802	0.03513	1.20E-06	7.36E-07	2.30E-06	2.3044	2.750
Cobalt	< 2	< 5.05E-11	< 0.000330	< 0.00236	< 0.01033	< 3.53E-07	< 2.16E-07	< 6.78E-07	< 0.6778	< 0.809
Copper	7.1	1.79E-10	0.001088	0.00837	0.03667	1.25E-06	7.68E-07	2.41E-06	2.4061	2.871
Lead	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Manganese	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Mercury	2.540	6.41E-11	0.000123	0.00300	0.01312	4.49E-07	2.75E-07	8.61E-07	0.8608	1.027
Nickel	2.0	5.05E-11	0.000332	0.00236	0.01033	3.53E-07	2.16E-07	6.78E-07	0.6778	0.809
Selenium	17.6	4.44E-10	0.002170	0.02076	0.09091	3.11E-06	1.90E-06	5.96E-06	5.9644	7.117
Silver	< 6	< 1.51E-10	< 0.000541	< 0.00708	< 0.03099	< 1.06E-06	< 6.49E-07	< 2.03E-06	< 2.0333	< 2.426
Thallium	< 4	< 1.01E-10	< 0.000191	< 0.00472	< 0.02066	< 7.07E-07	< 4.33E-07	< 1.36E-06	< 1.3555	< 1.618

Test Support Data	
Sample Volume (Vmstd)	87.326
Volumetric Flowrate (acfm)	1,271,326
Volumetric Flowrate (dscfm)	778,556
%O2	7.0
%CO2	12.2
Fuel Factor	9,780

Sunflower Electric Power Corporation

Trace Metals Emissions
Stack
Test #3
29-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)	Emissions Rate (tons/yr)	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	3.5	7.81E-11	0.000247	0.00356	0.01559	5.47E-07	3.40E-07	1.02E-06	1.0228	1.251
Arsenic	< 2	< 4.46E-11	< 0.000230	< 0.00203	< 0.00891	< 3.12E-07	< 1.94E-07	< 5.84E-07	< 0.5845	< 0.715
Barium	26.5	5.91E-10	0.001660	0.02695	0.11804	4.14E-06	2.57E-06	7.74E-06	7.7441	9.472
Beryllium	< 1	< 2.23E-11	< 0.000955	< 0.00102	< 0.00445	< 1.56E-07	< 9.72E-08	< 2.92E-07	< 0.2922	< 0.357
Cadmium	< 1	< 2.23E-11	< 0.000077	< 0.00102	< 0.00445	< 1.56E-07	< 9.72E-08	< 2.92E-07	< 0.2922	< 0.357
Chromium	9.2	2.05E-10	0.001522	0.00936	0.04098	1.44E-06	8.94E-07	2.69E-06	2.6885	3.288
Cobalt	< 2	< 4.46E-11	< 0.000292	< 0.00203	< 0.00891	< 3.12E-07	< 1.94E-07	< 5.84E-07	< 0.5845	< 0.715
Copper	5.5	1.23E-10	0.000745	0.00559	0.02450	8.59E-07	5.34E-07	1.61E-06	1.6073	1.966
Lead	2.6	5.80E-11	0.000108	0.00264	0.01158	4.06E-07	2.53E-07	7.60E-07	0.7598	0.929
Manganese	0.0	0.00E+00	0.000000	0.00000	0.00000	0.00E+00	0.00E+00	0.00E+00	0.0000	0.000
Mercury	2.760	6.16E-11	0.000118	0.00281	0.01229	4.31E-07	2.68E-07	8.07E-07	0.8066	0.986
Nickel	2.8	6.25E-11	0.000410	0.00285	0.01247	4.37E-07	2.72E-07	8.18E-07	0.8182	1.001
Selenium	19.3	4.31E-10	0.002103	0.01963	0.08597	3.01E-06	1.88E-06	5.64E-06	5.6401	6.898
Silver	< 6	< 1.34E-10	< 0.000479	< 0.00610	< 0.02673	< 9.37E-07	< 5.83E-07	< 1.75E-06	< 1.7534	< 2.145
Thallium	< 4	< 8.93E-11	< 0.000168	< 0.00407	< 0.01782	< 6.25E-07	< 3.89E-07	< 1.17E-06	< 1.1689	< 1.430

Test Support Data	
Sample Volume (Vmstd)	98.805
Volumetric Flowrate (acfm)	1,221,130
Volumetric Flowrate (dscfm)	759,623
%O2	6.6
%CO2	12.3
Fuel Factor	9,780

TEST DATA	-	Method 29	Run No.: 1

Project Number: M22E0517 **Test Date:** 7/27/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	T. Barr				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.26	**in. Hg.**		
Static Pressure:	-10.00	**in. H_2O**		
Flue Pressure (Ps):	26.52	**in. Hg. abs.**		
Sample Train Leak Check **Pre:**	0.005			
Post:	0.008			
@	10/12	**in. Hg.**		
Carbon Dioxide:	14.0	**%**		
Oxygen:	4.8	**%**		
Nitrogen:	81.2	**%**		

MOISTURE DETERMINATION

Initial Impinger Content:	0.00	**mls.**
Final Impinger Content:	238.20	**mls.**
Difference:	238.20	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	238.20	

STACK PARAMETERS

Delta H:	1.40	**Inches H_2O**	**Gas Weight dry, Md:**	30.432	**lb/lb mole**
Meter Temperature, Tm:	95.6	**°F**	**Gas Weight wet, Ms:**	28.777	**lb/lb mole**
Sqrt ΔP:	0.744	**Inches H_2O**	**Excess Air:**	28.852	**%**
Stack Temperature, Ts:	285.5	**°F**	**Gas Velocity, Vs:**	52.804	
Meter Volume, Vm:	84.231	**Cubic Feet**	**Volumetric Flow, ACFM:**	918,792	
Meter Volume, Vmstd:	73.058	**dscf**	**Volumetric Flow, DSCFM:**	500,090	
Meter Volume, Vwstd:	11.219	**wscf**	**Volumetric Flow, SCFM:**	576,887	
Moisture, Bws:	0.133		**Isokinetic Variance, %I:**	103.6	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 1 **Test Date:** 7/27/2004
Start Time: 12:30
End Time: 15:01

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	12:30:00	0.50	1.26	170.41	0.707	276	98	94	4.0	3.330	49.86
1-2	12:35:00	0.53	1.33	173.74	0.728	278	98	94	4.0	3.440	51.41
1-3	12:40:00	0.45	1.13	177.18	0.671	278	98	94	4.0	3.163	47.37
	12:45:00			180.34							
2-1	12:50:00	0.68	1.71	180.34	0.825	279	98	94	5.0	3.897	58.27
2-2	12:55:00	0.60	1.51	184.24	0.775	279	98	94	5.0	3.640	54.73
2-3	13:00:00	0.53	1.33	187.88	0.728	278	99	94	5.0	3.418	51.41
	13:05:00			191.30							
3-1	13:08:00	0.55	1.38	191.30	0.742	292	98	94	5.0	3.482	52.86
3-2	13:13:00	0.60	1.51	194.78	0.775	289	99	94	5.0	3.660	55.10
3-3	13:18:00	0.52	1.31	198.44	0.721	284	98	94	5.0	3.387	51.13
	13:23:00			201.83							
4-1	13:28:00	0.45	1.13	201.83	0.671	290	98	94	5.0	3.143	47.75
4-2	13:33:00	0.50	1.26	204.97	0.707	285	98	94	5.0	3.050	50.17
4-3	13:38:00	0.42	1.05	208.02	0.648	287	98	94	5.0	3.087	46.04
	13:43:00			211.11							
5-1	13:48:00	0.65	1.63	211.11	0.806	295	96	94	5.0	3.803	57.58
5-2	13:53:00	0.70	1.76	214.91	0.837	297	97	94	5.0	3.940	59.83
5-3	13:58:00	0.60	1.51	218.85	0.775	286	97	94	5.0	3.648	54.99
	14:03:00			222.50							
6-1	14:08:00	0.55	1.38	222.50	0.742	288	97	94	5.0	3.482	52.72
6-2	14:13:00	0.50	1.26	225.98	0.707	286	97	94	5.0	3.330	50.20
6-3	14:18:00	0.42	1.05	229.31	0.648	285	96	94	5.0	3.435	45.98
	14:23:00			232.75							
7-1	14:28:00	0.60	1.51	232.75	0.775	283	97	94	5.0	3.645	54.88
7-2	14:33:00	0.60	1.51	236.39	0.775	286	96	94	5.0	3.650	54.99
7-3	14:38:00	0.55	1.38	240.04	0.742	285	96	94	5.0	3.501	52.61
	14:43:00			243.54							
8-1	14:46:00	0.65	1.63	243.54	0.806	288	96	94	5.0	3.809	57.31
8-2	14:51:00	0.60	1.51	247.35	0.775	290	95	94	5.0	3.640	55.14
8-3	14:56:00	0.60	1.51	250.99	0.775	288	95	94	5.0	3.651	55.06
	15:01:00			254.64							
			1.40	84.231	0.744	286	97	94		84.231	
							95.60				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 2

Project Number: M22E0517 **Test Date:** 7/28/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MJK				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.21	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	255.10	**mls.**
Flue Pressure (Ps):	26.47	**in. Hg. abs.**	**Difference:**	255.10	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	14.4	**%**	**Total Water Gain:**	255.10	
Oxygen:	4.6	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.91	**Inches H_2O**	**Gas Weight dry, Md:**	30.488	**lb/lb mole**
Meter Temperature, Tm:	102.5	**°F**	**Gas Weight wet, Ms:**	28.843	**lb/lb mole**
Sqrt ΔP:	0.868	**Inches H_2O**	**Excess Air:**	27.407	**%**
Stack Temperature, Ts:	288.4	**°F**	**Gas Velocity, Vs:**	61.809	
Meter Volume, Vm:	92.507	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,075,482	
Meter Volume, Vmstd:	79.218	**dscf**	**Volumetric Flow, DSCFM:**	582,952	
Meter Volume, Vwstd:	12.015	**wscf**	**Volumetric Flow, SCFM:**	671,370	
Moisture, Bws:	0.132		**Isokinetic Variance, %I:**	96.4	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 2 **Test Date:** 7/28/2004
Start Time: 11:50
End Time: 14:25

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:50:00	0.75	1.90	55.21	0.866	288	99	97	3.0	4.122	61.56
1-2	11:55:00	0.79	2.00	59.34	0.889	284	100	98	3.0	4.221	63.02
1-3	12:00:00	0.54	1.40	63.56	0.735	285	100	98	3.0	3.541	52.13
	12:05:00			67.10							
2-1	12:10:00	0.59	1.50	67.10	0.768	280	101	97	3.0	4.000	54.31
2-2	12:15:00	0.80	2.00	71.10	0.894	277	101	96	3.0	4.212	63.11
2-3	12:20:00	0.68	1.70	75.31	0.825	279	102	96	3.0	3.941	58.27
	12:25:00			79.25							
3-1	12:30:00	0.60	1.50	79.25	0.775	291	102	96	3.0	4.160	55.17
3-2	12:35:00	0.73	1.84	83.41	0.854	290	105	96	4.0	3.840	60.82
3-3	12:40:00	0.81	2.04	87.25	0.900	289	107	97	5.0	4.350	64.02
	12:45:00			91.60							
4-1	12:50:00	0.89	2.25	92.21	0.943	290	107	97	5.0	3.790	67.15
4-2	12:55:00	0.72	1.82	96.00	0.849	293	107	100	4.0	4.000	60.52
4-3	13:00:00	0.61	1.54	100.00	0.781	295	108	100	3.0	4.120	55.78
	13:05:00			104.12							
5-1	13:10:00	0.89	2.25	104.65	0.943	289	108	98	5.0	3.560	67.11
5-2	13:15:00	0.92	2.32	108.21	0.959	290	109	100	5.5	4.580	68.28
5-3	13:20:00	0.76	1.92	112.79	0.872	290	109	101	4.0	4.210	62.06
	13:25:00			117.00							
6-1	13:30:00	0.65	1.64	117.62	0.806	291	109	102	3.0	3.480	57.43
6-2	13:35:00	0.81	2.04	121.10	0.900	291	109	103	5.0	3.900	64.11
6-3	13:40:00	0.76	1.92	125.00	0.872	293	109	103	4.0	0.150	62.18
	13:45:00			125.15							
7-1	13:50:00	0.93	2.35	125.90	0.964	285	106	100	7.0	4.530	68.42
7-2	13:55:00	0.87	2.20	130.43	0.933	287	107	102	7.0	4.070	66.26
7-3	14:00:00	0.74	1.87	134.50	0.860	291	107	102	6.0	3.810	61.27
	14:05:00			138.31							
8-1	14:10:00	0.69	1.74	138.87	0.831	290	108	100	5.0	3.120	59.13
8-2	14:15:00	0.85	2.15	141.99	0.922	291	108	101	7.0	4.510	65.67
8-3	14:20:00	0.81	2.04	146.50	0.900	293	110	102	6.0	4.290	64.19
	14:25:00			150.79							
		1.91		92.507	0.868	288	106	99		92.507	
							102.50				

Field Notes/Comments:

TEST DATA	-	Method 29	Run No.: 3

Project Number: M22E0517 **Test Date:** 7/29/2004

TEST PARAMETERS

Company:	Sunflower Electric Power Corporation		**Duct Shape:**	Rectangular	
Plant:	Holcomb Facility		**Length:**	10.00	**Feet**
Test Location:	Air Heater Outlet		**Width:**	29.00	**Feet**
Source Condition:	Normal		**Duct Area:**	290.000	**Sq. Ft.**
Test Engineer:	MJK				
Temp ID:	E-22		**Sample Plane:**	Vertical	
Meter ID:	E-22		**Port Length:**	5.50	**in.**
Meter Calibration Factor:	0.998		**Port Size (diameter):**	3.50	**in.**
Pitot ID:			**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.841		**Number of Ports Sampled:**	8	
Probe Length:	6.0	**ft.**	**Number of Points per Port:**	3	
Probe Liner Material:	Teflon		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.250	**in.**	**Total Number of Traverse Points:**	24	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	27.00	**in. Hg.**	**Initial Impinger Content:**	0.00	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	260.40	**mls.**
Flue Pressure (Ps):	26.26	**in. Hg. abs.**	**Difference:**	260.40	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	14.0	**%**	**Total Water Gain:**	260.40	
Oxygen:	5.0	**%**			
Nitrogen:	81.0	**%**			

MOISTURE DETERMINATION

STACK PARAMETERS

Delta H:	1.74	**Inches H_2O**	**Gas Weight dry, Md:**	30.440	**lb/lb mole**
Meter Temperature, Tm:	92.3	**°F**	**Gas Weight wet, Ms:**	28.800	**lb/lb mole**
Sqrt ΔP:	0.856	**Inches H_2O**	**Excess Air:**	30.518	**%**
Stack Temperature, Ts:	286.6	**°F**	**Gas Velocity, Vs:**	61.140	
Meter Volume, Vm:	93.345	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,063,838	
Meter Volume, Vmstd:	80.757	**dscf**	**Volumetric Flow, DSCFM:**	573,371	
Meter Volume, Vwstd:	12.265	**wscf**	**Volumetric Flow, SCFM:**	660,451	
Moisture, Bws:	0.132		**Isokinetic Variance, %I:**	99.9	

TRAVERSE DATA: Method 29

Company: Sunflower Electric Power Corporation
Plant: Holcomb Facility
Location: Air Heater Outlet

Test Run: 3 **Test Date:** 7/29/2004
Start Time: 11:30
End Time: 14:05

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:30:00	0.52	1.20	47.34	0.721	298	88	89	4.0	3.287	51.60
1-2	11:35:00	0.57	1.40	50.63	0.755	292	88	90	4.0	3.511	53.81
1-3	11:40:00	0.60	1.40	54.14	0.775	289	89	91	4.0	3.566	55.10
	11:45:00			57.71							
2-1	11:50:00	0.61	1.50	57.71	0.781	286	89	91	5.0	3.795	55.45
2-2	11:55:00	0.59	1.40	61.50	0.768	288	89	92	5.0	3.550	54.60
2-3	12:00:00	0.68	1.60	65.05	0.825	283	89	92	5.0	3.775	58.42
	12:05:00			68.83							
3-1	12:10:00	0.69	1.60	68.83	0.831	288	89	93	5.0	4.018	59.05
3-2	12:15:00	0.75	1.80	72.84	0.866	279	89	93	5.0	3.987	61.19
3-3	12:20:00	0.75	1.80	76.83	0.866	284	89	94	5.0	3.989	61.40
	12:25:00			80.82							
4-1	12:30:00	0.73	1.70	80.82	0.854	289	89	94	5.0	4.106	60.78
4-2	12:35:00	0.84	2.00	84.93	0.917	286	90	95	5.0	4.211	65.07
4-3	12:40:00	0.90	2.10	89.14	0.949	283	90	95	5.0	4.364	67.21
	12:45:00			93.50							
5-1	12:50:00	0.88	2.10	93.50	0.938	277	90	95	5.0	4.583	66.19
5-2	12:55:00	0.88	2.10	98.08	0.938	280	91	95	5.0	4.328	66.33
5-3	13:00:00	0.84	2.00	102.41	0.917	279	91	95	5.0	4.206	64.76
	13:05:00			106.62							
6-1	13:10:00	0.90	2.10	106.62	0.949	283	91	96	6.0	4.483	67.21
6-2	13:15:00	0.85	2.00	111.10	0.922	285	91	96	6.0	4.215	65.41
6-3	13:20:00	0.81	1.90	115.32	0.900	287	91	96	6.0	4.141	63.94
	13:25:00			119.46							
7-1	13:30:00	0.65	1.54	119.95	0.806	290	92	96	5.0	3.450	57.39
7-2	13:35:00	0.73	1.73	123.40	0.854	290	92	96	6.0	3.700	60.82
7-3	13:40:00	0.81	1.91	127.10	0.900	291	92	96	6.5	4.280	64.11
	13:45:00			131.38							
8-1	13:50:00	0.80	1.89	133.00	0.894	290	93	96	6.5	2.600	63.67
8-2	13:55:00	0.69	1.63	135.60	0.831	290	93	97	5.0	3.650	59.13
8-3	14:00:00	0.62	1.46	139.25	0.787	291	93	97	5.0	3.550	56.09
	14:05:00			142.80							
			1.74	93.345	0.856	287	90	94		93.345	
							92.25				

Field Notes/Comments:

Sunflower Electric Power Corporation

Trace Metals Emissions
Air Heater Outlet
Test #1
27-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)*	Emissions Rate (tons/yr)*	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	10.1	2.64E-10	0.000837	0.01586	0.06948	1.85E-06	1.01E-06	3.36E-06	3.3560	4.234
Arsenic	131.1	3.43E-09	0.017660	0.20591	0.90190	2.40E-05	1.31E-05	4.36E-05	43.5621	54.963
Barium	1764.5	4.62E-08	0.129659	2.77142	12.13881	3.23E-04	1.76E-04	5.86E-04	586.31	739.757
Beryllium	< 1.5	< 3.93E-11	< 0.001680	< 0.00236	< 0.01032	< 2.75E-07	< 1.50E-07	< 4.98E-07	< 0.4984	< 0.629
Cadmium	0.55	1.44E-11	0.000049	0.00086	0.00378	1.01E-07	5.48E-08	1.83E-07	0.1828	0.231
Chromium	105.1	2.75E-09	0.020402	0.16508	0.72303	1.93E-05	1.05E-05	3.49E-05	34.9228	44.063
Cobalt	41.3	1.08E-09	0.007073	0.06487	0.28412	7.57E-06	4.12E-06	1.37E-05	13.7232	17.315
Copper	246.4	6.45E-09	0.039130	0.38701	1.69510	4.51E-05	2.46E-05	8.19E-05	81.8741	103.302
Lead	27.1	7.09E-10	0.001320	0.04256	0.18643	4.96E-06	2.70E-06	9.00E-06	9.0048	11.362
Manganese	159.8	4.18E-09	0.029354	0.25099	1.09934	2.93E-05	1.59E-05	5.31E-05	53.0986	66.995
Mercury	34.57	9.05E-10	0.001739	0.05430	0.23782	6.33E-06	3.45E-06	1.15E-05	11.4870	14.493
Nickel	81.6	2.14E-09	0.014027	0.12817	0.56136	1.49E-05	8.14E-06	2.71E-05	27.1142	34.210
Selenium	176.7	4.62E-09	0.022584	0.27753	1.21560	3.24E-05	1.76E-05	5.87E-05	58.7141	74.081
Silver	14	3.66E-10	0.001310	0.02199	0.09631	2.56E-06	1.40E-06	4.65E-06	4.6519	5.869
Thallium	21	5.50E-10	0.001037	0.03298	0.14447	3.85E-06	2.09E-06	6.98E-06	6.9779	8.804

