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PREVENTION OF SIGNIFICANT DETERIORATION PERMIT APPLICATION 737 LINE EXPANSION

Spirit AeroSystems, Inc.
Wichita, Kansas

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RAMBOLL ENVIRON

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1. INTRODUCTION

Spirit AeroSystems, Inc. (Spirit) operates an aerospace parts and assemblies manufacturing facility located at and around the intersection of South Oliver Street and East MacArthur Road in Wichita, Kansas. Figure 1-1 shows the general location of the facility in the Wichita area and Figure 1-2 shows the location of the facility relative to Sedgwick County.

In February 2012, Spirit was issued a permit to construct an expansion of the 737 production line from 31 to 42 airplane fuselages per month (APM) via a debottlenecking of the assembled fuselage paint booth, CAMO I Paint Area (EU-2309K-P1). This debottlenecking was accomplished through the construction and operation of a separate paint booth handling the same work as CAMO I Paint Area: the North Plant 2 Booth (EU-2297F-B7) along with other assembly and fabrication emission units. Spirit was then issued subsequent updated version of this permit when the design of the expansion required installation of new sludge dryers to handle waste from the tank line in September 2012, a second regenerative thermal oxidizer (RTO) for the CAMO1 paint area (third overall for the permit) in November 2012 and additional carbon beds for emissions control of the chemical milling maskant spray booth in May 2013. At the time of issuance for this permit and subsequent updates, Spirit was considering plans to expand the 737 fuselage production further. Since this further expansion was not an economic reality at the time of the 31 to 42 APM expansion and no specific design plans were completed, Spirit could not permit this further expansion.

Spirit is now planning to produce 737 fuselages at a further expanded rate of 57 APM. Since plans for this further expansion were documented in 2012 but not finalized or acted upon until now, Spirit is permitting this expansion from the current 737 fuselage production rate of 42 to 57 APM in combination with the originally permitted expansion of 31 to 42 APM. This makes the effective 737 fuselage rate increase for this Prevention of Significant Deterioration (PSD) permit application 31 to 57 APM.

The modifications Spirit made in order to increase their 737 airplane fuselage production from 31 to 42 APM are accounted for in the May 2013 737 construction permit (C-11237) and include:

A. Three Adwest Technologies, Inc. RTOs, Model RETOX 25.0 RTO97, 7.3695 one million British thermal units (MMBtu)/hour (hr) burner capacity, natural gas-fired. Units controlling CAMO I (EU-2309K-P1) are designated CE-2309K-P1FN and CE-2309K-P1FS.

B. One new paint booth designated EU-2297F-B7, used for surface coating of 737 fuselages. Particulate matter (PM) emissions will be controlled by fabric filters (CE-2297F-B7) and volatile organic compound (VOC) emissions from interior spray coating operations will be controlled by an RTO (CE-2297F-B7F).

C. Two new chord trimmers, designated EU-3193G-PM31 and 32. PM emissions will be controlled by cyclone/filter units (CE-3193G-PM31 and 32).

D. One new Modig WZY model extrusion mill, designated EU-2280J-PM33. PM emissions will be controlled by a fabric filter (CE-2280J-PM33).

E. Two new Makino A7 MAG7 model Hi-speed mills, designated EU-2280J-PM49 and 50. PM emissions will be controlled by cyclone/filter units (CE-2280J-PM49 and 50).

F. One new Mazak Vortex 6-axis mill, designated EU-2280J-PM51. PM emissions will be controlled by a cyclone/filter unit (CE-2280J-PM51).

G. One new Trim and Drill Machine with 40 foot T-slot/40 foot Pogo, designated EU-2280J-PM52. PM emissions will be controlled by a fabric filter (CE-2280J-PM52).

H. One new induced draft cooling tower, designated EU-2280J-CT1.

I. Two new natural gas fired sludge dryers, each with a maximum design heat input rate of 0.408 MMBtu/hr designated EU-55028-PM4 and 5.

J. One new carbon adsorption system (CAS) (designated CE-CARBON2) is being added in parallel to the existing CAS (CE-CARBON1). Which will both control emissions from the existing MPF Spray Maskant Operation (designated EU-2278M-MSK).

In addition to these emission units, Spirit is proposing to install and operate the following emission units in order to reach the 737 airplane fuselage production rate of 57 APM:

K. One additional new Trim and Drill Machine with 40’ T-slot/40’ Pogo, designated EU-2280J-PM53. PM emissions will be controlled by a fabric filter (CE-2280J-PM53).