*All emissions rates are doubled assuming equal emissions on second "pant leg" of the system

Test Support Data	
Sample Volume (Vmstd)	84.234
Volumetric Flowrate (acfm)	918,791
Volumetric Flowrate (dscfm)	500,092
%O2	4.8
%CO2	14.0
Fuel Factor	9,780

Sunflower Electric Power Corporation

Trace Metals Emissions
Air Heater Outlet
Test #2
28-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)*	Emissions Rate (tons/yr)*	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	1.9	4.53E-11	0.000143	0.00317	0.01387	3.17E-07	1.72E-07	5.68E-07	0.5678	0.725
Arsenic	144.4	3.44E-09	0.017712	0.24074	1.05442	2.41E-05	1.31E-05	4.32E-05	43.1543	55.125
Barium	2966.1	7.07E-08	0.198464	4.94492	21.65876	4.95E-04	2.68E-04	8.86E-04	886.4270	1132.312
Beryllium	< 1.5	< 3.57E-11	< 0.001530	< 0.00250	< 0.01095	< 2.50E-07	< 1.36E-07	< 4.48E-07	< 0.4483	< 0.573
Cadmium	< 1.5	< 3.57E-11	< 0.000123	< 0.00250	< 0.01095	< 2.50E-07	< 1.36E-07	< 4.48E-07	< 0.4483	< 0.573
Chromium	91.9	2.19E-09	0.016244	0.15321	0.67106	1.53E-05	8.31E-06	2.75E-05	27.4646	35.083
Cobalt	35.3	8.41E-10	0.005505	0.05885	0.25776	5.89E-06	3.19E-06	1.05E-05	10.5495	13.476
Copper	232.8	5.55E-09	0.033664	0.38811	1.69993	3.88E-05	2.11E-05	6.96E-05	69.5729	88.872
Lead	32.2	7.67E-10	0.001428	0.05368	0.23513	5.37E-06	2.91E-06	9.62E-06	9.6231	12.292
Manganese	51334	1.22E-06	8.586318	85.58096	374.84460	8.56E-03	4.64E-03	1.53E-02	#########	19596.744
Mercury	33.72	8.04E-10	0.001545	0.05622	0.24623	5.63E-06	3.05E-06	1.01E-05	10.0773	12.873
Nickel	70.6	1.68E-09	0.011051	0.11770	0.51553	1.18E-05	6.38E-06	2.11E-05	21.0990	26.952
Selenium	203.8	4.86E-09	0.023719	0.33976	1.48817	3.40E-05	1.84E-05	6.09E-05	60.9062	77.801
Silver	106.0	2.53E-09	0.009030	0.17672	0.77402	1.77E-05	9.59E-06	3.17E-05	31.6784	40.466
Thallium	28	6.67E-10	0.001259	0.04668	0.20446	4.67E-06	2.53E-06	8.37E-06	8.3679	10.689

*All emissions rates are doubled assuming equal emissions on second "pant leg" of the system

Test Support Data	
Sample Volume (Vmstd)	92.507
Volumetric Flowrate (acfm)	1,075,484
Volumetric Flowrate (dscfm)	582,949
%O2	4.6
%CO2	14.4
Fuel Factor	9,780

Sunflower Electric Power Corporation

Trace Metals Emissions
Air Heater Outlet
Test #3
29-Jul-04

Parameter	Sample Results (ug)	Concentration (lbs/dscf)	Concentration (ppm)	Emissions Rate (lbs/hr)*	Emissions Rate (tons/yr)*	gr/dscf	gr/acf	lbs/10^6Btu	lbs/10^{12}Btu	ug/dscm^3
Antimony	6.4	1.51E-10	0.000479	0.01040	0.04555	1.06E-06	5.70E-07	1.94E-06	1.9432	2.421
Arsenic	228.5	5.40E-09	0.027776	0.37132	1.62638	3.78E-05	2.04E-05	6.94E-05	69.3773	86.447
Barium	1881.7	4.44E-08	0.124775	3.05783	13.39328	3.11E-04	1.68E-04	5.71E-04	571.32	711.893
Beryllium	< 1.5	< 3.54E-11	< 0.001516	< 0.00244	< 0.01068	< 2.48E-07	< 1.34E-07	< 4.55E-07	< 0.4554	< 0.567
Cadmium	< 1.5	< 3.54E-11	< 0.000122	< 0.00244	< 0.01068	< 2.48E-07	< 1.34E-07	< 4.55E-07	< 0.4554	< 0.567
Chromium	102.9	2.43E-09	0.018025	0.16722	0.73241	1.70E-05	9.17E-06	3.12E-05	31.2426	38.930
Cobalt	43.2	1.02E-09	0.006676	0.07020	0.30748	7.14E-06	3.85E-06	1.31E-05	13.1164	16.344
Copper	246.3	5.82E-09	0.035296	0.40025	1.75308	4.07E-05	2.19E-05	7.48E-05	74.7817	93.181
Lead	25.5	6.02E-10	0.001121	0.04144	0.18150	4.22E-06	2.27E-06	7.74E-06	7.7423	9.647
Manganese	61.4	1.45E-09	0.010178	0.09978	0.43702	1.02E-05	5.47E-06	1.86E-05	18.6423	23.229
Mercury	42.31	9.99E-10	0.001921	0.06876	0.30115	6.99E-06	3.77E-06	1.28E-05	12.8462	16.007
Nickel	79.5	1.88E-09	0.012332	0.12919	0.56585	1.31E-05	7.08E-06	2.41E-05	24.1378	30.077
Selenium	1.6	3.78E-11	0.000185	0.00260	0.01139	2.65E-07	1.43E-07	4.86E-07	0.4858	0.605
Silver	7.3	0 1.72E-10	0 0.000616	0 0.01186	0 0.05196	1.21E-06	6.50E-07	2.22E-06	2.2164	2.762
Thallium	29	6.85E-10	0.001292	0.04713	0.20641	4.79E-06	2.58E-06	8.80E-06	8.8050	10.971

*All emissions rates are doubled assuming equal emissions on second "pant leg" of the system

Test Support Data	
Sample Volume (Vmstd)	93.345
Volumetric Flowrate (acfm)	1,063,838
Volumetric Flowrate (dscfm)	573,371
%O2	5.0
%CO2	14.0
Fuel Factor	9,780

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

NOZZLES

The nozzles are measured according to Method 5, Section 5.1.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

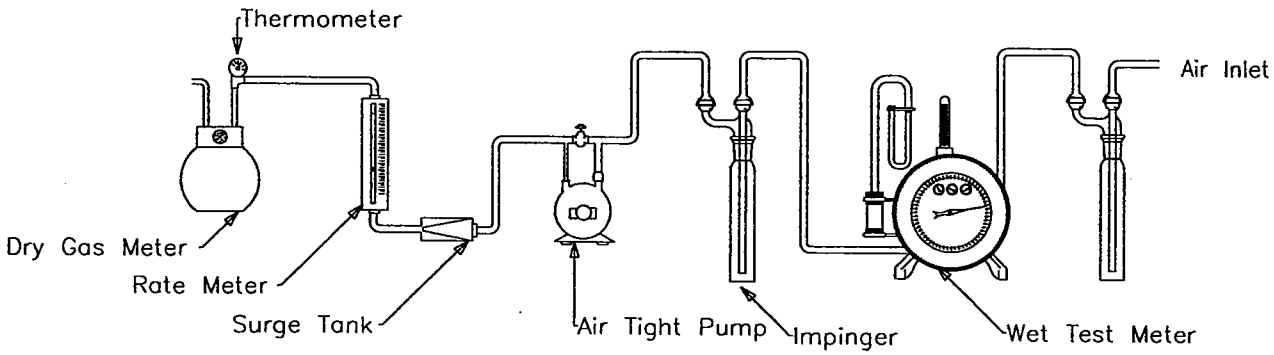
DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Gas Meter Calibration Train



Dwg - AF

METER BOX CALIBRATION

Dry Gas Meter No.	E15	Date:	07-15-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.30

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			69.293	71.895	78	93	87					
Inital			63.554	66.084	78	93	86					
Difference	1	0.20	5.739	5.811	78	93	87	90	20	38	1.009	1.472
Final			74.388	77.864	78	95	88					
Inital			69.386	72.777	78	93	87					
Difference	2	0.50	5.002	5.087	78	94	88	91	11	32	1.005	1.511
Final			57.727	60.993	78	91	85					
Inital			52.727	55.934	78	88	84					
Difference	3	0.70	5.000	5.059	78	90	85	87	9	51	1.003	1.554
Final			79.465	83.036	78	97	89					
Inital			74.464	77.947	78	95	88					
Difference	4	0.90	5.001	5.089	78	96	89	92	8	45	1.006	1.561
Final			84.578	88.279	78	99	90					
Inital			79.573	83.149	78	97	89					
Difference	5	1.20	5.005	5.130	78	98	90	94	7	37	1.001	1.571
Final			63.516	66.826	78	93	86					
Inital			57.828	61.092	78	91	85					
Difference	6	2.00	5.688	5.734	78	92	86	89	6	48	1.007	1.630
									Average		1.005	1.550

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E15 Name: PSH

Ambient Temperature: 78 °F Date: 07-15-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-15-04 Name: PSH

EPA Control Module No.: E15 Ambient Temperature: 78 °F

Calibration (Y): 1.005 Barometric Pressure: 29.3 "Hg

Delta H: 1.550

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	94.135	82	80	1.026
	10	101.617	84	81	
	Vm=	7.482	Avg.= 82	541.75	
2	0	112.066	84	81	1.027
	10	119.555	86	82	
	Vm=	7.489	Avg.= 83	543.25	
3	0	119.555	86	82	1.029
	10	127.042	88	84	
	Vm=	7.487	Avg.= 85	545.00	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.975 <Yc< 1.035

METER BOX CALIBRATION

Dry Gas Meter No.	E15	Date:	08-12-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.37

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			17.317	94.140	73	78	76					
Inital			12.296	89.139	73	77	74					
Difference	1	0.20	5.021	5.001	73	78	75	76	18	21	1.010	1.526
Final			22.416	99.234	73	82	77					
Inital			17.412	94.233	73	78	76					
Difference	2	0.50	5.004	5.001	73	80	77	78	11	48	1.009	1.583
Final			6.929	83.821	72	74	73					
Inital			1.897	78.820	72	72	72					
Difference	3	0.70	5.032	5.001	72	73	73	73	10	3	1.006	1.600
Final			33.798	110.642	73	85	78					
Inital			28.797	105.627	73	82	77					
Difference	4	0.90	5.001	5.015	73	84	78	81	8	53	1.009	1.610
Final			38.944	115.813	73	88	79					
Inital			33.943	110.788	73	85	78					
Difference	5	1.20	5.001	5.025	73	87	79	83	7	44	1.010	1.621
Final			12.163	89.007	72	77	74					
Inital			7.119	84.006	72	74	73					
Difference	6	2.00	5.044	5.001	72	76	74	75	6	11	1.008	1.717
									Average		1.009	1.609

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E15 Name: PSH

Ambient Temperature: 72 °F Date: 08-12-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	598	0.2
1200	1197	0.2

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-12-04 Name: PSH

EPA Control Module No.: E15 Ambient Temperature: 72 °F

Calibration (Y): 1.009 Barometric Pressure: 29.37 "Hg

Delta H: 1.609

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	16.408	88	82	1.015
	10	23.994	90	83	
	Vm=	7.586	Avg.= 86	545.75	
2	0	23.994	90	83	1.018
	10	31.567	92	85	
	Vm=	7.573	Avg.= 88	547.50	
3	0	31.567	92	85	1.019
	10	39.144	94	86	
	Vm=	7.577	Avg.= 89	549.25	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.978 <Yc< 1.039

METER BOX CALIBRATION

Dry Gas Meter No.	E22	Date:	07-19-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.29

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			97.505	46.253	78	86	82					
Inital			92.504	41.162	78	84	80					
Difference	1	0.20	5.001	5.091	78	85	81	83	18	53	0.991	1.644
Final			102.843	51.661	78	88	83					
Inital			97.561	46.308	78	86	82					
Difference	2	0.50	5.282	5.353	78	87	83	85	13	8	0.998	1.776
Final			87.323	35.997	78	82	79					
Inital			82.321	30.962	78	80	78					
Difference	3	0.70	5.002	5.035	78	81	79	80	10	32	0.995	1.800
Final			107.992	56.884	78	90	84					
Inital			102.971	51.790	78	88	83					
Difference	4	0.90	5.021	5.094	78	89	84	86	9	28	0.999	1.834
Final			113.080	62.032	79	92	85					
Inital			108.079	56.978	79	90	84					
Difference	5	1.20	5.001	5.054	79	91	85	88	8	19	1.003	1.904
Final			92.491	41.168	78	84	80					
Inital			87.427	36.103	78	82	79					
Difference	6	2.00	5.064	5.065	78	83	80	81	6	34	1.001	1.945
									Average		0.998	1.817

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E22 Name: PSH

Ambient Temperature: 78 °F Date: 07-19-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-19-04 Name: PSH

EPA Control Module No.: E22 Ambient Temperature: 78 °F

Calibration (Y): 0.998 Barometric Pressure: 29.29 "Hg

Delta H: 1.817

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	63.737	89	86	1.022
	10	71.300	91	87	
	Vm=	7.563	Avg.= 88	548.25	
2	0	71.300	91	87	1.023
	10	78.867	93	88	
	Vm=	7.567	Avg.= 90	549.75	
3	0	78.867	93	88	1.022
	10	86.448	94	89	
	Vm=	7.581	Avg.= 91	551.00	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.968 <Yc< 1.028

METER BOX CALIBRATION

Dry Gas Meter No.	E22	Date:	08-18-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.40

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			40.840	78.890	78	89	83					
Inital			35.838	73.806	78	88	81					
Difference	1	0.20	5.002	5.084	78	89	82	85	18	47	0.997	1.613
Final			45.905	84.024	78	90	84					
Inital			40.904	78.943	78	89	83					
Difference	2	0.50	5.001	5.081	78	90	84	87	12	16	0.999	1.717
Final			30.706	68.669	78	87	81					
Inital			25.705	63.648	78	84	79					
Difference	3	0.70	5.001	5.021	78	86	80	83	10	28	1.003	1.762
Final			51.031	89.238	79	92	85					
Inital			46.030	84.151	78	90	84					
Difference	4	0.90	5.001	5.087	79	91	85	88	9	17	0.998	1.769
Final			56.132	94.410	79	94	86					
Inital			51.131	89.341	79	92	85					
Difference	5	1.20	5.001	5.069	79	93	86	89	8	9	1.002	1.816
Final			35.813	73.781	78	89	82					
Inital			30.812	68.776	78	87	81					
Difference	6	2.00	5.001	5.005	78	88	82	85	6	20	1.007	1.836
									Average		1.001	1.752

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E22 Name: PSH

Ambient Temperature: 78 °F Date: 08-18-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-18-04 Name: PSH

EPA Control Module No.: E22 Ambient Temperature: 78 °F

Calibration (Y): 1.001 Barometric Pressure: 29.4 "Hg

Delta H: 1.752

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	94.906	91	85	1.023
	10	102.446	92	86	
	Vm=	7.540	Avg.= 89	548.50	
2	0	102.446	92	86	1.023
	10	110.000	95	88	
	Vm=	7.554	Avg.= 90	550.25	
3	0	110.000	95	88	1.028
	10	117.535	97	90	
	Vm=	7.535	Avg.= 93	552.50	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.971 <Yc< 1.031

METER BOX CALIBRATION

Dry Gas Meter No.	E46	Date:	07-07-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.15

Formula Protection Password: MPA

Run Number	Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final		47.477	62.081	75	81	77					
Inital		42.476	57.014	75	81	76					
Difference 1	0.20	5.001	5.067	75	81	77	79	18	22	0.993	1.558
Final		52.540	67.218	75	84	79					
Inital		47.537	62.120	75	81	77					
Difference 2	0.50	5.003	5.098	75	83	78	80	11	46	0.990	1.592
Final		37.245	51.752	75	79	75					
Inital		32.244	46.730	75	77	74					
Difference 3	0.70	5.001	5.022	75	78	75	76	10	5	0.996	1.651
Final		57.630	72.394	75	86	80					
Inital		52.627	67.311	75	84	79					
Difference 4	0.90	5.003	5.083	75	85	80	82	8	59	0.995	1.665
Final		62.701	77.579	75	88	82					
Inital		57.700	72.478	75	86	80					
Difference 5	1.20	5.001	5.101	75	87	81	84	7	58	0.994	1.741
Final		42.438	56.984	75	81	76					
Inital		37.328	51.853	75	79	75					
Difference 6	2.00	5.110	5.131	75	80	76	78	6	28	0.996	1.853
								Average		0.994	1.677

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E46 Name: PSH

Ambient Temperature: 75 °F Date: 07-07-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-07-04 Name: PSH

EPA Control Module No.: E46 Ambient Temperature: 75 °F

Calibration (Y): 0.994 Barometric Pressure: 29.15 "Hg

Delta H: 1.677

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	78.850	79	74	1.017
	10	86.388	81	75	
	Vm=	7.538	Avg.= 77	537.25	
2	0	86.388	81	75	1.019
	10	93.925	82	76	
	Vm=	7.537	Avg.= 79	538.50	
3	0	104.090	82	76	1.019
	10	111.633	84	77	
	Vm=	7.543	Avg.= 80	539.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.964 <Yc< 1.024

METER BOX CALIBRATION

Dry Gas Meter No.	E46	Date:	08-09-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.39

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			110.323	64.483	77	88	84					
Inital			105.322	59.383	76	87	82					
Difference	1	0.20	5.001	5.100	77	88	83	85	18	12	0.996	1.507
Final			115.968	70.253	77	90	86					
Inital			110.392	64.547	77	88	84					
Difference	2	0.50	5.576	5.706	77	89	85	87	13	1	0.994	1.548
Final			100.009	53.964	76	85	81					
Inital			95.008	48.871	76	83	80					
Difference	3	0.70	5.001	5.093	76	84	81	82	10	1	0.992	1.604
Final			121.070	75.497	77	92	87					
Inital			116.066	70.361	77	90	86					
Difference	4	0.90	5.004	5.136	77	91	87	89	8	54	0.993	1.613
Final			126.300	80.895	77	94	88					
Inital			121.292	75.728	77	92	87					
Difference	5	1.20	5.008	5.167	77	93	88	90	7	54	0.990	1.687
Final			105.292	59.354	76	87	82					
Inital			100.118	54.080	76	85	81					
Difference	6	2.00	5.174	5.274	76	86	82	84	6	21	0.990	1.716
									Average		0.993	1.612

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E46 Name: PSH

Ambient Temperature: 76 °F Date: 08-09-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference* Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-09-04 Name: PSH

EPA Control Module No.: E46 Ambient Temperature: 76 °F

Calibration (Y): 0.993 Barometric Pressure: 29.39 "Hg

Delta H: 1.612

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	81.256	77	73	1.020
	10	88.729	79	74	
	Vm=	7.473	Avg.= 76	535.75	
2	0	88.729	79	74	1.022
	10	96.204	81	75	
	Vm=	7.475	Avg.= 77	537.25	
3	0	96.204	81	75	1.022
	10	103.686	83	76	
	Vm=	7.482	Avg.= 79	538.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.963 <Yc< 1.022

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	07-21-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.24

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			44.077	60.123	83	91	86					
Inital			38.472	54.519	83	91	85					
Difference	1	0.20	5.605	5.604	83	91	86	88	19	40	1.009	1.435
Final			49.060	65.171	83	93	87					
Inital			44.057	60.147	83	91	86					
Difference	2	0.50	5.003	5.024	83	92	87	89	11	44	1.006	1.600
Final			33.221	49.207	83	89	84					
Inital			28.218	44.188	83	87	83					
Difference	3	0.70	5.003	5.019	83	88	84	86	10	5	1.000	1.664
Final			54.169	70.283	84	94	88					
Inital			49.168	65.257	84	93	87					
Difference	4	0.90	5.001	5.026	84	94	88	91	8	56	1.005	1.673
Final			59.510	75.623	84	96	89					
Inital			54.244	70.356	84	94	88					
Difference	5	1.20	5.266	5.267	84	95	89	92	8	11	1.011	1.684
Final			38.425	54.454	83	91	85					
Inital			33.369	49.379	83	89	84					
Difference	6	2.00	5.056	5.075	83	90	85	87	6	13	0.999	1.765
									Average		1.005	1.637

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 83 °F Date: 07-21-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[1] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-21-04 Name: PSH

EPA Control Module No.: E51 Ambient Temperature: 83 °F

Calibration (Y): 1.005 Barometric Pressure: 29.24 "Hg

Delta H: 1.637

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	6.661	89	84	1.023
	10	14.217	91	85	
	Vm=	7.556	Avg.= 87	547.25	
2	0	14.217	91	85	1.020
	10	21.800	93	86	
	Vm=	7.583	Avg.= 89	548.75	
3	0	21.800	93	86	1.020
	10	29.394	95	87	
	Vm=	7.594	Avg.= 90	550.25	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.975 <Yc< 1.035

METER BOX CALIBRATION

Dry Gas Meter No.	E51	Date:	08-26-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.35

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			111.432	46.202	77	80	79					
Inital			106.317	41.085	77	80	77					
Difference	1	0.20	5.115	5.117	77	80	78	79	19	1	1.003	1.596
Final			116.522	51.307	77	82	80					
Inital			111.521	46.287	77	80	79					
Difference	2	0.50	5.001	5.020	77	81	80	80	12	3	1.001	1.673
Final			101.162	35.957	77	79	76					
Inital			96.156	30.957	77	77	75					
Difference	3	0.70	5.006	5.000	77	78	76	77	10	16	0.999	1.707
Final			121.687	56.489	78	85	81					
Inital			116.686	51.480	77	82	80					
Difference	4	0.90	5.001	5.009	78	84	81	82	9	7	1.004	1.721
Final			126.785	61.584	78	87	82					
Inital			121.784	56.566	78	85	81					
Difference	5	1.20	5.001	5.018	78	86	82	84	7	55	1.004	1.728
Final			106.294	40.059	77	81	77					
Inital			101.272	35.058	77	79	76					
Difference	6	2.00	5.022	5.001	77	80	77	78	6	13	1.002	1.772
									Average		1.002	1.700

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E51 Name: PSH

Ambient Temperature: 77 °F Date: 08-26-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-26-04 Name: PSH

EPA Control Module No.: E51 Ambient Temperature: 77 °F

Calibration (Y): 1.002 Barometric Pressure: 29.35 "Hg

Delta H: 1.700

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	79.832	89	83	1.024
	10	87.363	91	84	
	Vm=	7.531	Avg.= 87	546.75	
2	0	87.363	91	84	1.024
	10	94.900	93	85	
	Vm=	7.537	Avg.= 88	548.25	
3	0	94.900	93	85	1.027
	10	102.428	95	86	
	Vm=	7.528	Avg.= 90	549.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.972 <Yc< 1.032

METER BOX CALIBRATION

Dry Gas Meter No.	E74	Date:	07-06-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.21

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			91.756	107.477	79	82	77					
Inital			86.352	102.118	79	82	76					
Difference	1	0.20	5.404	5.359	79	82	77	79	20	9	1.008	1.625
Final			96.844	112.540	79	84	78					
Inital			91.803	107.538	79	82	77					
Difference	2	0.50	5.041	5.002	79	83	78	80	12	30	1.009	1.793
Final			81.080	96.936	79	80	75					
Inital			76.041	91.935	79	78	74					
Difference	3	0.70	5.039	5.001	79	79	75	77	10	37	1.002	1.824
Final			101.961	117.613	79	86	79					
Inital			96.926	112.611	79	84	78					
Difference	4	0.90	5.035	5.002	79	85	79	82	9	27	1.009	1.844
Final			107.092	122.698	80	88	80					
Inital			102.051	117.697	80	86	79					
Difference	5	1.20	5.041	5.001	80	87	80	83	8	15	1.011	1.871
Final			86.297	102.059	79	82	76					
Inital			81.169	97.017	79	80	75					
Difference	6	2.00	5.128	5.042	79	81	76	78	6	37	1.011	1.949
									Average		1.008	1.818

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E74 Name: PSH

Ambient Temperature: 79 °F Date: 07-06-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-06-04 Name: PSH

EPA Control Module No.: E74 Ambient Temperature: 79 °F

Calibration (Y): 1.008 Barometric Pressure: 29.21 "Hg

Delta H: 1.818

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	22.894	83	80	1.026
	10	30.395	86	82	
	Vm=	7.501	Avg.= 83	542.75	
2	0	30.395	86	82	1.027
	10	37.910	89	84	
	Vm=	7.515	Avg.= 85	545.25	
3	0	37.910	89	84	1.030
	10	45.422	92	86	
	Vm=	7.512	Avg.= 88	547.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.978 <Yc< 1.039

METER BOX CALIBRATION

Dry Gas Meter No.	E74	Date:	08-02-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.61

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			47.079	22.493	87	88	84					
Inital			42.017	17.492	87	88	82					
Difference	1	0.20	5.062	5.001	87	88	83	86	18	31	1.009	1.571
Final			52.224	27.590	87	90	85					
Inital			47.172	22.586	87	88	84					
Difference	2	0.50	5.052	5.004	87	89	85	87	12	21	1.008	1.750
Final			36.729	12.303	87	86	80					
Inital			31.644	7.300	87	84	79					
Difference	3	0.70	5.085	5.003	87	85	80	82	10	32	1.006	1.773
Final			57.399	32.710	87	92	86					
Inital			52.343	27.709	87	90	85					
Difference	4	0.90	5.056	5.001	87	91	86	88	9	23	1.011	1.810
Final			62.527	37.810	87	94	87					
Inital			57.485	32.807	87	92	86					
Difference	5	1.20	5.042	5.003	87	93	87	90	8	12	1.010	1.848
Final			41.929	17.423	87	89	82					
Inital			36.846	12.417	87	86	80					
Difference	6	2.00	5.083	5.006	87	88	81	84	6	26	1.005	1.885
									Average		1.008	1.773

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E74 Name: PSH

Ambient Temperature: 87 °F Date: 08-02-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	598	0.2
1200	1198	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-02-04 Name: PSH

EPA Control Module No.: E74 Ambient Temperature: 87 °F

Calibration (Y): 1.008 Barometric Pressure: 29.61 "Hg

Delta H: 1.773

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	39.006	94	87	1.025
	10	46.522	96	88	
	Vm=	7.516	Avg.= 91	551.25	
2	0	46.522	96	88	1.026
	10	54.048	98	90	
	Vm=	7.526	Avg.= 93	553.00	
3	0	54.048	98	90	1.028
	10	61.566	100	91	
	Vm=	7.518	Avg.= 95	554.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.978 <Yc< 1.038

METER BOX CALIBRATION

Dry Gas Meter No.	E75	Date:	07-14-04
Standard Meter No.	677191	Calibrated By:	PSH
Standard Meter (Yr)	0.9986	Barometric Pressure :	29.20

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			108.432	100.030	83	84	79					
Inital			103.335	94.991	83	84	78					
Difference	1	0.20	5.097	5.039	83	84	79	81	18	34	1.008	1.568
Final			114.005	105.527	83	86	80					
Inital			108.527	100.107	83	84	79					
Difference	2	0.50	5.478	5.420	83	85	80	82	13	16	1.008	1.730
Final			98.060	89.808	83	82	77					
Inital			92.981	84.807	83	80	76					
Difference	3	0.70	5.079	5.001	83	81	77	79	10	26	1.006	1.754
Final			119.348	110.811	83	88	81					
Inital			114.161	105.677	83	86	80					
Difference	4	0.90	5.187	5.134	83	87	81	84	9	36	1.009	1.814
Final			124.497	115.992	84	90	83					
Inital			119.444	110.989	84	88	81					
Difference	5	1.20	5.053	5.003	84	89	82	86	8	7	1.010	1.822
Final			103.263	94.925	83	84	78					
Inital			98.177	89.923	83	82	77					
Difference	6	2.00	5.086	5.002	83	83	78	80	6	23	1.007	1.865
									Average		1.008	1.759

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E75 Name: PSH

Ambient Temperature: 82 °F Date: 07-14-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	1	0.2
600	600	0.0
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 07-14-04 Name: PSH

EPA Control Module No.: E75 Ambient Temperature: 82 °F

Calibration (Y): 1.008 Barometric Pressure: 29.2 "Hg

Delta H: 1.759

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	16.214	90	86	1.028
	10	23.745	92	87	
	Vm=	7.531	Avg.= 89	548.75	
2	0	23.745	92	87	1.030
	10	31.269	94	88	
	Vm=	7.524	Avg.= 90	550.25	
3	0	31.269	94	88	1.030
	10	38.808	96	89	
	Vm=	7.539	Avg.= 92	551.75	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

Limit: 0.978 <Yc< 1.038

METER BOX CALIBRATION

Dry Gas Meter No.	E75	Date:	08-04-04
Standard Meter No.	2547159	Calibrated By:	PSH
Standard Meter (Yr)	1.0008	Barometric Pressure :	29.50

Formula Protection Password: MPA

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			29.667	43.133	81	82	79					
Inital			24.353	37.869	81	82	78					
Difference	1	0.20	5.314	5.264	81	82	79	80	19	33	1.008	1.575
Final			41.374	54.717	81	83	80					
Inital			36.274	49.661	81	82	79					
Difference	2	0.50	5.100	5.056	81	83	80	81	12	16	1.007	1.681
Final			19.157	32.733	81	80	77					
Inital			13.691	27.332	81	79	76					
Difference	3	0.70	5.466	5.401	81	80	77	78	11	14	1.005	1.727
Final			46.527	59.807	82	84	80					
Inital			41.449	54.794	82	83	80					
Difference	4	0.90	5.078	5.013	82	84	80	82	9	17	1.010	1.752
Final			51.697	64.923	82	85	81					
Inital			46.639	59.916	82	84	80					
Difference	5	1.20	5.058	5.007	82	85	81	83	8	6	1.008	1.790
Final			24.304	37.812	81	83	78					
Inital			19.244	32.811	81	80	77					
Difference	6	2.00	5.060	5.001	81	82	78	80	6	20	1.004	1.825
									Average		1.007	1.725

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: E75 Name: PSH

Ambient Temperature: 81 °F Date: 08-04-04

Omega Engineering Calibrator Model No. CL23A Serial # T-236796

Date Of Calibration Verification: Jan. 15, 2004

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1200	0.0

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

VOLUME METERING SYSTEM FIELD AUDIT

Date: 08-04-04 Name: PSH

EPA Control Module No.: E75 Ambient Temperature: 81 °F

Calibration (Y): 1.007 Barometric Pressure: 29.5 "Hg

Delta H: 1.725

Run No.	Time (Minutes)	Gas Meter Reading/Gas Meter Temperature (Cubic Feet)	Inlet (°F)	Outlet (°F)	Yc (Calculated)
1	0	65.200	81	78	1.022
	10	72.678	83	79	
	Vm=	7.478	Avg.= 80	540.25	
2	0	72.678	83	79	1.024
	10	80.156	86	80	
	Vm=	7.478	Avg.= 82	542.00	
3	0	80.156	86	80	1.024
	10	87.643	89	81	
	Vm=	7.487	Avg.= 84	544.00	

$$Yc = \frac{10}{Vm}\sqrt{\frac{0.319Tm}{Pbar}}$$

Limit: 0.97Y <Yc< 1.03Y

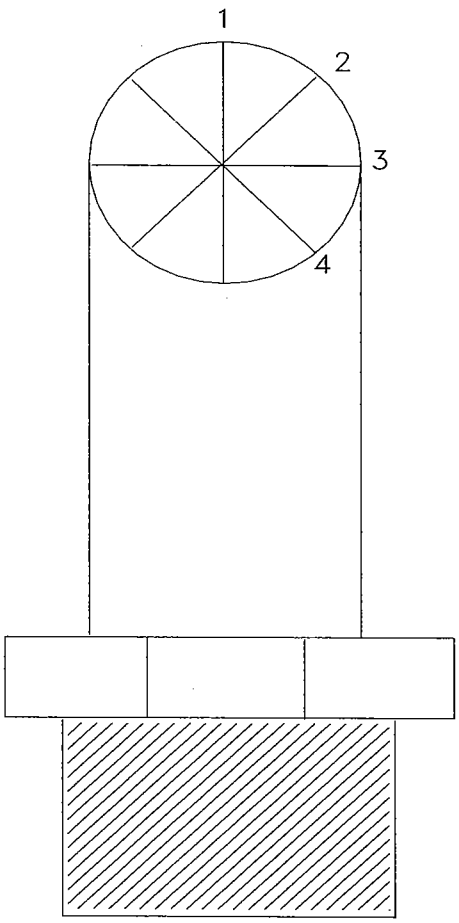
Limit: 0.977 <Yc< 1.037

Nozzle Calibration

Date: 7/23/2004

Nozzle ID No.: N/A

Analyst: TAM



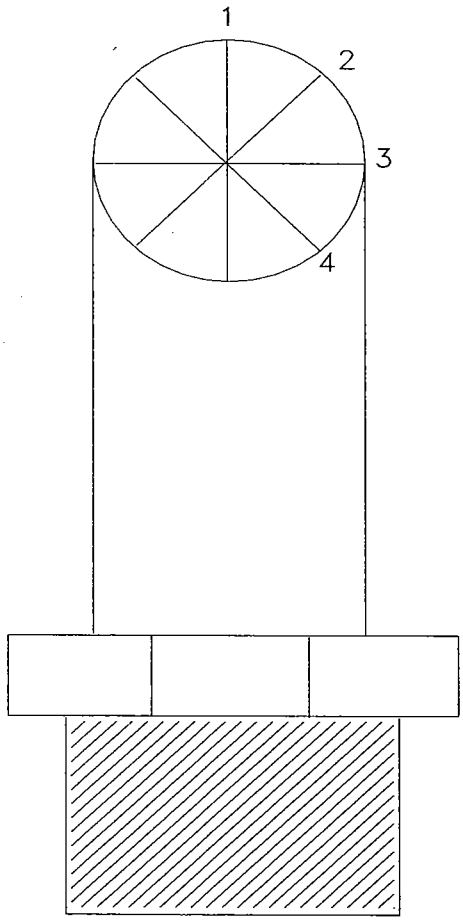
Pre Test		Post Test
0.250	1	√
0.251	2	√
0.250	3	√
0.250	4	√

Average
0.250

Nozzle Calibration

Date: 7/23/2004 Nozzle ID No.: N/A

Analyst: TAM



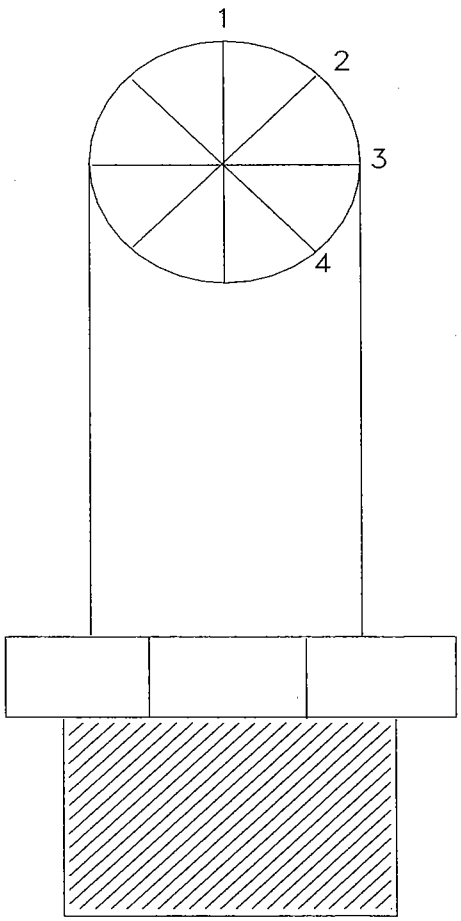
Pre Test		Post Test
0.200	1	√
0.199	2	√
0.200	3	√
0.200	4	√

Average
0.200

Nozzle Calibration

Date: 7/23/2004 Nozzle ID No.: N/A

Analyst: TAM



Pre Test		Post Test
0.144	1	√
0.145	2	√
0.144	3	√
0.144	4	√

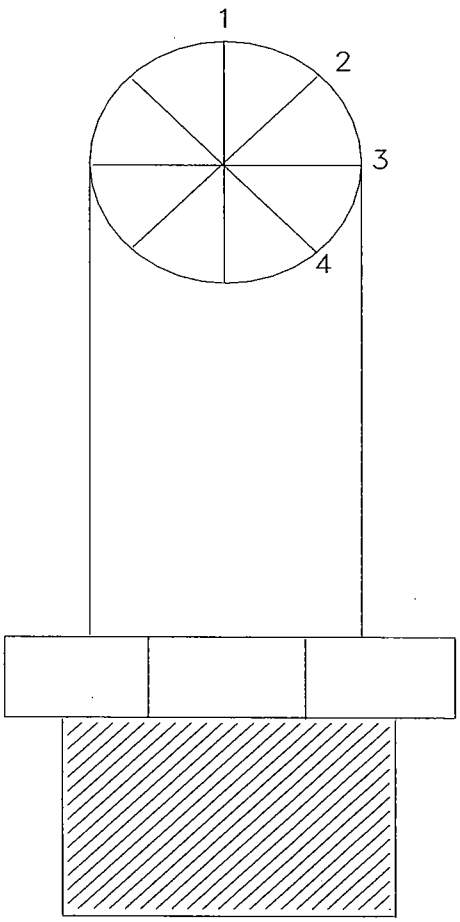
Average
0.144

Nozzle Calibration

Date: 7/23/2004

Nozzle ID No.: N/A

Analyst: TAM



Pre Test		Post Test
0.240	1	√
0.241	2	√
0.241	3	√
0.241	4	√

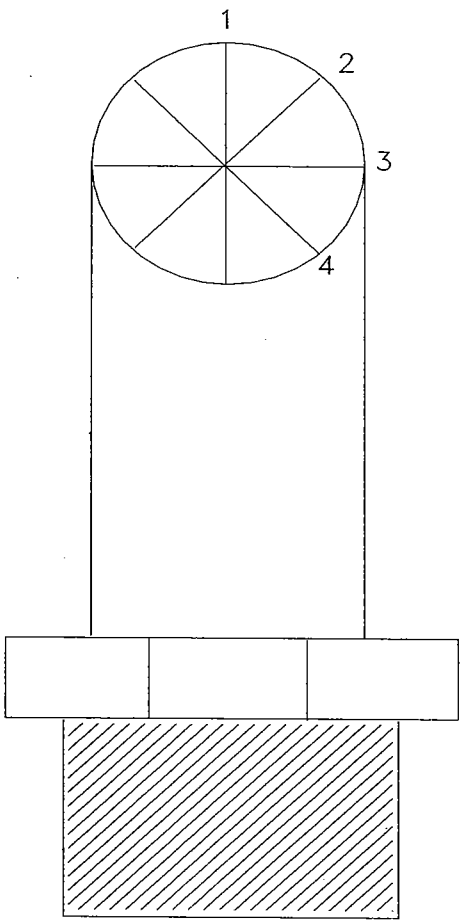
Average
0.241

Nozzle Calibration

Date: 7/23/2004

Nozzle ID No.: N/A

Analyst: TAM



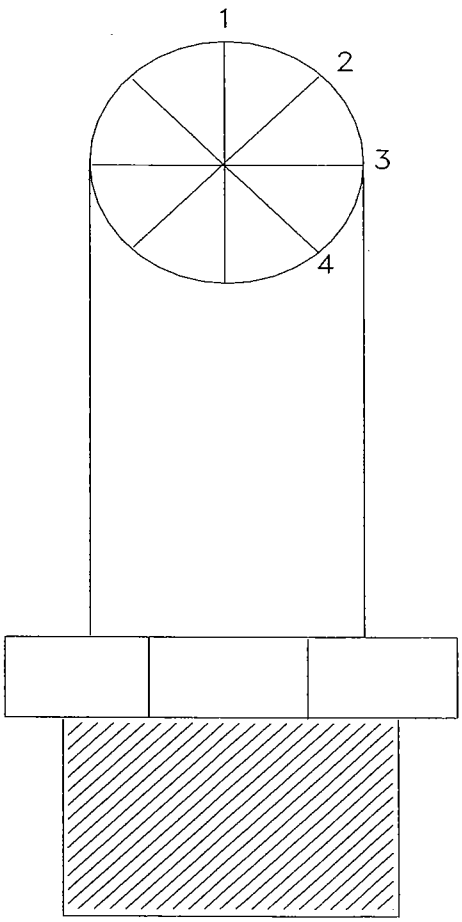
Pre Test		Post Test
0.253	1	√
0.253	2	√
0.252	3	√
0.254	4	√