L. One new Robotic Drill, designated IA-3187S-PM22.

M. One Clean Up Sanding Booth, designated IA-3187S-PM23. PM emissions will be controlled by a fabric filter (CE-3187S-PM23).

N. One combination Spray Booth/Oven, designated EU-3187S-B4. The booth will be heated by a 6 MMBtu/hr natural gas-fired burner. PM emissions will be controlled by a fabric filter (CE-3187S-B4).

The last modification Spirit proposes for this 737 line expansion is a material substitution for the current primer used in the CAMO1 Paint Area (EU-2309K-P1) and the North Plant 2 Booth (EU-2297F-B7). The current primer is designated BMS 10-11 Type 1 Grade E. The substitute primer formulation is designated BMS 10-11 Type 1 Grade A. This operation change will result in increased volatile organic compound (VOC) and certain hazardous air pollutant (HAP) emissions. Changes in emissions from this substitution are detailed in the CAMO1 and North Plant 2 Booth calculations in Appendix B.

Table 1. 737 Expansion Project Emissions Summary

Emission Source	Projected VOC Emissions Change (tpy)	Projected PM Emissions Change (tpy)	Projected PM_{10} Emissions Change (tpy)	Projected $PM_{2.5}$ Emissions Change (tpy)	Projected NO_X Emissions Change (tpy)	Projected SO_2 Emissions Change (tpy)	Projected CO Emissions Change (tpy)	Projected Pb Emissions Change (tpy)	Projected GHG Emissions Change (tpy)	Projected GHG (CO_2e) Emissions Change (tpy)
CAMO 1 Paint Booth	19.77	0.41	0.41	0.41	13.44	0.04	5.32	0.00	8,702.57	8,718.09
North Plant 2 Booth	24.65	0.27	0.27	0.27	5.55	0.02	2.66	0.00	4,090.82	4,098.58
MPF Booths	16.78	0.14	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Materials Booth	1.15	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Hand Spray Maskant Booth	1.32	0.15	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00
CAMO 2 Paint Booth	3.72	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Hot House Booths	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IPB1 Booth	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IPB 2 Booths	1.36	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
IPB 4 Booths	14.34	0.11	0.11	0.11	1.18	0.01	0.99	0.00	1,411.76	1,414.68
Plant 2 Booths	13.33	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Polish Palace Booth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Assembly / Fabrication Sources	0.00	19.81	11.85	7.89	0.00	0.00	0.00	0.00	0.00	0.00
2 New Sludge Dryers	0.02	0.03	0.03	0.03	0.35	0.00	0.29	0.00	420.49	421.35
Total Increase (Step 1)	**97.14**	**20.94**	**12.98**	**9.02**	**20.51**	**0.07**	**9.26**	**0.00**	**14,625.64**	**14,652.70**
Contemporaneous Emissions Change (Step 2)	**11.37**									
Net Emissions Change	**108.50**									
PSD Threshold	**40**	**25**	**15**	**10**	**40**	**40**	**40**	**0.6**	**NA**	**75,000**

Figure 1-1: Facility Location (county)