Average
0.253

Nozzle Calibration

Date: 7/23/2004 Nozzle ID No.: N/A

Analyst: TAM



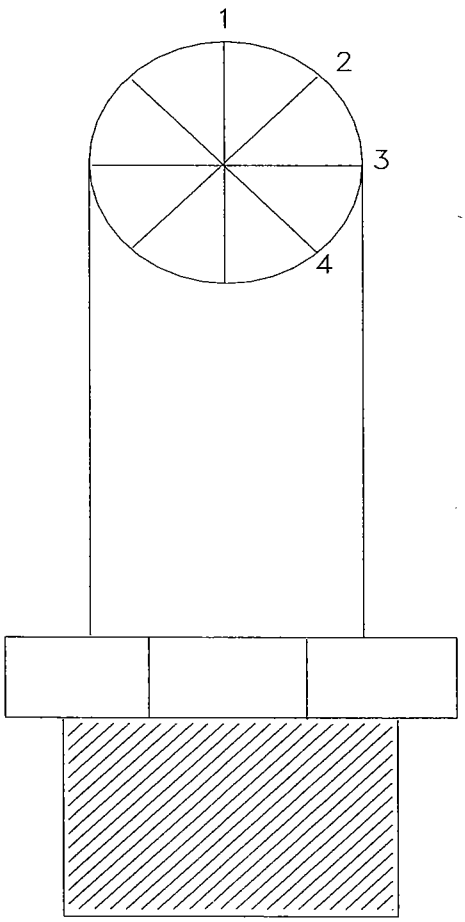
Pre Test		Post Test
0.157	1	√
0.156	2	√
0.159	3	√
0.157	4	√

Average
0.157

Nozzle Calibration

Date: 7/23/2004 Nozzle ID No.: N/A

Analyst: TAM



Pre Test		Post Test
0.188	1	√
0.188	2	√
0.188	3	√
0.188	4	√

Average
0.188

ANALYTICAL BALANCE ACCURACY CHECK

Weight Set #100	Calibration Weights*	Sartorius Balance CP224S	OK?	Sartorius Balance CP 225D	OK?
100 g	100.0000	100.0001	Yes	100.0004	Yes
50 g	50.0000	50.0001	Yes	50.00026	Yes
30 g	30.0000	30.0002	Yes	30.00006	Yes
20 g	20.0000	20.0000	Yes	20.00002	Yes
10 g	10.0000	10.0000	Yes	9.99994	Yes
5 g	5.0000	4.9999	Yes	4.99999	Yes
3 g	3.0000	3.0000	Yes	2.99998	Yes
2 g	2.0000	2.0000	Yes	2.00007	Yes
1 g	1.0000	0.9999	Yes	1.00008	Yes
0.500 g	0.5000	0.4999	Yes	0.50005	Yes
0.300 g	0.3000	0.3001	Yes	0.30001	Yes
0.200 g	0.2000	0.2002	Yes	0.20002	Yes
0.100 g	0.1000	0.1000	Yes	0.09995	Yes
0.050 g	0.0500	0.0499	Yes	0.05002	Yes
0.030 g	0.0300	0.0298	Yes	0.02996	Yes
0.020 g	0.0200	0.0198	Yes	0.01987	Yes
0.010 g	0.0100	0.0100	Yes	0.01004	Yes

Analyst: Dino Santelli Date: 7/19/2004

* Calibration by M and R Balance Service, Chicago, Illinois 04/26/2004

Note: Each weight must be within 0.5 mg of the mass determined on the 04/26/04 calibration.
Sartorius: Model CP224S,Serial No.13209196
Sartorius: Model CP225D, Serial No. 14702385

Pitot Tube Calibration Data

Calibration Pitot Tube: Type: HEMI STD Size (OD): 1/4" Pitot ID #: 16018

Type "S" Pitot Tube ID Number: 501 (3/8") Cp(std) = 0.99

Calibration Date: 12/15/1997 Performed By: R. Jimenez

P_{std}, (in.) H_2O		A-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.27	0.38	0.840	0.000
0.55	0.57	0.79	0.841	0.000
0.85	0.86	1.20	0.836	0.005
1.00	1.00	1.35	0.852	0.012
2.00	2.10	2.95	0.835	0.005
3.00	3.05	4.25	0.839	0.002
		Average	0.840	0.004

P_{std}, (in.) H_2O		B-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.27	0.38	0.840	0.003
0.55	0.57	0.80	0.836	0.001
0.85	0.86	1.20	0.836	0.001
1.00	1.00	1.40	0.837	0.000
2.00	2.10	2.95	0.835	0.002
3.00	3.05	4.25	0.839	0.002
		Average	0.837	0.002

$\overline{C_p}(A) - \overline{C_p}(B) =$ 0.003 (must be ≤ 0.01)

[a] $C_{p(S)} = C_{p(std)}\sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$

[b] $DEV = C_{p(S)} - \overline{C_p}$, (must be ≤ 0.01)

Pitot Tube Calibration Data

Calibration Pitot Tube: Type: std Size (OD): 1/4" Pitot ID #: 160-8

Type "S" Pitot Tube ID Number: 541A Cp(std) = 1.00

Calibration Date: 10/8/99 Performed By: LC

P_{std}, (in.) H_2O		A-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV.[b]
0.25	0.28	0.40	0.837	0.000
0.55	0.53	0.76	0.835	0.001
0.85	0.84	1.20	0.837	0.000
1.00	0.98	1.40	0.837	0.000
2.00	1.90	2.70	0.839	0.002
3.00	3.00	4.30	0.835	0.001
		Average	0.837	0.001

P_{std}, (in.) H_2O		B-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV.[b]
0.25	0.28	0.40	0.837	0.000
0.55	0.53	0.76	0.835	0.001
0.82	0.84	1.20	0.837	0.000
1.00	0.98	1.40	0.837	0.000
2.00	1.90	2.70	0.839	0.002
3.00	3.00	4.30	0.835	0.001
		Average	0.837	0.001

$\overline{C_p}(A) - \overline{C_p}(B) =$ 0.000 (must be ≤ 0.01)

[a] $C_{p(S)} = C_{p(std)}\sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$

[b] $DEV = C_{p(S)} - \overline{C_p}$, (must be ≤ 0.01)

ISOKINETIC TEST DATA

List Method Used: 26A Test Run No. #1 Run Date: 7-27-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: T. Ruel / CH
Temp ID: 215
Meter ID: 215
Meter Calibration Factor: 1.005
Pitot ID: SD1B
Pitot Tube Coefficient: .867
Probe Length (ft.): 7
Probe Liner Material: Glass
Nozzle Diameter (in.): .144
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): ____ Diameter (ft): 16.33
Width (ft): ____
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.99
Static Pressure (in. H_2O): -2.6
Flue Pressure (in. Hg Abs): ____
Sample Train Leak Check: Pre: 0 Post: 0 @ 10 in. Hg
Pitot Leak Check: Pre 0@4" Post 0@4"
Carbon Dioxide (%): ~~12~~ 11.6
Oxygen (%): ~~7~~ 7.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 122.3 Silica Final Wt (g): ____
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. 1019 Tare Wt (g) .62776
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric Power
Plant: Harquab Station
Test Location: Stack

List Test Method Used: M 26A
Test Run No. #1
Date: 07-27-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.205 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	.337 Sqrt. ΔP	[redacted] .45 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	[redacted] Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4	855	1.8	.46	29.175	1.342	.439	2.171		190	254	258	33	95	92	1
1	900	1.9	.49	29.367	1.378	.451	2.254	29.346	190	254	256	34	96	92	1
2	905	1.8	.46	31.584	1.342		2.175	31.607	190	255	253	34	96	93	1
2	910	1.8	.46	33.786	1.342		2.175	33.754	190	256	254	35	97	93	1
3	915	1.6	.41	35.946	1.265		2.056	35.931	189	256	254	35	98	93	1
3	920	1.6	.41	37.972	1.265		2.056	37.987	189	255	253	36	98	93	1
	925			40.029				40.043							
4	927	1.9	.48	40.029	1.378		2.239		190	256	254	38	98	93	1
1	932	1.9	.48	42.274	1.378		2.239	42.268	190	256	254	38	98	93	1
2	937	1.9	.48	44.493	1.378		2.243	44.507	190	253	253	35	99	94	1
2	942	1.9	.48	46.759	1.378		2.243	46.749	190	253	253	35	99	94	1
3	947	1.9	.48	49.011	1.378		2.245	48.992	190	254	253	34	100	94	1
3	952	1.9	.48	51.250	1.378		2.245	51.237	190	254	253	34	100	94	1
	957			53.491				53.482							
3	1000	1.9	.48	53.491	1.378		2.239		190	253	253	32	97	94	1
1	1005	1.9	.48	55.720	1.378		2.243	55.730	190	253	253	32	99	94	1
2	1010	2.0	.51	57.963	1.414		2.303	57.973	190	253	255	32	100	94	1
2	1015	2.0	.51	60.268	1.414		2.303	60.276	190	253	255	32	100	94	1
3	1020	1.8	.46	62.555	1.342		2.191	62.579	189	253	254	35	101	95	1
3	1025	1.8	.46	64.754	1.342		2.191	64.769	189	253	254	35	101	95	1
	1030			66.943				66.960							

[redacted] = Data does not get entered in Excel

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Electric Power
Plant: Jacobs
Test Location: Stack

List Test Method Used: M26A
Test Run No. #1
Date: 7-27-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1033	2.0	.51	66.943	1.414		2.303		190	252	251	45	99	95	1
1	1038	2.0	.51	69.245	1.414		2.305	69.246	190	253	251	45	100	95	1
2	1043	2.0	.51	71.540	1.414		2.309	71.551	190	249	253	55	101	96	1
2	1048	2.0	.51	73.873	1.414		2.309	73.861	190	249	253	54	101	96	1
3	1053	1.6	.41	76.162	1.265		2.069	76.170	189	247	256	61	102	96	1
3	1058	1.6	.41	78.246	1.265		2.069	78.239	189	247	256	61	102	96	1
	1103			80.300				80.308							
1 8AM6			.47	53.125	1.361				190				96	56	
				53.125											

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 26A Test Run No. # 2 Run Date: 7-28-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: TJ Heid KH
Temp ID: 2816
Meter ID: 246
Meter Calibration Factor: .994
Pitot ID: Type S
Pitot Tube Coefficient: .840
Probe Length (ft.): 7
Probe Liner Material: G
Nozzle Diameter (in.): .1875
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.94
Static Pressure (in. H_2O): -1.3
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .000 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre 0 @ 4" Post 0 @ 4"
Carbon Dioxide (%): 12.2
Oxygen (%): 6.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 353.7 Silica Final Wt (g):
Impinger Initial Wt (mL): 0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 1025 Tare Wt (g) .6145
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunbrook Power Corp
Plant: Hocomb Station
Test Location: Stack

List Test Method Used: M26A
Test Run No. #2
Date: 7-28-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	830	2.4	1.9	92.721	1.549		4.312		192	258	256	33	94	93	1
1	835	2.4	1.9	97.046	1.549		4.316	97.033	192	258	256	33	95	93	1
2	840	2.4	1.9	101.354	1.549		4.332	101.349	193	259	256	33	99	94	1
2	845	2.4	1.9	105.693	1.549		4.332	105.682	193	259	256	33	99	94	1
3	850	1.9	1.5	110.078	1.378		3.864	110.014	191	257	255	33	100	94	1
3	855	1.9	1.5	113.891	1.378		3.864	113.878	191	257	255	33	100	94	1
	900			117.729				117.742							
2-1	902	2.5	2.0	117.729	1.581		4.425		192	262	255	33	99	94	1
1	907	2.5	2.0	122.148	1.581		4.429	122.154	192	262	255	33	100	94	1
2	912	2.4	1.9	126.589	1.549		4.351	126.583	192	259	258	46	102	95	1
2	917	2.4	1.9	130.952	1.549		4.351	130.934	192	259	258	46	102	95	1
3	922	2.1	1.7	135.302	1.449		4.043	135.285	191	259	257	58	102	95	1
3	927	2.1	1.7	139.365	1.449		4.043	139.358	191	259	257	58	102	95	1
	932			143.439				143.432							
3-1	934	2.5	2.0	143.439	1.581		4.424		191	259	258	50	97	95	1
1	939	2.5	2.0	147.848	1.581		4.436	147.863	191	259	258	50	100	95	1
2	944	2.4	1.9	152.287	1.549		4.355	152.300	192	258	257	51	102	96	1
2	949	2.4	1.9	156.650	1.549		4.355	156.655	192	258	257	51	102	96	1
3	954	2.2	1.8	161.000	1.483		4.177	161.010	191	259	256	45	103	96	1
3	959	2.2	1.8	165.201	1.483		4.177	165.186	191	259	256	45	103	96	1
	1004			169.374				169.363							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp
Plant: Hacone Station
Test Location: Stack

List Test Method Used: 26A
Test Run No. #2
Date: 7-28-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1006	2.5	2.0	169.874	1.581		4.433		192	258	255	39	99	96	1
1	1011	2.5	2.0	173.795	1.581		4.441	173.807	192	258	255	39	101	96	1
2	1016	2.4	1.9	178.262	1.549		4.355	178.248	192	259	257	39	102	96	1
2	1021	2.4	1.9	182.610	1.549		4.355	182.603	192	259	257	39	102	96	1
3	1026	2.1	1.7	186.965	1.449		4.088	186.958	191	260	258	45	104	97	1
3	1031	2.1	1.7	191.028	1.449		4.088	191.046	191	260	258	45	104	97	1
	1036			195.146				195.134							
	Avg		1.85	102.485	1.521				192				97.81		

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 26A Test Run No. #3 Run Date: 7-29-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: T. Wey
Temp ID: 846
Meter ID: 846
Meter Calibration Factor: .994
Pitot ID: 7994
Pitot Tube Coefficient: .840
Probe Length (ft.): 7
Probe Liner Material: 6
Nozzle Diameter (in.): .1875
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type:
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.73
Static Pressure (in. H_2O): -1.4
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .000 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre ✓ @ 4" Post ✓ @ 4"
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 307.10 Silica Final Wt (g):
Impinger Initial Wt (mL): 0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 1022 Tare Wt (g) .6893
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp.
Plant: Hacomb Station
Test Location: Stack

List Test Method Used: M26A
Test Run No. #3
Date: 7-29-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	830	2.2	1.7	23.053	1.483		4.124		191	259	259	83	94	91	1
1	835	2.2	1.7	27.191	1.483		4.150	27.200	191	259	259	33	95	91	1
2	840	2.2	1.7	31.358	1.483		4.154	31.350	191	260	257	33	96	91	1
2	845	2.2	1.7	35.520	1.483		4.154	35.504	191	260	257	33	96	91	1
3	850	1.6	1.3	39.1606	1.265		3.549	39.658	190	260	258	33	97	91	1
3	855	1.6	1.3	43.217	1.265		3.549	43.207	190	260	258	33	97	91	1
	900			46.941				46.756							
2-1	902	2.2	1.7	46.941	1.483		4.154		191	258	251	46	96	91	1
1	907	2.2	1.7	50.906	1.483		4.158	50.895	191	258	251	48	97	91	1
2	912	2.4	1.9	55.063	1.549		4.351	55.053	191	260	250	48	98	92	1
2	917	2.4	1.9	59.2226	1.549		4.351	59.404	191	260	250	50	98	92	1
3	922	2.1	1.7	63.748	1.449		4.074	63.754	189	259	250	50	99	92	1
3	927	2.1	1.7	67.816	1.449		4.074	67.831	189	259	250	50	99	92	1
	932			71.891				71.907							
3-1	934	2.4	1.9	71.891	1.549		4.359		192	258	252	41	100	93	1
1	939	2.4	1.9	76.253	1.549		4.363	76.250	192	258	252	41	101	93	1
2	944	2.5	2.0	80.631	1.581		4.457	80.613	192	259	251	41	102	93	1
2	949	2.5	2.0	85.060	1.581		4.457	85.070	192	259	251	41	102	93	1
3	954	2.2	1.8	89.541	1.483		4.192	89.527	191	259	251	41	103	94	1
3	959	2.2	1.8	93.728	1.483		4.192	93.719	191	259	251	41	103	94	1
	1004			97.900				97.910							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp.
Plant: Holcomb Station
Test Location: Stack

List Test Method Used: 1 & 2 & 4
Test Run No. #3
Date: 7-29-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1006	2.5	2.0	97.960	1.581		4.461		192	257	255	41	101	95	1
1	1011	2.5	2.0	102.346	1.581		4.461	102.861	192	257	255	41	101	95	1
2	1016	2.5	2.0	106.837	1.581		4.469	106.822	192	257	254	41	102	96	1
2	1021	2.5	2.0	111.312	1.581		4.469	111.291	192	257	254	41	102	96	1
3	1026	2.1	1.7	115.753	1.449		4.099	115.760	191	260	251	41	102	96	1
3	1031	2.1	1.7	119.864	1.449		4.099	119.859	191	260	257	41	102	96	1
	1036			123.942				123.958							
			1.78	100.889	1.495				191				96.10		

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M26A Test Run No. 3 Run Date: 07-28-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Gen
Plant: Holcomb
Test Location: Bag House Inlet Loc 2
Source Condition: Normal
Test Engineer: J Hamner
Temp ID: E75
Meter ID: E75
Meter Calibration Factor: 1.008
Pitot ID:
Pitot Tube Coefficient: .836
Probe Length (ft.): 11.5
Probe Liner Material: Teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 11 Diameter (ft):
Width (ft): 16
Duct Area (Sq. Ft.): 176
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5
Port Size (diameter in.): 4
Port Type: Flange
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.21
Static Pressure (in. H_2O): -13.2
Flue Pressure (in. Hg Abs): 26.24
Sample Train Leak Check: Pre: .000 Post: .000 @ 15/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.5
Oxygen (%): 6.5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 144.0 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): 144.0 Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. 247 Tare Wt (g) 2.7291
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gen
Plant: Holcomb
Test Location: Bag House Inlet Loc 2

List Test Method Used: M 26A
Test Run No. 3
Date: 07-28-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.102 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	[redacted] .376 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	[redacted] Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	11:15	1.3	.52	1.31	1.140	.43	2.14		180	249		52	76	75	5
2	11:20	1.0	.40	3.46	1.000	.38	1.88	3.45	178	250		53	76	75	5
3	11:25	.94	.38	5.31	.970	.36	1.82	5.33	179	249		52	76	75	6
4	11:30	.87	.35	7.16	.933	.35	1.75	7.15	180	250		52	76	75	6
	11:35			8.93				8.90							
2-1	11:36	1.2	.48	9.42	1.095	.41	2.06		181	249		53	76	75	6
2	11:41	.90	.36	11.49	.949	.36	1.78	11.48	181	248		54	76	76	6
3	11:46	.85	.34	13.28	.922	.35	1.73	13.26	181	249		54	76	76	6
4	11:51	.79	.32	15.03	.889	.33	1.67	14.99	176	248		53	76	76	6
	11:56			16.53				16.66							
3-1	11:57	1.1	.44	17.21	1.049	.39	1.97		179	248		55	77	76	6
2	12:02	1.0	.40	19.19	.995	.37	1.87	19.18	180	251		56	77	76	6
3	12:07	.73	.29	21.07	.854	.32	1.61	21.05	182	249		56	78	77	6
4	12:12	.68	.27	22.68	.825	.31	1.55	22.66	177	248		56	77	76	6
	12:17			24.20				24.21							
4-1	12:20	.95	.38	25.48	.975	.37	1.83		181	249		56	78	77	7
2	12:25	.83	.33	27.22	.911	.34	1.71	27.23	181	247		56	78	77	7
3	12:30	.79	.32	28.96	.889	.33	1.67	28.94	180	247		57	78	77	7
4	12:35	.79	.32	30.60	.889	.33	1.67	30.61	178	248		57	79	77	7
	12:40			32.31				32.28							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gen
Plant: Holcomb
Test Location: Bag House Inlet Loc 2

List Test Method Used: M26A
Test Run No. 3
Date: 07-28-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.402 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.376 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
5-1	12:41	1.2	.48	33.16	1.095	.41	2.06		180	250		59	79	78	8
2	12:46	.89	.36	35.24	.943	.35	1.77	35.22	180	248		59	80	78	8
3	12:51	.72	.29	36.97	.849	.32	1.60	36.99	179	250		60	80	79	8
4	12:56	.68	.27	38.62	.825	.31	1.55	38.59	177	249		60	80	79	8
	13:01			40.17				40.14							
6-1	13:02	1.0	.40	40.74	1.000	.38	1.88		181	248		62	80	80	8
2	13:07	.93	.37	42.65	.964	.36	1.81	42.62	180	249		62	80	79	8
3	13:12	.85	.34	44.53	.922	.35	1.73	44.43	181	250		63	80	79	9
4	13:17	.76	.31	46.18	.872	.33	1.64	46.16	180	249		63	81	80	10
	13:22			47.81				47.80							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M26A Test Run No. 4 Run Date: 07-21-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Gen
Plant: Holcomb
Test Location: Bag House Inlet Loc 2
Source Condition: Normal
Test Engineer: J Hamm
Temp ID: E75
Meter ID: E75
Meter Calibration Factor: 1.007
Pitot ID:
Pitot Tube Coefficient: .836
Probe Length (ft.): 11.5
Probe Liner Material: Teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 11 Diameter (ft):
Width (ft): 16
Duct Area (Sq. Ft.): 176
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 7
Port Size (diameter in.): 4
Port Type: Flange
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 2.5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -13
Flue Pressure (in. Hg Abs): 26.04
Sample Train Leak Check: Pre: .000 Post: .000 @ 15/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.4
Oxygen (%): 6.2
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 147.5 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): 147.5 Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

Didn't do Top & Bottom Port

SAMPLE COLLECTION:

Thimble No. 261 Tare Wt (g) 2.9348
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gas
Plant: Holcomb
Test Location: Bag House Inlet Loc 2

List Test Method Used: M26A
Test Run No. 4
Date: 07-29-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.402 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.378 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	8:10	1.0	.40	0.68	1.000	.38	1.90		180	249		53	66	65	6
2	8:15	.88	.35	2.59	.938	.35	1.77	2.58	180	248		53	66	65	6
3	8:20	.74	.30	4.37	.860	.33	1.63	4.35	181	250		54	67	65	6
4	8:25	.72	.29	6.01	.849	.32	1.60	5.98	177	249		55	68	66	5
	8:30			7.60				7.58							
2-1	8:31	1.0	.40	8.04	1.000	.38	1.90		180	249		56	70	67	6
2	8:36	.89	.36	9.96	.943	.36	1.78	9.94	181	249		57	70	67	5
3	8:41	.81	.33	11.74	.900	.34	1.70	11.72	181	249		57	70	67	5
4	8:46	.76	.31	13.45	.872	.33	1.65	13.42	176	249		57	70	67	5
	8:51			15.09				15.07							
3-1	8:52	1.1	.44	15.78	1.049	.40	1.98		180	247		57	71	68	5
2	8:57	.94	.38	17.75	.970	.37	1.83	17.76	182	250		58	71	68	5
3	9:02	.85	.34	19.57	.922	.35	1.74	19.59	181	248		58	71	69	5
4	9:07	.78	.31	21.36	.883	.33	1.67	21.33	182	247		59	72	69	6
	9:12			22.97				23.00							
4-1	9:13	.97	.39	23.58	.985	.37	1.86		182	249		59	72	69	6
2	9:18	.93	.37	25.46	.964	.36	1.82	25.44	181	249		59	72	69	6
3	9:23	.87	.35	27.25	.933	.35	1.76	27.26	181	249		60	72	69	6
4	9:28	.72	.29	29.04	.849	.32	1.60	29.02	178	249		60	73	70	6
	9:33			30.61				30.62							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gen
Plant: Holcomb
Test Location: Bag House Inlet Loc 2

List Test Method Used: M26A
Test Run No. 4
Date: 07-29-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.402 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.378 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
5-1	9:34	1.2	.48	31.24	1.095	.41	2.07		181	249		61	73	71	6
2	9:39	.98	.39	33.35	.990	.37	1.87	33.31	181	248		61	73	71	6
3	9:44	.81	.33	35.19	.900	.34	1.70	35.18	181	249		62	74	71	6
4	9:49	.76	.31	36.92	.872	.33	1.65	36.88	178	250		63	75	72	7
	9:54			38.55				38.53							
6-1	9:55	1.0	.40	39.02	1.000	.38	1.90		180	249		64	75	72	7
2	10:00	.93	.37	40.94	.964	.36	1.82	40.92	180	249		64	75	72	7
3	10:05	.88	.35	42.71	.938	.35	1.77	42.74	181	247		64	75	73	8
4	10:10	.82	.33	44.53	.906	.34	1.71	44.51	176	248		65	75	73	10
	10:15			46.25				46.22							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M 26A Test Run No. 5 Run Date: 07-29-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Gen
Plant: Holcomb
Test Location: Baghouse Inlet Loc 2
Source Condition: Normal
Test Engineer: J Hammer
Temp ID: E75
Meter ID: E75
Meter Calibration Factor: 1.008
Pitot ID:
Pitot Tube Coefficient: .836
Probe Length (ft.): 11.5
Probe Liner Material: Teflon
Nozzle Diameter (in.): .157
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 11 Diameter (ft):
Width (ft): 16
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): (Horizontal) or Vertical
Port Length (in.): 7
Port Size (diameter in.): 4
Port Type: Flange
Number of Ports Sampled: 6
Number of Points per Port: 4
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -13
Flue Pressure (in. Hg Abs): 26.04
Sample Train Leak Check: Pre: .000 Post: .000 @ 15/15 in. Hg
Pitot Leak Check: Pre ✓ Post
Carbon Dioxide (%): 13.5
Oxygen (%): 6.5
Gas Values by (select one): (Method 3 Orsat/Fyrite) Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 157.3 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

Didn't do Top & Bottom Pt-T

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 263 Tare Wt (g) 2.9427
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gen
Plant: Holcomb
Test Location: Baghouse Inlet Loc 2

M St Charles MT 25A

List Test Method Used: M26A
Test Run No. 5
Date: 07-29-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.402 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.378 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	10:45	1.2	.48	8.75	1.095	.41	2.07		179	258		48	74	73	5
2	10:50	.95	.38	10.84	.975	.37	1.84	10.82	180	257		48	74	73	5
3	10:55	.74	.30	12.61	.860	.33	1.63	12.66	181	258		49	75	73	5
4	11:00	.68	.27	14.32	.825	.31	1.56	14.29	180	256		49	76	74	5
	11:05			15.87				15.85							
2-1	11:06	1.3	.52	16.43	1.140	.43	2.15		180	257		49	76	74	5
2	11:11	.89	.36	18.63	.943	.36	1.78	18.58	181	257		50	77	74	5
3	11:16	.75	.30	20.37	.866	.33	1.64	20.36	181	258		50	77	75	5
4	11:21	.70	.28	22.05	.837	.32	1.58	22.00	180	257		50	77	75	6
	11:26			23.57				23.58							
3-1	11:27	1.1	.44	23.85	1.049	.40	1.98		181	256		50	78	75	6
2	11:32	.85	.34	25.81	.922	.35	1.74	25.83	181	257		50	77	76	6
3	11:37	.79	.32	27.59	.889	.34	1.68	27.57	180	257		51	77	76	6
4	11:42	.77	.31	29.28	.877	.33	1.66	29.25	176	258		51	77	76	6
	11:47			30.90				30.91							
4-1	11:48	1.0	.40	31.45	1.000	.38	1.90		180	255		52	78	76	6
2	11:53	.91	.37	33.36	.954	.36	1.80	33.35	181	258		52	77	76	6
3	11:58	.86	.35	35.13	.927	.35	1.75	35.15	181	257		52	77	76	6
4	12:03	.73	.29	36.94	.854	.32	1.61	36.90	179	257		53	77	76	6
	12:08			38.51				38.52							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Gen
Plant: Holcomb
Test Location: Baghouse Inlet Loc 2

List Test Method Used: M26A
Test Run No. 5
Date: 07-29-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.402 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.379 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
5-1	12:09	1.2	.48	39.03	1.095	.41	2.07		181	257			77	76	6
2	12:14	.90	.36	41.09	.949	.36	1.79	41.10	180	255			77	76	6
3	12:19	.87	.35	42.91	.933	.35	1.76	42.89	181	258			77	76	7
4	12:24	.69	.28	44.67	.831	.31	1.57	44.65	180	257			78	76	7
	12:29			46.24				46.22							
6-1	12:30	.97	.39	46.83	.985	.37	1.86		180	258			78	76	8
2	12:35	.89	.36	48.67	.943	.36	1.78	48.69	182	256			78	76	8
3	12:40	.74	.30	50.46	.860	.33	1.63	50.47	181	257			78	77	10
4	12:45	.68	.27	52.08	.825	.31	1.56	52.10	181	256			78	77	10
	12:50			53.69				53.66							

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ISOKINETIC TEST DATA

List Method Used: 26-A Test Run No. 1 Run Date: 7-27-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1
Source Condition:
Test Engineer: MRE
Temp ID: E74
Meter ID: E74
Meter Calibration Factor: 1.008
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .253
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 15
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.26
Static Pressure (in. H_2O): -16
Flue Pressure (in. Hg Abs): 26.53
Sample Train Leak Check: Pre: ✓ .005 Post: ✓ .008 @ 11 in. Hg
Pitot Leak Check: Pre ✓ Post
Carbon Dioxide (%): 13.8
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 205.1 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1

List Test Method Used: M26A
Test Run No. 1
Date: 7-27-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (x 2.63)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (x .982)	Theoretical Meter Volume per Point (V_m) ft^3 (x5)	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	855	.29	.76	46.673	.54	.51	2.563		285	250			83	84	1
-2	900	.35	.92	49.119	.59	.56	2.816	49.236	283	250		FULLY	85	89	1
-3	905	.52	1.4	52.013	.72	.69	3.433	52.052	284	250			86	90	1
	910			55.491				55.485							
2-1	915	.56	1.5		.75	.71	3.562		285	250			86	90	1
-2	920	.60	1.6	58.989	.78	.74	3.687	59.047	285	250		ICED	87	90	1
-3	925	.51	1.3	62.727	.71	.68	3.399	62.734	286	250			87	91	1
	930			66.139				66.133							
3-1	935	.59	1.5		.77	.73	3.656		284	250			87	91	2
-2	940	.77	2.0	69.630	.88	.84	4.177	69.789	280	250			87	93	2
-3	945	.45	1.2	74.003	.67	.64	3.193	73.966	281	250			87	93	2
	950			77.170				77.159							
4-1	955	.70	1.8		.84	.80	3.983		279	250			88	95	2
-2	1000	.63	1.6	81.150	.79	.76	3.778	81.142	281	250			88	97	2
-3	1005	.65	1.7	84.933	.81	.77	3.838	84.920	283	250			89	98	2
	1010			88.783				88.758							
5-1	1015	.79	2.1		.89	.85	4.231		278	250			90	99	2
-2	1020	.59	1.5	92.979	.77	.73	3.656	92.989	283	250			91	98	3
-3	1025	.57	1.5	96.630	.76	.72	3.594	96.645	287	250			91	98	3
	1030			100.289				100.239							
6-1	1035	.53	1.4		.73	.70	3.465		283	250			91	97	3
-2	1040	.50	1.3	103.709	.71	.67	3.366	103.704	283	250			91	97	3
-3	1045	.47	1.2	107.079	.66	.65	3.263	107.070	285	250			91	97	3
	1050			110.369				110.333							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1

List Test Method Used: M26A
Test Run No. 1
Date: 7-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (x 2.63)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (x .952)	Theoretical Meter Volume per Point (V_m) ft^3 (x5)	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1055	.70	1.8		.84	.80	3.983	110.333	283	250			93	99	3
-2	1100	.73	1.9	114.319	.85	.81	4.067	114.316	286	250			93	99	3
-3	1105	.69	1.8	118.390	.83	.79	3.954	118.383	287	250		FULLY	93	99	3
	1110			122.345				122.337							
8-1	1115	.51	1.3		.71	.68	3.399		289	250			93	99	3
-2	1120	.43	1.1	125.778	.66	.62	3.121	125.736	290	250		ICED	93	99	3
-3	1125	.46	1.2	128.866	.68	.65	3.228	128.857	291	250			93	99	3
	1130			132.096				132.085							

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ISOKINETIC TEST DATA

List Method Used: M26A Test Run No. 2 Run Date: 7-28-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1
Source Condition:
Test Engineer: MRE
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: 0.998
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .253
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.21
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.48
Sample Train Leak Check: Pre: \ .000 Post: \ .000 @ 13 in. Hg
Pitot Leak Check: Pre \ Post \
Carbon Dioxide (%): 14.6
Oxygen (%): 5.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 288.4 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. 252 Tare Wt (g) 2.8875
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO Loc. 1

List Test Method Used: M26A
Test Run No. 2
Date: 7-28-04
Traverse Sheet 1 of 2

	Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	x 2.53 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	x .95 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
	1-1	830	.88	2.2	55.576	.94	.89	4.456		286	250			86	87	2
	-2	835	.74	2.0	60.079	.88	.84	4.195	60.032	289	250		FULLY	88	90	2
	-3	840	.85	2.2	64.239	.92	.88	4.379	64.227	284	250			88	91	2
.460		845			68.630				68.606							
	2-1	850	.93	2.4		.96	.92	4.581		285	250		ICED	87	89	2
	-2	855	.80	2.0	73.197	.89	.85	4.249	73.187	288	250			87	89	3
	-3	900	.79	2.0	77.455	.88	.84	4.222	77.436	287	250			87	89	3
.530		905			81.691				81.658							
	3-1	910	.64	1.6		.80	.76	3.800		290	250			87	91	3
	-2	915	.73	1.9	85.455	.85	.81	4.058	85.458	287	250			87	93	3
	-3	920	.59	1.5	89.566	.77	.73	3.649	89.516	287	250			88	93	3
.450		925			93.157				93.165							
	4-1	930	.69	1.8		.83	.79	3.946		282	250			89	95	3
	-2	935	.53	1.3	97.079	.73	.69	3.458	97.111	278	250			89	95	3
	-3	940	.70	1.8	100.566	.84	.80	3.974	100.569	279	250			89	95	3
.710		945			104.530				104.543							
	5-1	950	.88	2.2		.94	.89	4.456		275	250			90	96	3
	-2	955	.58	1.5	109.075	.76	.72	3.618	108.999	277	250			91	97	3
	-3	1000	.66	1.7	112.630	.81	.77	3.859	112.617	273	250			91	98	3
.310		1005			116.494				116.476							
	6-1	1010	.77	2.0		.88	.83	4.168		275	250			92	98	3
	-2	1015	.82	2.1	120.678	.91	.86	4.301	120.644	282	250			93	99	3
	-3	1020	.64	1.6	125.005	.80	.76	3.800	124.945	270	250			93	99	3
.410		1025			128.783				128.745							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO Loc. 1

List Test Method Used: M26A
Test Run No. 2
Date: 7-28-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (x2.53)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (x.95)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1030	.80	2.0		.89	.85	4.0245	128.745	276	250			94	100	3
-2	1035	.74	1.9	133.015	.86	.82	4.086	132.994	275	250			94	100	3
-3	1040	.78	2.0	137.125	.88	.84	4.195	137.080	279	250			94	101	3
.310	1045			141.289				141.275				FULLY			
8-1	1050	.55	1.4		.74	.70	3.523		275	250			95	101	3
-2	1055	.61	1.5	144.819	.78	.74	3.710	144.798	277	250			95	101	3
-3	1100	.58	1.5	148.963	.76	.72	3.618	148.508	281	250		ICED	95	101	3
	1105			154.545				152.126							
					-3.32	PORT CHANGES									
189															
5.5															

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M26A Test Run No. 3 Run Date: 7-29-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1
Source Condition:
Test Engineer: MRE
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: .998
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 16 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): ~~3~~ 3.5
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: ~~1~~5
Total Number of Traverse Points: ~~8~~ 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.27
Sample Train Leak Check: Pre: .000 Post: .000 @ 15 in. Hg
Pitot Leak Check: Pre Post
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 233.7 Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. 256 Tare Wt (g) 2.7982
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1

List Test Method Used: M26A
Test Run No. 3
Date: 7-29-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (x 2.37)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (x .92)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	830	.69	1.6	53.278	.83	.76	3.821		279	250			81	82	2
-2	835	.73	1.7	57.119	.85	.79	3.930	57.099	285	250			82	83	2
-3	840	.58	1.4	61.083	.76	.70	3.503	61.029	287	250		FULLY	82	84	2
	845			64.561			-.220	64.532							
2-1	850	.67	1.6		.82	.75	3.765	64.752	288	250		~~ICED~~	83	84	2
-2	855	.70	1.7	68.556	.84	.77	3.849	68.517	290	250			83	85	3
-3	900	.76	1.8	72.369	.87	.80	4.010	72.366	289	250			83	85	3
	905			76.385			-.140	76.376							
3-1	910	.73	1.7		.85	.79	3.930	76.516	290	250			83	86	3
-2	915	.84	2.0	80.505	.92	.84	4.216	80.446	292	250			83	87	3
-3	920	.80	1.9	84.630	.89	.82	4.114	84.662	287	250			83	88	3
	925			88.778			-.220	88.776							
4-1	930	.86	2.0		.93	.85	4.266	88.996	289	250			84	89	3
-2	935	.80	1.9	93.289	.89	.82	4.114	93.262	293	250			85	90	3
-3	940	.77	1.8	97.319	.88	.81	4.037	97.376	286	250			86	91	3
	945			101.425			-.260	101.413							
5-1	950	.66	1.6		.81	.75	3.737	101.673	287	250			87	91	4
-2	955	.63	1.5	105.413	.79	.73	3.651	105.410	286	250			87	92	4
-3	1000	.64	1.5	109.113	.80	.74	3.680	109.061	287	250			88	93	4
	1005			112.783			-.230	112.741							
6-1	1010	.68	1.6		.83	.76	3.793	112.971	288	250			89	93	5
-2	1015	.70	1.7	116.778	.84	.77	3.849	116.764	284	250			89	94	5
-3	1020	.62	1.5	120.604	.79	.72	3.622	120.613	279	250			90	94	5
	1025			124.289			-.300	124.275							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1

List Test Method Used: M26A
Test Run No. 3
Date: 7-29-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1030	.70	1.7		.84	.77	3.849	124.575	283	250			90	94	5
-2	1035	.65	1.5	128.437	.81	.74	3.709	128.424	283	250			90	94	5
-3	1040	.66	1.6	132.164	.81	.75	3.737	132.133	286	250			90	94	5
	1045			135.877			-.130	135.870				FULLY			
8-1	1050	.59	1.4		.77	.71	3.533	130.000	287	250			90	93	6
-2	1055	.63	1.5	139.556	.79	.73	3.651	139.533	287	250			89	93	6
-3	1100	.61	1.5	143.189	.78	.72	3.593	143.184	289	250		ICED	89	93	6
	1105			146.779				146.777							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: Ontario Hydro Test Run No: #1 Run Date: 7-27-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: DT
Temp ID: E51
Meter ID: E51
Meter Calibration Factor: 1.008
Pitot ID: 799A
Pitot Tube Coefficient: .840
Probe Length (ft.): 7
Probe Liner Material: GLASS
Nozzle Diameter (in.): .1875
Train Setup (select): (Anderson Box) Hot Box Other

Duct Shape (select): Rectangular or (Round)
Length (ft): ____ Diameter (ft): 16.33
Width (ft): ____
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): (Horizontal) or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: FLANGE
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.99
Static Pressure (in. H_2O): -2.8
Flue Pressure (in. Hg Abs): 26.78
Sample Train Leak Check: Pre: 0.010 Post: 0.005 @ 10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.2
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 307.2 Silica Final Wt (g): ____
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. 1020 Tare Wt (g) 0.6386
Filter No. ____ Tare Wt (g) ____
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB STATION
Test Location: STACK