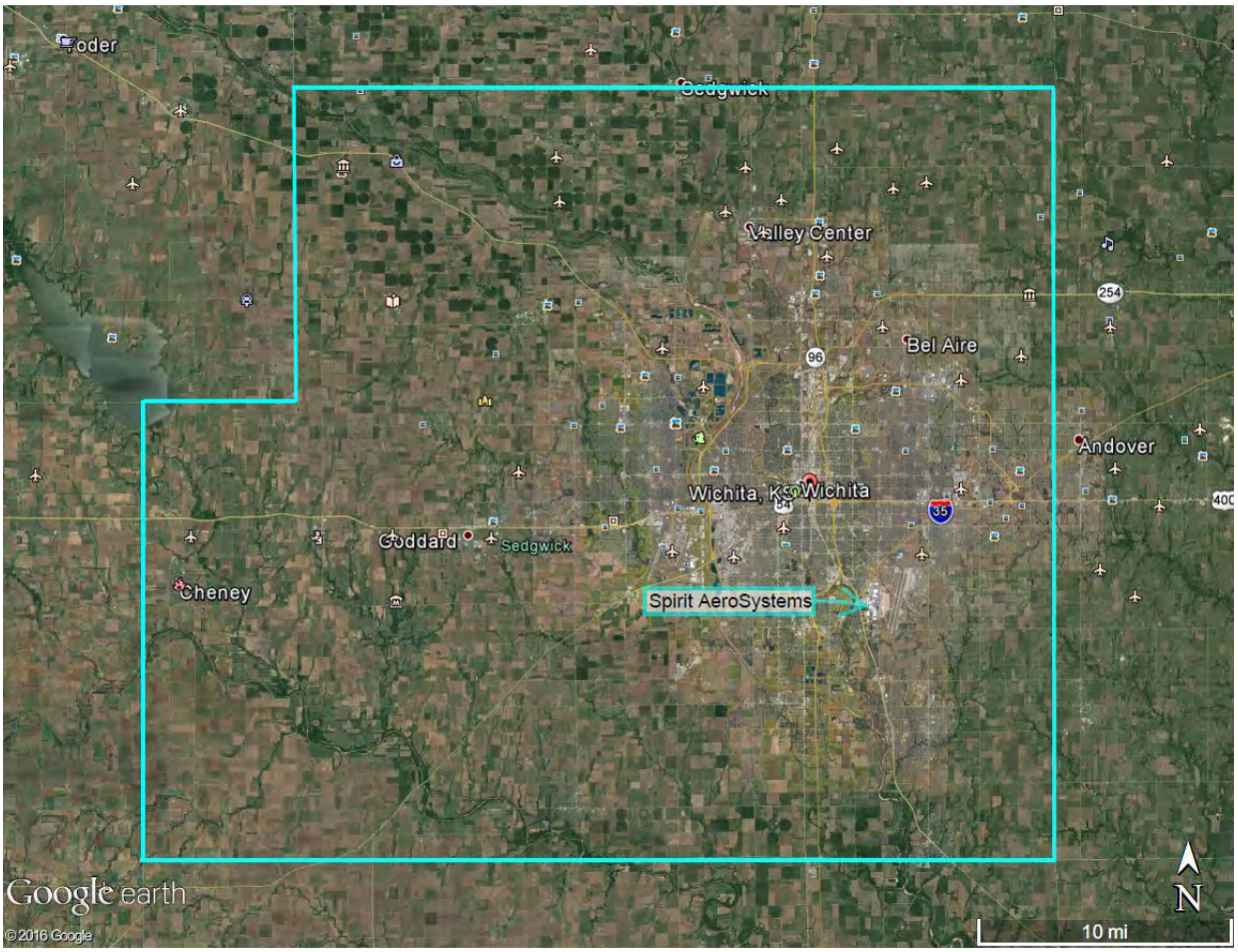
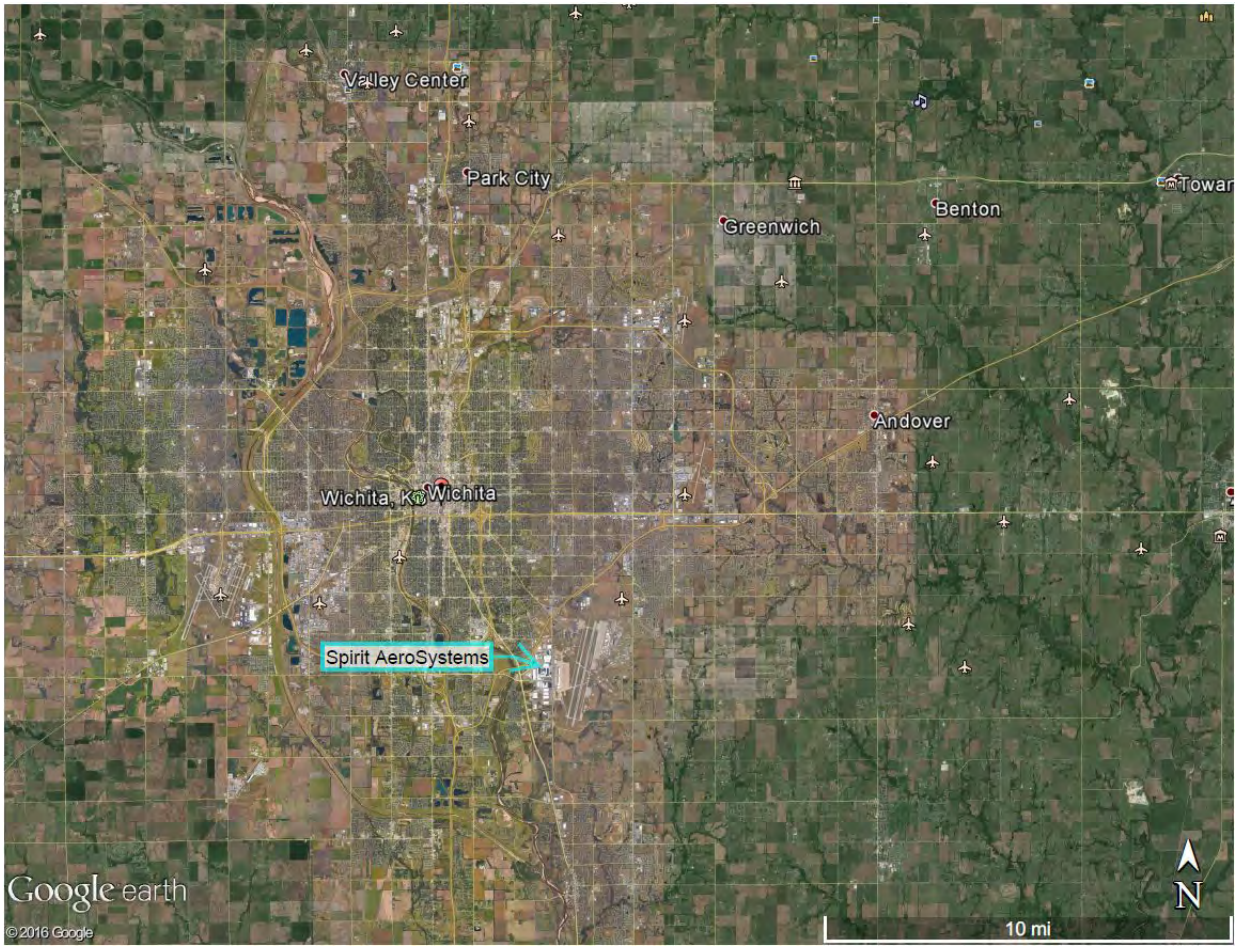