List Test Method Used: ONTARIO HYDRO
Test Run No. 1
Date: 7/27/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	0.713 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	0.552 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	0950	2.1	1.6	29.693	1.45	.800	4.000		191	253	258	66	85	85	8
1-1	0955	2.1	1.6	33.71	1.45	.800	4.000	33.693	191	252	256	64	87	85	9
1-2	1000	2.0	1.55	37.70	1.41	.781	3.903	37.693	191	252	253	62	88	85	9
1-2	1005	2.0	1.55	41.60	1.41	.781	3.903	41.596	191	254	254	60	89	85	9
1-3	1010	1.9	1.47	45.51	1.38	.761	3.804	45.499	190	253	256	58	90	86	9
1-3	1015	1.8	1.39	49.31	1.34	.741	3.703	49.303	190	252	255	56	91	86	9
	1020			53.120				53.006							
2-1	1024	2.1	1.6	53.120	1.45	.800	4.000		191	255	254	57	91	87	6
2-1	1029	2.0	1.55	57.13	1.41	.781	3.903	57.120	191	254	256	58	92	87	6
2-2	1034	2.0	1.55	61.12	1.41	.781	3.903	61.023	191	253	255	58	93	87	6
2-2	1039	2.0	1.55	64.94	1.41	.781	3.903	64.926	191	254	255	59	94	88	6
2-3	1044	1.9	1.47	68.83	1.38	.761	3.804	68.829	190	253	256	61	94	88	6
2-3	1049	1.9	1.47	72.64	1.38	.761	3.804	72.633	190	255	255	63	94	88	6
	1054			76.469				76.437							
3-1	1059	2.2	1.70	76.469	1.48	.819	4.094		191	257	258	65	93	89	6
3-1	1104	2.1	1.6	80.58	1.45	.800	4.000	80.563	191	254	258	64	94	89	6
3-2	1109	2.0	1.55	84.58	1.41	.781	3.903	84.563	191	255	258	63	95	90	6
3-2	1114	2.0	1.55	88.47	1.41	.781	3.903	88.466	191	254	256	62	96	90	6
3-3	1119	1.9	1.47	92.39	1.38	.761	3.804	92.369	191	255	258	61	97	90	6
3-3	1124	1.9	1.47	96.20	1.38	.761	3.804	96.173	191	256	257	60	97	91	6
	1129			100.097				99.977							
4-1	1133	2.1	1.6	100.097	1.45	.800	4.000		191	254	259	60	97	91	6
4-1	1138	2.1	1.6	104.11	1.45	.800	4.000	104.097	191	255	260	61	97	91	6
4-2	1143	2.0	1.55	108.10	1.41	.781	3.903	108.097	191	256	258	63	97	91	6
4-2	1148	2.0	1.55	112.02	1.41	.781	3.903	112.000	191	256	256	64	97	91	6
	1153			115.91				115.903							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB STATION
Test Location: STACK

List Test Method Used: ONTARIO HYDRO
Test Run No. 1
Date: 7/27/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	.773 Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-3	1153	1.9	1.47	115.91	1.38	1.38	3.804	115.703	190	254	259	65	98	92	6
4-3	1158	1.9	1.47	119.72	1.38	1.38	3.804	119.703	190	253	257	66	98	92	6
	1203			123.556				123.511							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: Ontario Hydro Test Run No. #2 Run Date: 7-28-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: DT
Temp ID: E15
Meter ID: E15
Meter Calibration Factor: 1.005
Pitot ID: 541B
Pitot Tube Coefficient: 0.837
Probe Length (ft.): 7
Probe Liner Material: GLASS
Nozzle Diameter (in.): .144
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.94
Static Pressure (in. H_2O): -1.3
Flue Pressure (in. Hg Abs): 26.84
Sample Train Leak Check: Pre: 0.000 Post: 0.000 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.4
Oxygen (%): 6.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 128.6 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. 1031 Tare Wt (g) 0.6425
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

GE Energy - Form 1053

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB STATION
Test Location: STACK

List Test Method Used: ONTARIO HYDRO
Test Run No. 2
Date: 7/28/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.256 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	.328 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	0930	2.4	.61	89.824	1.55	.508	2.541		193	254	258	64	89	88	3
1-1	0935	2.4	.61	92.38	1.55	.508	2.541	92.365	193	255	257	63	90	88	3
1-2	0940	2.4	.61	94.92	1.55	.508	2.541	94.906	193	253	256	61	91	89	3
1-2	0945	2.4	.61	97.47	1.55	.508	2.541	97.447	193	252	258	60	92	89	3
1-3	0950	2.0	.51	99.99	1.41	.464	2.319	99.988	192	250	257	60	93	89	3
1-3	0955	2.0	.51	102.33	1.41	.464	2.319	102.307	192	251	256	59	94	89	3
	1000			104.687				104.626							
2-1	1003	2.3	.59	104.687	1.52	.497	2.487		193	253	258	61	95	90	3
2-1	1008	2.3	.59	107.19	1.52	.497	2.487	107.174	193	254	257	60	96	90	3
2-2	1013	2.3	.59	109.68	1.52	.497	2.487	109.661	193	255	258	59	97	91	3
2-2	1018	2.3	.59	112.17	1.52	.497	2.487	112.148	193	254	256	57	98	91	3
2-3	1023	2.1	.54	114.65	1.45	.475	2.377	114.635	192	256	259	56	98	92	3
2-3	1028	2.1	.54	117.04	1.45	.475	2.377	117.012	192	255	258	55	99	92	3
	1033			119.423				119.389							
3-1	1038	2.5	.64	119.423	1.58	.519	2.593		193	256	257	58	99	93	3
3-1	1043	2.5	.64	122.05	1.58	.519	2.593	122.016	193	254	259	60	99	93	3
3-2	1048	2.4	.61	124.64	1.55	.508	2.541	124.609	194	257	258	61	100	94	3
3-2	1053	2.4	.61	127.19	1.55	.508	2.541	127.150	194	256	257	60	100	94	3
3-3	1058	2.2	.56	129.72	1.48	.487	2.433	129.691	193	255	259	62	101	94	3
3-3	1103	2.2	.56	132.16	1.48	.487	2.433	132.124	193	258	258	63	101	94	3
	1108			134.590				134.557							
4-1	1111	2.5	.64	134.590	1.58	.519	2.593		194	256	260	63	100	95	3
4-1	1116	2.5	.64	137.21	1.58	.519	2.593	137.183	194	257	259	64	101	95	3
4-2	1121	2.4	.61	139.80	1.55	.508	2.541	139.776	194	255	258	62	102	96	3
4-2	1126	2.4	.61	142.34	1.55	.508	2.541	142.317	194	256	260	61	102	96	3
	1131			144.88				144.858							

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ISOKINETIC TEST DATA

List Method Used: Ontario Hydro Test Run No. #3 Run Date: 7-29-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower Electric Power Corp.
Plant: Holcomb Station
Test Location: Stack
Source Condition: Normal
Test Engineer: DT
Temp ID: E15
Meter ID: E15
Meter Calibration Factor: 1.005
Pitot ID: 541B
Pitot Tube Coefficient: .837
Probe Length (ft.): 7
Probe Liner Material: Glass
Nozzle Diameter (in.): .144
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): ____ Diameter (ft): 16.33
Width (ft): ____
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.73
Static Pressure (in. H_2O): -1.4
Flue Pressure (in. Hg Abs): 26.63
Sample Train Leak Check: Pre: 0.008 Post: 0.000 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.0
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 201.6 Silica Final Wt (g): ____
Impinger Initial Wt (mL): 4.0 Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. 1036 Tare Wt (g) 0.6744
Filter No. ____ Tare Wt (g) ____
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

GE Energy - Form 1053

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB STATION
Test Location: STACK

List Test Method Used: ONTARIO HYDRO
Test Run No. 3
Date: 7/29/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	.256 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	[redacted] .330 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	[redacted] Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	0930	2.4	.61	3.978	1.55	.511	2.556		192	248	254	54	91	90	3
1-1	935	2.4	.61	6.55	1.55	.511	2.556	6.534	192	249	253	53	93	90	3
1-2	940	2.4	.61	9.11	1.55	.511	2.556	9.090	193	250	256	51	96	91	3
1-2	945	2.4	.61	11.67	1.55	.511	2.556	11.646	193	251	255	50	97	91	3
1-3	950	2.1	.54	14.23	1.45	.478	2.391	14.202	192	253	257	52	97	91	3
1-3	955	2.1	.54	16.61	1.45	.478	2.391	16.594	192	252	256	53	97	91	3
	1000			19.050				18.984							
2-1	1002	2.5	.64	19.050	1.58	.522	2.609		193	254	258	53	95	91	3
2-1	1007	2.5	.64	21.68	1.58	.522	2.609	21.659	193	255	257	52	95	91	3
2-2	1012	2.4	.61	24.29	1.55	.511	2.556	24.268	193	256	259	54	94	90	3
2-2	1017	2.4	.61	26.85	1.55	.511	2.556	26.824	193	254	258	56	93	89	3
2-3	1022	2.2	.56	29.41	1.48	.489	2.447	29.380	192	253	257	57	93	89	3
2-3	1027	2.2	.56	31.84	1.48	.489	2.447	31.827	192	255	258	55	93	89	3
	1032			34.348				34.274							
3-1	1034	2.5	.64	34.348	1.58	.522	2.609		193	256	260	54	94	89	3
3-1	1039	2.5	.64	36.98	1.58	.522	2.609	36.957	193	254	259	53	94	89	3
3-2	1044	2.5	.64	39.59	1.58	.522	2.609	39.566	193	255	258	52	95	89	3
3-2	1049	2.5	.64	42.20	1.58	.522	2.609	42.175	193	253	259	51	96	89	3
3-3	1054	2.2	.56	44.81	1.48	.489	2.447	44.784	192	252	257	53	96	89	3
3-3	1059	2.2	.56	47.27	1.48	.489	2.447	47.231	192	254	258	55	96	89	3
	1104			49.744				49.678							
4-1	1106	2.4	.61	49.744	1.55	.511	2.556		193	255	257	57	96	90	3
4-1	1111	2.4	.61	52.33	1.55	.511	2.556	52.300	193	253	256	59	96	90	3
4-2	1116	2.4	.61	54.87	1.55	.511	2.556	54.856	193	255	259	60	96	90	3
4-2	1121	2.4	.61	57.43	1.55	.511	2.556	57.412	193	252	258	61	97	91	3
	1126			60.01				59.968							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOCCOMB STATION
Test Location: STACK

List Test Method Used: ONTARIO HYDRO
Test Run No. 3
Date: 7/29/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-3	1126	2.1	.54	60.01	1.45	.478	2.391	59.968	192	254	260	63	98	91	3
4-3	1131	2.1	.54	62.38	1.45	.478	2.391	62.359	192	253	257	65	98	91	3
	1136			64.813				64.750							

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ISOKINETIC TEST DATA

List Method Used: Ontario Hydro Test Run No. 1 Run Date: 07-27-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower
Plant: Holcomb County
Test Location: Air Heater Outlet - Location 1
Source Condition:
Test Engineer: TBarr
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: 0.998
Pitot ID:
Pitot Tube Coefficient: 840
Probe Length (ft.): 6
Probe Liner Material: Teflon
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Nipple
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.26
Static Pressure (in. H_2O): -10.0
Flue Pressure (in. Hg Abs): 26.525
Sample Train Leak Check: Pre: 0.008 Post: 0.004 @ 10/10 In. Hg
Pitot Leak Check: Pre @4" Post @4"
Carbon Dioxide (%): 13.8
Oxygen (%): 5
Gas Values by (select one): (Method 3 Orsat/Fyrite) Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 2240 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower
Plant: Holcomb
Test Location: Air Heater Outlet - Location 1

List Test Method Used: Ontario Hydro
Test Run No. 1
Date: 07-27-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	2.51 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	94.8 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	950	.75	1.88	84.900	.866	.816	4.079		278	248	N/A	68°F	91	88	2
2	955	.60	1.51	88.980	.775	.730	3.648	88.979	283	252		Fully	92	87	2
3	1000	.65	1.63	92.64	.806	.759	3.797	92.627	280	252		Iced	92	87	2
	1005			96.427				96.424							
2-1	1008	.55	1.38	96.427	.742	.699	3.493		285	255			93	88	2
2	1013	.40	1.00	99.930	.632	.596	2.979	99.920	285	255			95	88	2
3	1018	.48	1.20	102.900	.693	.653	3.263	102.899	284	253			95	89	2
	1023			106.153				106.162							
3-1	1028	.70	1.76	106.153	.837	.788	3.941		281	255			94	88	2
2	1033	.55	1.38	110.090	.742	.699	3.493	110.094	279	257			94	88	2
3	1038	.60	1.51	113.590	.775	.730	3.648	113.587	282	257			93	89	2
	1043			117.242				117.235							
4-1	1047	.62	1.56	117.242	.818	.765	3.826		279	255			93	89	3
2	1052	.50	1.26	121.070	.707	.666	3.330	121.068	279	255			93	89	3
3	1057	.53	1.33	124.400	.728	.686	3.429	124.398	280	255			93	89	3
	1102			127.836				127.827							
5-1	1110	.55	1.38	127.836	.742	.699	3.493		286	257			94	89	3
2	1115	.60	1.51	131.340	.775	.730	3.648	131.339	285	257			94	89	3
3	1120	.63	1.58	134.980	.794	.748	3.738	134.977	285	254			95	89	3
	1125			138.723				138.715							
6-1	1128	.48	1.20	138.723	.693	.653	3.263		283	253			97	89	3
2	1133	.45	1.13	141.970	.671	.632	3.160	141.986	283	255			97	89	3
3	1138	.50	1.26	145.160	.707	.666	3.330	145.146	280	255			97	89	3
	1143			148.481				148.476							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower
Plant: Holcomb
Test Location: AHO Location 1

List Test Method Used: Ont Hydro
Test Run No. 1
Date: 07-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1148	.68	1.71	148.481	.885	.777	3.884		277	253	N/A	68°F	97	88	3
2	1153	.73	1.83	152.370	.854	.805	4.024	152.365	280	253		Fully	97	88	3
3	1158	.65	1.63	156.390	.806	.759	3.797	156.388	281	253		Iced	98	89	3
	1203			160.192				160.186							
8-1	1208	.50	1.26	160.192	.707	.666	3.330		280	255			98	89	3
2	1213	.55	1.38	163.520	.742	.699	3.493	163.528	278	255			98	89	3
3	1218	.50	1.26	167.020	.707	.666	3.330	167.015	281	255			98	89	3
	1223			170.353				170.345							

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ISOKINETIC TEST DATA

5/

List Method Used: ONTARIO Hydro Test Run No. #2 Run Date: 07/28/07

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); ~~Test Location~~ must be filled out on each sheet.

Company: SUNFLOWER - APA
Plant: Holcomb Ks.
Test Location: Air Heater outlet Location 1
Source Condition: Normal
Test Engineer: MSL
Temp ID: E 74
Meter ID: E74
Meter Calibration Factor: 1.008
Pitot ID: N/A
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: Teflon
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft): ____
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): 8.5
Port Type: Nipple
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.21
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.47
Sample Train Leak Check: Pre: .000 Post: .001 @ 10/12 in. Hg
Pitot Leak Check: Pre >3in Post >3in
Carbon Dioxide (%): 14.4
Oxygen (%): 5.4
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 278.1 Silica Final Wt (g): ____
Impinger Initial Wt (mL): 600 Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. 257 Tare Wt (g) 2.9131
Filter No. ____ Tare Wt (g) ____
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - ADM
Plant: Holcomb KS.
Test Location: Mill Heater Outlet Location 1

List Test Method Used: Ontario Hydro
Test Run No. #2
Date: 07/28/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (2.417)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (.920)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	9:30	.90	2.17	50.81	.948	.872	4.36	50.81	280	249	259	-68°F	91	90	4.0
2	9:35	.81	1.95	55.31	.900	.828	4.14	55.17	280	251	261	Fully	96	91	3.0
3	9:40	.87	2.10	59.10	.932	.858	4.29	59.31	281	252	265	iced	99	91	3.0
	9:45			63.40				63.60							
2 1	9:51	.93	2.24	63.90	.964	.887	4.43	63.60	281	255	261		100	91	4.0
2	9:56	.80	1.93	67.75	.894	.822	4.11	68.03	283	257	260		101	91	3.0
3	10:01	.75	1.81	72.00	.866	.796	3.98	72.14	280	255	257		103	92	2.5
	10:06			76.19				76.12							
3 1	10:10	.80	1.93	76.40	.894	.822	4.11	76.12	279	259	263		100	92	5.0
2	10:15	.90	2.17	80.15	.948	.870	4.36	80.23	281	260	265		101	92	5.0
3	10:20	.75	1.81	84.20	.866	.796	3.98	84.59	283	262	266		102	93	5.0
	10:25	7.57	18.11	88.35	27.37			88.57	2528				1534		
4 1	10:30	.78	1.88	88.80	.883	.812	4.06	88.57	282	260	265		99	93	7.0
2	10:35	.90	2.19	92.45	.948	.870	4.36	92.63	281	260	261		103	94	8.0
3	10:40	.84	2.03	97.13	.916	.843	4.21	96.99	279	258	257		104	94	8.0
	10:45			101.20				101.20							
5 1	10:50	.60	1.45	102.91	.774	.712	3.56	101.20	275	255	259		100	95	7.0
2	10:55	.73	1.76	104.43	.854	.786	3.93	104.76	281	253	261		102	95	8.5
3	11:00	.87	2.10	108.54	.932	.858	4.29	108.69	280	257	264		104	96	10
	11:05			113.10				112.98							
6 1	11:12	.75	1.81	113.79	.866	.796	3.98	112.98	280	261	263		101	97	3.0
2	11:17	.86	2.07	116.75	.927	.853	4.26	116.96	280	260	261		103	97	4.0
3	11:22	.90	2.17	121.10	.948	.872	4.36	121.27	281	257	259		104	97	4.0
	11:27			125.39				125.58							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - ADR
Plant: Holcomb KS
Test Location: Air Heater Outlet Duct

List Test Method Used: Ontario Hydro
Test Run No. #2
Date: 07/28/04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7 1	11:30	.80	1.93	125.85	.894	.827	4.11	125.58	280	254	263	-60°F	104	97	5.0
2	11:36	.73	1.76	129.45	.854	.786	3.93	129.69	283	261	264	Zero	105	97	4.5
3	11:41	.87	2.10	133.70	.932	.858	4.29	133.62	285	264	263	ice	107	98	6.5
	11:46			137.81				137.91							
8 1	11:51	.83	2.00	138.54	.911	.838	4.19	137.91	281	261	263		103	98	7.0
2	11:56	.90	2.17	142.30	.948	.872	4.36	142.10	284	260	263		104	98	7.5
3	12:01	.69	1.66	146.21	.830	.764	3.82	146.46	285	257	261		106	99	5.5
	12:06			150.05				150.28							
206		.815	1.96		.901				281.04				94.125		

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ISOKINETIC TEST DATA

List Method Used: ONTARIO HYDRO Test Run No. #3 Run Date: 07/29/04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SunPower - ADA
Plant: Holcomb KS.
Test Location: 9th HATCH OUTLET LOC. 1
Source Condition: Normal load
Test Engineer: MTH
Temp ID: 674
Meter ID: 674
Meter Calibration Factor: 1.008
Pitot ID: N/A
Pitot Tube Coefficient: 1.008
Probe Length (ft.): 6
Probe Liner Material: Teflon
Nozzle Diameter (in.): .247
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 10 Diameter (ft): _____
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream _____ Downstream _____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Nipple
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.25
Sample Train Leak Check: Pre: .000 Post: .000 @ 10/12 in. Hg
Pitot Leak Check: Pre 23.12 Post _____
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - _____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): _____ Silica Final Wt (g): _____
Impinger Initial Wt (mL): 201.6 Silica Initial Wt (g): _____
Impinger Wt Gain (mL): _____ Silica Wt Gain (g): _____
Total Water Gain (mL/g): _____
Description of Impinger H_2O: _____
Silica Gel Exhausted?: _____
Impingers Recovered by: _____
Silica Gel Weighed by: _____
Sample Removed from Site by: _____

SAMPLE COLLECTION:

Thimble No. 258 Tare Wt (g) 2.8566
Filter No. _____ Tare Wt (g) _____
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - ADM
Plant: Holcomb Ks.
Test Location: Air Heater Outlet Col 1

List Test Method Used: Ontario Hydro
Test Run No. #3
Date: 07/29/04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (2.51)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (.942)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	9:30	.75	1.88	73.45	.866	.815	4.07	73.45	285	258	248	48°F	87	84	3.0
2	9:35	.87	2.18	77.40	.932	.878	4.39	77.52	287	260	251	Fully	90	84	3.0
3	9:40	.92	2.30	81.75	.959	.903	4.51	81.91	287	261	249	iced	95	86	3.5
	9:45	2.59	6.36	86.20	2.75			86.42	859				326		
-1.6 2-1	9:49	.60	1.50	87.80	.774	.729	3.64	86.42	290	262	249		95	86	3.0
2	9:54	.75	1.88	90.30	.866	.815	4.07	90.06	290	260	249		96	87	4.0
3	9:59	.69	1.73	94.30	.830	.782	3.91	94.13	287	262	251		97	87	4.0
	10:04	4.63	11.69	98.00	5.22			98.04	1726				1074		
-2.09 3-1	10:09	.80	2.00	100.09	.894	.842	4.21	98.04	285	260	251		96	88	4.0
2	10:14	.72	1.80	102.60	.848	.799	3.99	102.25	287	260	249		98	89	4.0
3	10:19	.69	1.73	106.50	.830	.782	3.91	106.24	287	258	249		98	89	4.0
	10:24	6.89	17.0	110.25	7.79			110.15	2585				1632		
1.43 4-1	10:28	.90	2.25	112.68	.948	.893	4.46	110.15	293	261	249		98	90	6.0
2	10:33	.83	2.08	115.25	.911	.858	4.29	114.61	290	262	249		99	90	5.0
3	10:38	.68	1.70	119.20	.824	.774	3.88	118.90	290	264	250		100	91	4.0
	10:43	9.25	23.03	122.85	10.47			122.78	3458				2129		
1.05 5-1	10:47	.85	2.13	124.00	.921	.868	4.34	122.78	289	263	249		100	92	5.0
2	10:52	.90	2.25	127.45	.948	.893	4.46	127.12	291	260	249		100	92	6.0
3	10:57	.77	1.93	131.75	.877	.826	4.13	131.58	291	257	249		101	92	4.0
	11:02	11.77	29.34	135.61	13.21			135.71	4324						
3.14 6-1	11:09	.65	1.62	138.75	.800	.753	3.65	135.71	285	257	249		101	93	2.0
2	11:14	.65	1.43	142.00	.806	.759	3.79	138.86	290	255	250		101	93	3.0
3	11:19	.86	2.03	145.86	.900	.847	4.23	142.65	287	256	250		100	94	5.0
	11:24	13.68	34.10	147.20	15.56			146.88	5191				3278		

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - ADA
Plant: Holcomb KS
Test Location: Air Heater Outlet Loc 1

List Test Method Used: Ontario Hydro
Test Run No. #3
Date: 07/29/07
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
#1:00 7-1	11:28	.78	1.95	148.2	.883	.831	4.15	146.88	286	261	249	-68°F	100	94	5.0
2	11:33	.62	1.55	151.37	.787	.741	3.70	151.03	287	260	250	Fully	100	94	3.0
3	11:38	.53	1.33	155.00	.728	.685	3.42	154.73	290	257	252	Iced	100	94	2.0
	11:43	15.61	38.95	158.20	17.97			158.15	1054				3860		
-2:00 8-1	11:47	.55	1.38	160.00	.741	.698	3.49	158.15	293	255	250		101	94	4.0
2	11:52	.50	1.25	162.00	.707	.666	3.33	161.64	295	255	249		101	94	4.0
3	11:57	.78	1.95	165.23	.883	.831	4.15	164.97	293	259	249		101	94	5.0
	12:02	17.44	43.44	169.25	20.30			169.12	1035				4045		
2:00		.724	1.81		.845				288				92.60		

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 29 Test Run No. #1 Run Date: 7-27-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: T. WEI
Temp ID: 815
Meter ID: 815
Meter Calibration Factor: 1.005
Pitot ID: 5D18
Pitot Tube Coefficient: .837
Probe Length (ft.): 7
Probe Liner Material: GLASS
Nozzle Diameter (in.): .200
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.99
Static Pressure (in. H_2O): -2.8
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .003 Post: .003 @ 10 in. Hg
Pitot Leak Check: Pre 0 @ 4" Post 0 @ 4"
Carbon Dioxide (%): 12.4
Oxygen (%): 6.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ~~[illegible]~~ 349.20 Silica Final Wt (g):
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 1035 Tare Wt (g) 1.4555
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp
Plant: Holcomb Station
Test Location: Stack

List Test Method Used: 4 29
Test Run No. #1
Date: 07-27-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (.950)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP (.632)	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1230	2.1	2.0	80.900	1.449		4.557		191	261	260	34	99	97	5
1	1235	2.1	2.0	85.441	1.449		4.561	85.457	191	261	260	34	100	97	3
2	1240	2.1	2.0	90.006	1.449		4.594	90.018	191	251	255	36	107	98	4
2	1245	2.1	2.0	94.632	1.449		4.594	94.612	191	251	255	36	107	98	4
3	1250	1.8	1.7	99.187	1.342		4.272	99.206	190	249	256	36	110	99	3
3	1255	1.8	1.7	103.486	1.342		4.272	103.478	190	249	256	36	110	99	3
	1300			107.761				107.749							
2-1	1303	2.1	2.0	107.761	1.449		4.602		191	257	249	41	107	100	4
1	1308	2.1	2.0	112.372	1.449		4.606	112.363	191	257	249	41	108	100	4
2	1313	2.1	2.0	116.952	1.449		4.626	116.969	190	254	259	45	111	101	4
2	1318	2.1	2.0	121.608	1.449		4.626	121.595	190	254	259	45	111	101	4
3	1323	1.9	1.8	126.214	1.378		4.408	126.221	189	251	262	48	112	101	4
3	1328	1.9	1.8	130.611	1.378		4.408	130.629	189	251	262	48	112	101	4
	1333			135.020				135.037							
3-1	1335	2.1	2.0	135.020	1.449		4.590		192	257	259	50	104	101	4
1	1340	2.1	2.0	139.600	1.449		4.590	139.610	192	257	259	50	104	101	4
2	1345	2.1	2.0	144.188	1.449		4.583	144.201	193	257	256	51	103	101	4
2	1350	2.1	2.0	148.773	1.449		4.583	148.784	193	257	256	51	103	101	4
3	1355	1.8	1.7	153.374	1.342		4.249	153.366	191	255	256	54	103	101	4
3	1400	1.8	1.7	157.631	1.342		4.249	157.616	191	255	256	54	103	101	4
	1405			161.854				161.865							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp
Plant: Holcomb Station
Test Location: Stack

List Test Method Used: M29
Test Run No. #1
Date: 07-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1408	2.1	2.0	161.954	1.449		4.598		191	257	258	41	107	99	4
1	1413	2.1	2.0	166.451	1.449		4.598	166.452	191	257	258	41	107	99	4
2	1418	2.1	2.0	171.065	1.449		4.602	171.050	191	256	256	41	108	99	4
2	1423	2.1	2.0	175.666	1.449		4.602	175.652	191	258	256	43	108	99	4
3	1428	1.9	1.8	180.232	1.378		4.385	180.254	190	258	254	45	109	99	4
3	1433	1.9	1.8	184.651	1.378		4.385	184.639	190	258	254	45	109	99	4
	1438			189.036				189.024							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: 29 Test Run No. #2 Run Date: 7-28-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: T. Lien / CH
Temp ID: 246
Meter ID: 246
Meter Calibration Factor: .994
Pitot ID: 799A
Pitot Tube Coefficient: .840
Probe Length (ft.): 7
Probe Liner Material: Glass
Nozzle Diameter (in.): .1875
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.94
Static Pressure (in. H_2O): -1.3
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .008 Post: .008 @ 10 in. Hg
Pitot Leak Check: Pre ✓ @ 4" Post ✓ @ 4"
Carbon Dioxide (%): 12.2
Oxygen (%): 7.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3734.50 Silica Final Wt (g):
Impinger Initial Wt (mL): 3389.40 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 1082 Tare Wt (g) .6880
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp.
Plant: Holcomb Station
Test Location: Stack

List Test Method Used: M29
Test Run No. #2
Date: 7-28-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1150	2.4	1.9	96.194	1.549		4.355		193	259	255	35	99	98	2
1	1155	2.4	1.9	100.163	1.549		4.359	100.149	193	259	255	35	100	98	2
2	1200	2.4	1.9	104.492	1.549		4.367	104.508	193	257	255	35	102	98	2
2	1205	2.4	1.9	108.870	1.549		4.367	108.875	193	257	258	35	102	98	2
3	1210	2.0	1.6	113.250	1.414		3.999	113.241	191	259	258	35	104	98	2
3	1215	2.0	1.6	117.260	1.414		3.999	117.241	191	259	258	35	104	98	2
	1220			121.234				121.240							
2-1	1222	2.5	2.0	121.284	1.581		4.468		192	258	254	41	103	99	3
1	1227	2.5	2.0	125.720	1.581		4.472	125.702	192	258	254	41	104	99	3
2	1232	2.4	1.9	130.160	1.549		4.390	130.174	192	258	256	41	106	99	3
2	1237	2.4	1.9	134.565	1.549		4.390	134.564	192	258	256	41	106	99	3
3	1242	2.1	1.7	138.963	1.449		4.120	138.953	191	259	255	41	108	100	3
3	1247	2.1	1.7	143.062	1.449		4.120	143.073	191	259	255	41	108	100	3
	1252			147.210				147.193							
3-1	1254	2.5	2.0	147.210	1.581		4.485		193	258	256	39	107	100	3
1	1259	2.5	2.0	151.710	1.581		4.493	151.695	193	257	256	39	108	101	3
2	1304	2.4	1.9	156.198	1.549		4.406	156.187	193	260	256	39	109	101	3
2	1309	2.4	1.9	160.604	1.549		4.406	160.593	193	260	256	39	109	101	3
3	1314	2.2	1.8	165.058	1.483		4.229	164.998	192	259	256	39	110	102	3
3	1319	2.2	1.8	169.255	1.483		4.229	169.227	192	259	256	39	110	102	3
	1324			173.465				173.465							

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ISOKINETIC TEST DATA

List Method Used: 29 Test Run No. #3 Run Date: 7-29-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER ELECTRIC POWER CORP.
Plant: HOLCOMB STATION
Test Location: STACK
Source Condition: NORMAL
Test Engineer: T. Neil
Temp ID: E46
Meter ID: E46
Meter Calibration Factor: .994
Pitot ID: 199A
Pitot Tube Coefficient: .840
Probe Length (ft.): 7
Probe Liner Material: 6
Nozzle Diameter (in.): .1875
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): Diameter (ft): 16.33
Width (ft):
Duct Area (Sq. Ft.): 209.441
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 3
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 26.73
Static Pressure (in. H_2O): -1.4
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .000 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre ✓ @ 4" Post ✓ @ 4"
Carbon Dioxide (%): 12.3
Oxygen (%): 6.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3411.20 Silica Final Wt (g):
Impinger Initial Wt (mL): 3691.7 Silica Initial Wt (g):
Impinger Wt Gain (mL): 280.5 Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

GE Energy - Form 1053

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunpower Power Corp.
Plant: Hacomb Station
Test Location: Stack

List Test Method Used: M29
Test Run No. #3
Date: 7-29-04
Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1130	2.4	1.9	24.287	1.549		4.311		193	252	254	44	95	94	1
1	1135	2.4	1.9	28.562	1.549		4.315	28.348	193	252	254	44	96	94	1
2	1140	2.4	1.9	32.851	1.549		4.327	32.863	193	252	254	44	98	95	1
2	1145	2.4	1.9	37.206	1.549		4.327	37.190	193	252	254	44	98	95	1
3	1150	2.1	1.7	41.529	1.449		4.058	41.517	192	252	254	44	99	96	1
3	1155	2.1	1.7	45.574	1.449		4.058	45.574	192	252	254	44	99	96	1
	1200			49.625				49.632							
2-1	1202	2.4	1.9	49.625	1.549		4.346		193	256	256	39	102	96	1
1	1207	2.4	1.9	53.984	1.549		4.350	53.971	193	256	256	39	103	96	1
2	1212	2.4	1.9	58.320	1.549		4.358	58.321	193	256	256	39	104	97	1
2	1217	2.4	1.9	62.686	1.549		4.358	62.679	193	256	256	39	104	97	1
3	1222	2.1	1.7	67.021	1.449		4.090	67.037	191	256	256	39	105	98	1
3	1227	2.1	1.7	71.138	1.449		4.090	71.127	191	256	256	39	105	98	1
	1232			75.229				75.217							
3-1	1234	2.0	1.6	75.229	1.414		3.988		191	253	257	42	104	98	1
1	1239	2.0	1.6	79.210	1.414		3.991	79.217	191	253	257	42	105	98	1
2	1244	2.0	1.6	83.196	1.414		3.991	83.208	191	253	257	42	105	98	1
2	1249	2.0	1.6	87.212	1.414		3.991	87.199	191	253	257	42	105	98	1
3	1254	1.8	1.4	91.205	1.342		3.796	91.191	190	253	257	42	106	99	1
3	1259	1.8	1.4	95.058	1.342		3.796	94.987	190	253	257	42	106	99	1
	1304			98.794				98.783							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower Power Corp
Plant: Holcomb Station
Test Location: Stack

List Test Method Used: M29
Test Run No. #3
Date: 7-29-04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
4-1	1306	2.2	1.8	98.794	1.483		4.197		191	253	258	49	106	100	1
1	1311	2.2	1.8	103.010	1.483		4.201	102.991	191	253	258	49	107	100	1
2	1316	2.1	1.7	107.204	1.449		4.112	107.192	191	253	258	49	108	101	1
2	1321	2.1	1.7	111.312	1.449		4.112	111.304	191	253	258	49	108	101	1
3	1326	1.8	1.4	115.438	1.342		3.807	115.416	191	253	258	49	108	101	1
3	1331	1.8	1.4	119.236	1.342		3.807	119.223	191	253	258	49	108	101	1
	1336			123.042				123.029							
			1.91	98.805	1.402				192				100.	63	

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ISOKINETIC TEST DATA

List Method Used: M28 Test Run No. 1 Run Date: 07-27-04

TEST PARAMETERS:

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower
Plant: Holcomb County
Test Location: Air Heater Outlet - Lane 1
Source Condition:
Test Engineer: TBarr
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: 0.998
Pitot ID:
Pitot Tube Coefficient: .84
Probe Length (ft.): 6
Probe Liner Material: Teflon
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box Other

Duct Shape (select): Rectangular or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: Nipple
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.26
Static Pressure (in. H_2O): -10.00
Flue Pressure (in. Hg Abs): 26.535
Sample Train Leak Check: Pre: .005 Post: .008 @ 10/12 in. Hg
Pitot Leak Check: Pre @ 4" Post @ 4"
Carbon Dioxide (%): 14
Oxygen (%): 4.8
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 238.2 Silica Final Wt (g):
Impinger Initial Wt (mL): 210 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. 249 Tare Wt (g) 2.8786
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower
Plant: Holcomb County
Test Location: AHO Loc. 1

List Test Method Used: M29
Test Run No. 11
Date: 07-27-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O (.251)	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm (.948)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1230	.50	1.26	170.410	.707	.666	3.330		276	253	N/A	48°F	98	94	4
2	1235	.53	1.33	173.740	.728	.686	3.429	173.740	278	255		Fully	98	94	4
3	1240	.45	1.13	177.180	.671	.632	3.160	177.169	278	255		Iced	98	94	4
	1245			180.343				180.328							
2-1	1250	.68	1.71	180.343	.825	.777	3.884		279	258			98	94	5
2	1255	.60	1.51	184.240	.775	.730	3.648	184.227	278	259			99	94	5
3	1300	.53	1.33	187.880	.728	.686	3.429	187.875	278	258			99	94	5
	1305			191.298				191.304							
3-1	1308	.55	1.38	191.298	.742	.699	3.493		282	258			98	94	5
2	1313	.60	1.51	194.780	.775	.730	3.648	194.791	283	260			99	94	5
3	1318	.50	1.31	198.440	.707	.666	3.330	198.435	284	260			98	94	5
	1323			201.887				201.835							
4-1	1328	.45	1.13	201.887	.671	.632	3.160		290	258			98	94	5
2	1333	.50	1.26	204.970	.707	.666	3.330	204.987	285	258			98	94	5
3	1338	.42	1.05	208.080	.648	.610	3.052	208.039	287	258			98	94	5
	1343			211.107				211.091							
5-1	1348	.65	1.63	211.107	.806	.759	3.797		285	260			96	94	5
2	1353	.70	1.76	214.910	.837	.788	3.941	214.904	287	260			97	94	5
3	1358	.60	1.51	218.850	.775	.730	3.648	218.845	286	258			97	94	5
	1403			222.498				222.493							
6-1	1408	.55	1.38	222.498	.742	.699	3.493		288	258			97	94	5
2	1413	.50	1.26	225.980	.707	.666	3.330	225.991	286	259			97	94	5
3	1418	.42	1.05	229.310	.648	.610	3.052	229.321	285	258			96	94	5
	1423			232.445				232.373							

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower
Plant: Hokomb County
Test Location: AHO Loc 1

List Test Method Used: M29
Test Run No. 1
Date: 07-27-04 Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7-1	1428	.60	1.51	232.745	.775	.730	3.648		283	259	N/A	≤68°F	97	94	5
2	1433	.60	1.51	236.390	.775	.730	3.648	236.393	286	260		Full	96	94	5
3	1438	.55	1.38	240.040	.742	.699	3.493	240.041	285	260		Ice	96	94	5
	1443			243.541				243.534							
8-1	1446	.65	1.63	243.541	.806	.759	3.797		288	260			96	94	5
2	1451	.60	1.51	247.338	.775	.730	3.648	247.338	290	260			95	94	5
3	1456	.60	1.51	250.990	.775	.730	3.648	250.986	288	260			95	94	5
	1501			254.641				254.634							

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M29 Test Run No. #2 Run Date: 07/28/04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: Sunflower AEA
Plant: Holcomb ICS
Test Location: Air heater outlet Location 1
Source Condition: normal
Test Engineer: MJW
Temp ID: E2279
Meter ID: B28
Meter Calibration Factor: .998
Pitot ID: N/A
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: Teflon
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft): _____
Width (ft): 29
Duct Area (Sq. Ft.): 290.0
Disturbance (in diameters) Upstream _____ Downstream _____
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): .85
Port Type: nipple
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.21
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.47
Sample Train Leak Check: Pre: .000 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre >3.2 Post _____
Carbon Dioxide (%): 14.4
Oxygen (%): 4.6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - _____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 255.1 Silica Final Wt (g): _____
Impinger Initial Wt (mL): 0.0 Silica Initial Wt (g): _____
Impinger Wt Gain (mL): 0.0 Silica Wt Gain (g): _____
Total Water Gain (mL/g): _____
Description of Impinger H_2O: _____
Silica Gel Exhausted?: _____
Impingers Recovered by: _____
Silica Gel Weighed by: _____
Sample Removed from Site by: _____

COMMENTS & NOTES:

SAMPLE COLLECTION:

Thimble No. _____ Tare Wt (g) _____
Filter No. _____ Tare Wt (g) _____
Fuel Samples collected for analysis? Yes No

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1

List Test Method Used: M29
Test Run No. 2
Date: 7-28-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	X 2.53 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	X .95 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1150	.75	1.9	55.213	.87	.82	4.114		288	250			99	97	3
-2	1155	.79	2.0	59.335	.89	.84	4.222	59.327	284	250			100	98	3
-3	1200	.54	1.4	63.556	.74	.70	3.491	63.549	285	250			100	98	3
.375	1205			67.097				67.040				FULLY			
2-1	1210	.59	1.5		.77	.73	3.649	67.415	280	250			101	97	3
-2	1215	.80	2.0	71.097	.89	.85	4.289	71.064	277	250		ICED	101	96	3
-3	1220	.68	1.7	75.309	.83	.78	3.917	75.353	279	250			102	96	3
-.330	1225			79.250				79.270							
3-1	1230	.60	1.5		.78	.74	3.679	79.600	291	250			102	96	3
22-2	1235	.73	1.84	83.41	.854	.811	4.05	83.279	290	251			105	96	4
-3	1240	.81	2.04	87.25	.900	.855	4.27	87.33	289	251			107	97	5
	1245			91.60				91.60							
4-1	1250	.89	2.25	92.21	.943	.896	4.48	91.68	290	252			107	97	5.0
-2	1255	.72	1.82	96.00	.848	.804	4.03	96.08	293	250			107	100	4.0
-3	1300	.61	1.54	100.00	.781	.741	3.70	100.21	295	254			108	100	3.0
	1305			104.12				103.91							
5-1	1310	.89	2.25	104.65	.943	.896	4.48	103.91	289	251			108	98	5.0
2	1315	.92	2.32	108.21	.954	.911	4.55	108.39	290	251			109	100	5.5
3	1320	.76	1.92	112.79	.871	.827	4.13	112.94	290	250			109	101	4.0
	1325			117.00				117.07							
6-1	1330	.65	1.64	117.62	.806	.765	3.82	117.07	291	251			109	102	3.0
2	1335	.81	2.04	121.10	.900	.855	4.27	120.89	291	253			109	103	5.0
3	1340	.76	1.92	125.00	.871	.827	4.13	125.16	293	252			109	103	4.0
	1345			129.15				129.29							
													1067		

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FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - ABA
Plant: Holcomb Ks
Test Location: Air Heater outlet Loc 1

List Test Method Used: M29
Test Run No. #2
Date: 07/28/04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7 1	13:50	.93	2.35	125.90	.964	.916	4.58	125.58	285	256		68°F	106	100	7.0
2	13:55	.87	2.20	130.43	.932	.886	4.43	130.16	287	253		Fully	107	102	7.0
3	14:00	.74	1.87	134.50	.860	.732	3.66	134.56	291	257		iced	107	102	6.0
	14:05			138.31				138.22							
4 1	14:10	.69	1.74	138.87	.830	.789	3.94	138.22	290	255			108	100	5.0
2	14:15	.85	2.15	141.99	.921	.875	4.37	142.16	291	253			108	101	7.0
3	14:20	.81	2.04	146.50	.900	.855	4.07	146.53	293	258			110	102	6.0
	14:25			150.79				150.80							
		1.75			1.46				288				102.5		

223

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ISOKINETIC TEST DATA

TEST PARAMETERS: List Method Used: M29 Test Run No. 3 Run Date: 7-29-04

☐ Check here if same Test Parameters as previous run (and if necessary, indicate new pitot, nozzle, etc.); Test Location must be filled out on each sheet.

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO LOCATION 1
Source Condition:
Test Engineer: MRE / MJK
Temp ID: E22
Meter ID: E22
Meter Calibration Factor: .998
Pitot ID:
Pitot Tube Coefficient: .841
Probe Length (ft.): 6
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .250
Train Setup (select): Anderson Box Hot Box (Other)

Duct Shape (select): (Rectangular) or Round
Length (ft): 10 Diameter (ft):
Width (ft): 29
Duct Area (Sq. Ft.): 290
Disturbance (in diameters) Upstream Downstream
Sample Plane (select): Horizontal or (Vertical)
Port Length (in.): 5.5
Port Size (diameter in.): 3.5
Port Type: NIPPLE
Number of Ports Sampled: 8
Number of Points per Port: 3
Minutes per Point: 5
Total Number of Traverse Points: 24
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 27.00
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): 26.27
Sample Train Leak Check: Pre: .000/10 Post: .000 @ 10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 14
Oxygen (%): 5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 260.4 Silica Final Wt (g):
Impinger Initial Wt (mL): [illegible] Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. 264 Tare Wt (g) 2.9107
Filter No. Tare Wt (g)
Fuel Samples collected for analysis? Yes No

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: SUNFLOWER
Plant: HOLCOMB
Test Location: AHO Loc. 1

List Test Method Used: M29
Test Run No. 3
Date: 7-29-04 Traverse Sheet 1 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	~~Filter Holder Temp. °F~~	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1130	.52	1.2	47.341	.72	.66	3.317		298	250			88	89	4
-2	1135	.57	1.4	50.628	.76	.70	3.473	50.658	292	250			88	90	4
-3	1140	.60	1.4	54.139	.78	.71	3.563	54.131	289	250		FULLY	89	91	4
	1145			57.705			-.200	57.694							
2-1	1150	.61	1.5		.78	.72	3.593	57.894	286	250			89	91	5
-2	1155	.59	1.4	61.500	.77	.71	3.533	61.487	288	250		ICED	89	92	5
-3	1200	.68	1.6	65.050	.83	.76	3.793	65.020	283	250			89	92	5
	1205			68.825			-.200	68.813							
3-1	1210	.69	1.6		.83	.76	3.821	69.013	288	250			89	93	5
-2	1215	.75	1.8	72.843	.87	.80	3.984	72.834	279	250			89	93	5
-3	1220	.75	1.8	76.830	.87	.80	3.984	76.818	284	250			89	94	5
	1225			80.919			-.170	80.802							
4-1	1230	.73	1.7		.85	.79	3.930	80.972	289	250			89	94	5
-2	1235	.84	2.0	84.925	.92	.84	4.216	84.902	286	250			90	95	5
-3	1240	.90	2.1	89.136	.95	.87	4.364	89.118	283	250			90	95	5
	1245			93.500			-.270	93.482							
5-1	1250	.88	2.1		.94	.86	4.315	93.752	277	250			90	95	5
-2	1255	.88	2.1	98.083	.94	.86	4.315	98.067	280	250			91	95	5
-3	1300	.84	2.0	102.411	.92	.84	4.216	102.382	279	250			91	95	5
	1305			106.617			-.110	106.598							
6-1	1310	.90	2.1		.95	.87	4.364	106.708	283	250			91	96	6
-2	1315	.85	2.0	111.100	.92	.85	4.241	111.072	285	250			91	96	6
-3	1320	.81	1.9	115.315	.90	.83	4.140	115.313	287	250			91	96	6
	1325			119.456				119.453							

= Data does not get entered in Excel

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: Sunflower - AGA
Plant: Holcomb Kansas
Test Location: Air Heater outlet Location 1

List Test Method Used: M29
Test Run No. #3
Date: 02/24/04
Traverse Sheet 2 of 2

Port-Point No.	Clock Time 24 hr.	Velocity Head (ΔP) in. H_2O	Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
7 1	13130	.65	1.54	119.95	.806	.741	3.70	119.453	290	250		-68°F	92	96	5.0
2	13135	.73	1.73	123.40	.854	.790	3.95	123.16	290	253		Fully	92	96	6.0
3	13140	.81	1.91	127.10	.900	.828	4.14	127.11	291	254		iced	92	96	6.5
	13145			131.30				131.25							
8 1	13150	.80	1.89	133.00	.894	.822	4.11	131.25	290	254			93	96	6.5
2	13155	.69	1.63	135.60	.830	.764	3.82	135.36	290	250			93	97	5.0
3	14100	.62	1.46	139.25	.787	.724	3.62	139.18	291	248			93	97	5.0
	14105			142.80				142.80							

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= Data does not get entered in Excel

APPENDIX H

Bag Analysis Report

Grubb Filtration Testing Services, Inc.

8006 Route 130 North
Post Office Box 1156
Delran, NJ 08075

TEL (856) 461-1800
FAX (856) 461-1613
www.GFTS.com

LABORATORY REPORT NO. 4033
DATE: February 2, 2005

RECEIVED
FEB 10 2005

PREPARED FOR: ADA-ES, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

REFERENCE: Sunflower Electric - Holcomb Station
Used Fiberglass, Reverse-Gas Filter Bag Analysis
ADA-ES P.O. No. AD04-445

REQUEST AND SAMPLE DESCRIPTION

One used fiberglass, reverse-gas filter bag was received from ADA-ES on September 9, 2004. It had reportedly been removed from one of the two boiler/spray dryer FGD baghouses at Holcomb Station at the conclusion of an activated carbon injection (ACI), Hg-removal test program. The bag had reportedly been in service for a total of 2.5 years (installed April 2002). Its location within the baghouses was not stated.

The bag was submitted for examination of its general condition and for testing of its fabric strength and dirty fabric pH (permeability testing was specifically excluded). The results were to be compared to typical used bags of this type in this application, as no bag had been removed for reference testing prior to the ACI test.

SUMMARY AND CONCLUSIONS

This bag was entirely normal in its appearance, fabric strength, and ph; with no evidence that it had been affected by the ACI test. It was in excellent condition with no signs of wear or degradation. Internally, it had a moderately thin residual cake of tan-colored dust (no overt evidence of residual carbon), with only a little soft crust and slight staining near its bottom.

The average Mullen burst strength of the fabric was 392 psi (net) which is in the normal range for bags of this type and age in this application. For comparison, the average Mullen burst for ten OEM bags tested from Holcomb in 1989 after six years of service was 374 psi. The Mullen burst for new fabric of this type would be about 550 psi. The dirty (as-received) fabric pH was 9.72, a typical value for a coal-fired boiler / lime spray dryer bag. The as-received bag weighed 20.75 lb, compared to the 20.6 lb average weight of the bags tested in 1989.

FABRIC CONSTRUCTION

The bag was made of a standard combination glass fabric, with the textured filling face on the inside (filtration) surface. The fabric construction is as follows:

Weave:	3 x 1 Left-hand Twill
Yarns, warp:	150 1/2
fill:	150 1/4 Textured
Count:	53 x 30 per inch, warp x fill
Weight:	10 oz/yd^2 (nominal, based on yarns and count)
Finish:	Teflon B (based on its white color)

BAG DIMENSIONS AND CONSTRUCTION

The bag was nominally 32'6" long by 12" in diameter (18.75" flat width), with a stainless steel cap top, eight (8) stainless steel anti-collapse rings, and a compression band bottom. The rings were spaced at nominal four-foot intervals, with the terminal rings being 2'0" from the bottom and 2'9" from the top. The bag had a manufacturer's stamp (BHA format) on its external surface about a foot from the top, as follows:

325 1870
REV A TOP
DS 3

OBSERVATIONS

The bag had a relatively thin layer of powdery tan ash on its internal surface, and this ash was easily removed by vacuuming. There was only a small amount of soft crust, inside the bottom cuff, and there were only a few mild stains in the bottom section. On the external surface, the fabric was white in color with only slight dust contamination, which likely occurred during removal and handling of the bag.

USED FABRIC PROPERTIES

Mullen Burst (vacuumed, average of three readings in each section):

Top	Mid	Bot		Avg
373	430	374	=	**392** lb/in^2, net (429 lb/in^2, gross)

Fabric pH (as-received, middle, 5g per 100 ml distilled H_2O): **9.72**

APPENDIX I

Reaction Engineering International Memo

REACTION ENGINEERING INTERNATIONAL

Committed Individuals Solving Challenging Problems

Date: December 23, 2004

To: Sharon Sjostrom, Travis Starns

From: Connie Senior

Re: Leaching and thermal desorption results for Holcomb fly ash samples

---

EERC carried out TCLP analysis for Hg and other metals and thermal desorption analysis on two Holcomb ash samples: HOL087 (baseline, 0.157 µg Hg/g) and HOL512 (long term, ~1.6µg Hg/g).

The TCLP results are shown in Table 1. The long-term sample (HOL512) was repeated. The duplicate sets of data for this sample agree well. Mercury concentration in the leachate from baseline sample was higher than that from the long-term sample. Note that the mercury concentration in the leachate from the long-term sample was ten times that of the baseline sample. Arsenic, cadmium and lead were below detection limits in all leachates; chromium was below detection limits in the leachate from the long-term samples. Chromium and barium concentrations in the leachate were lower in the long-term samples than in the baseline, perhaps due to a dilution effect from the added activated carbon. Selenium concentration in the leachate from the long-term samples was about twice that of the leachate from the baseline sample; the activated carbon may be adsorbing gas-phase selenium (suggested by Salem Harbor and Brayton Point data) in a form that is leachable via TCLP.

Table 1. TCLP results from EERC, in µg/L.

	HOL087 Baseline (MTI 04-260)	**HOL0512 Long Term (MTI 04-261)**	**HOL0512 Long Term (MTI 04-261)**
As	<4	<4	<4
Ba	1	0.558	0.535
Cd	<0.6	<0.6	<0.6
Cr	12	<2	<2
Pb	<4	<4	<4
Hg	0.089	0.032	0.04
Se	48	87	81
Ag	<0.6	<0.6	<0.6

77 West 200 South, Suite 210 • Salt Lake City, UT 84101 USA
p: +801 364 6925 x37 • f: +801 364 6977 • senior@reaction-eng.com

Gustin and Ladwig[1] published SPLP leaching data on mercury and other metals from several plants burning PRB subbituminous coals, including Pleasant Prairie Unit 4, with and without ACI. Table 2 summarizes their leaching results in terms of metal concentration in the leachate. In this study, mercury concentrations in the SPLP leachate were about ten times lower than those in the TCLP leachate of Holcomb samples. Leachate from Pleasant Prairie samples containing activated carbon had *less* Hg than the baseline sample.

Table 2. SPLP results from Gustin and Ladwig[1], in µg/L.

	S1	S3	S3	Pleasant Prairie			
		Unit A PRB blend	Unit B PRB blend	Baseline	ACI-1	ACI-2	ACI-2
As	5	17	34	11	17	26	16
Cd	0.6	8.9	6.2	0.3	0.3	0.9	3.7
Cr	453	69	39	20	25	20	60
Pb	0.1	6.2	10.1	0.2	0	4.5	8.6
Hg	0.0014	ND	0.0041	0.0006 (1)	0.0029	0.0069 (1)	
Se	21.4	63.5	121.4	2.1	1.6	97.3	64.4

(1) Average value

ND - Not determined

Thermal desorption analyses were carried out. In these experiments the samples were heated from a temperature of 22°C, at a rate of 25°C/minute, to 750°C. The mass of mercury desorbed was measured as a function of temperature. Table 3 gives the results in terms of the amount of mercury desorbed at each peak per gram of original sample. Figure 1 shows the results graphically. The long-term sample (HOL512) was repeated; the thermal desorption curve was very reproducible.

The baseline ash sample (HOL087) lost evolved mercury at four different temperatures: 240, 338, 425 and 524°C. Approximately equal amounts of mercury were evolved at these temperatures. In contrast, the long-term samples evolved more than 90% of the mercury at 315-318°C. Minor amounts (less than 5% of the mercury) evolved at higher temperatures, but not at the same temperatures of mercury evolution in the baseline sample.

The comparison of the baseline and long-term samples suggests that mercury is bound to these samples in different forms. This suggests that when activated carbon is injected into the duct, *there is no "native" mercury capture by the fly ash*; instead the more reactive activated carbon reacts with gaseous mercury before reacting with fly ash.

[1] Gustin, M.S, Ladwig, K. "An Assessment of Mercury Release from Coal Fly Ash". *J.AWMA*, **2004**, *54*, 320-330.

Thermal desorption of pure mercury compounds in argon[2] shows the relative thermal stability of pure compounds (Figure 2). The principle peaks in the pure spectra have been noted on Figure 1. The primary desorption peak from the long-term sample appears closest to the peaks for HgO or HgS in Figure 2. $HgCl_2$ and $HgSO_4$ do not seem to be significant for the long-term sample, but may be responsible for some of the peaks observed in the baseline desorption data.

Table 3. Thermal desorption peaks and amount of mercury evolved from each peak, when samples were heated from 22°C to 750°C, at 25°C/min.

	HOL087		HOL512		HOL512	
Peak	***T, °C***	***ng/g***	***T, °C***	***ng/g***	***T, °C***	***ng/g***
1st	240	56.2	315	1482.6	318	1585.6
2nd	338	33	460	49.9	463	65
3rd	425	26.6	497	60.7	497	43.6
4th	524	33.4	696	23.2	643	2.8
Total:		*149.2*		*1616.5*		*1696.9*

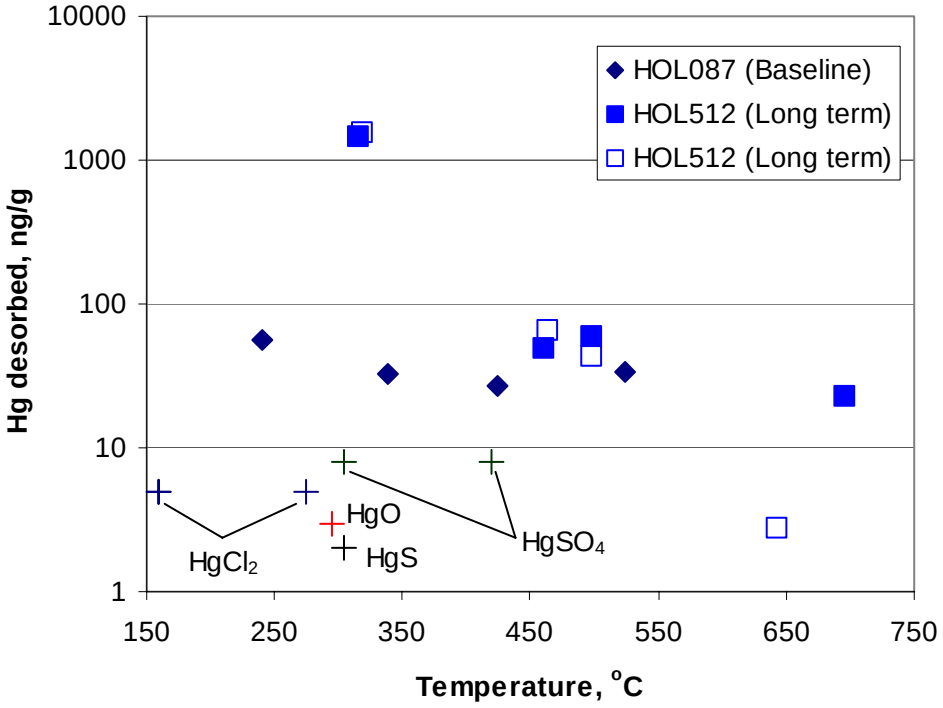

Figure 1. Mercury desorption (ng/g) at different temperatures.

[2] Milobowski et al., "Wet FGD Enhanced Mercury Control For Coal-Fired Boilers," presented at the 27th International Technical Conference on Coal Utilization and Fuel Systems, March 4-7, 2002, Clearwater, FL.

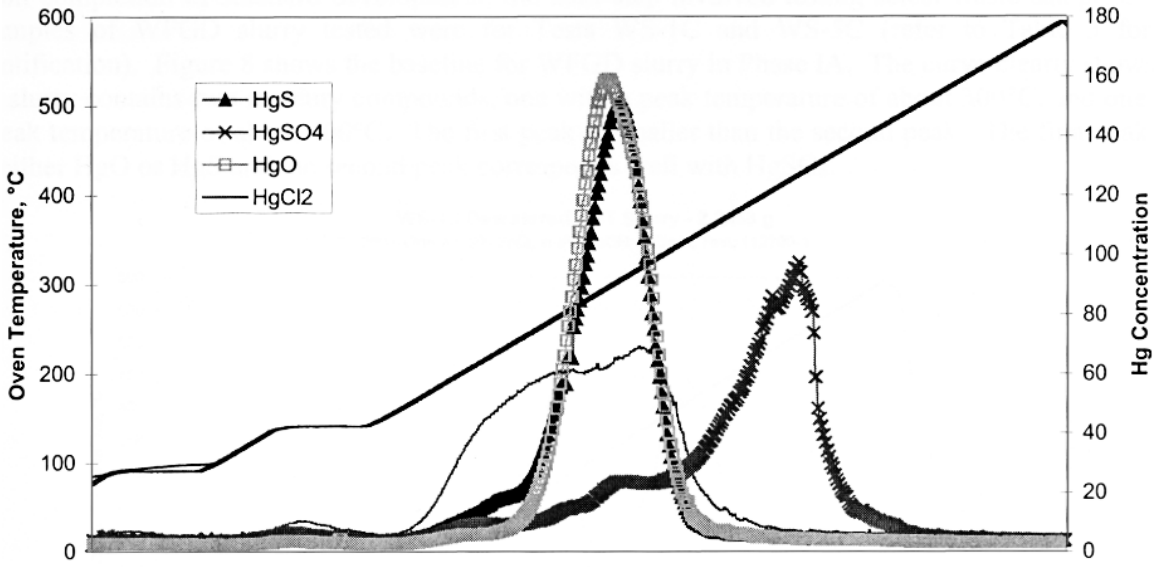

Figure 2. Thermal desorption of mercury compounds in argon.[2]