Figure 1-2: Facility Location (city)



2. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

Federal PSD regulations (40 CFR 52.21(j)) and State of Kansas regulations (K.A.R. 28-19-350) require the use of Best Available Control Technology (BACT) to minimize the emissions of regulated PSD pollutants from a new major stationary source or a major modification occurring at an existing major stationary source. For a major modification, BACT shall be applied to each proposed emission unit for each regulated NSR pollutant for which the modification would result in a significant net emissions increase.

The project is a major modification under the PSD regulations and potential emissions of VOCs exceed their respective PSD significance threshold rates; therefore, requiring a BACT analysis. This analysis addresses the BACT chosen for each subject emission unit for the proposed project.

BACT is only applied to emission units that are new or existing and undergo a physical or operational change that results in the increased emissions. For the 737 Expansion Project, the new emission units are North Plant 2 Booth, two natural gas fired sludge dryers rated at 0.408 MMBtu/hr each and a combination spray booth and oven (IPB4 Spoven). Therefore, BACT is triggered for VOC emissions from these emission units. VOC emission increases that result from increased utilization of existing emission units are not subject to BACT requirements. Emission units subject to a BACT analysis are in the table below.

Table 2. Units Subject to BACT Analysis

Emission Unit	Source ID	Pollutant Loading	Size
North Plant 2 Booth	EU-2297F-B7	10.94 lb/hr (5.1 ppmv)	150,000 standard cubic feet per minute (scfm)
Natural Gas Sludge Dryers	EU-55028-PM4 EU-5528-PM05	- -	0.408 MMBtu/hr 0.408 MMBtu/hr
IPB4 Spoven Booth IPB4 Spoven Oven	EU-3187S-B4	0.61 lb/hr (1.1 ppmv) -	40,000 scfm 6 MMBtu/hr

This BACT analysis considers those technologies that reduce VOC emissions from the coating operations that will take place in the new paint booths. The analysis also considers VOCs emissions that result from combustion equipment. The two sludge dryers will be fired on natural gas, each with a heat input rating of 0.408 MMBtu/hr when operating at full load and assumed to operate 8,760 hrs/year. The

oven associated with IPB4 Spoven will be fired on natural gas with a heat input of 6 MMBtu/hr at full load and assumed to operate 24 hrs a day, 250 days/year.

2.1 Detailed Top-Down BACT Analysis Process

BACT is defined at 40 CFR 52.21(b)(12) as "an emissions limitation … based on the maximum degree of reduction for each pollutant subject to regulation under this Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant." Therefore, a BACT analysis is conducted on a case-by-case basis and represents an evaluation of the degree of emissions reductions that each available emissions-reducing technology or technique would achieve, as well as the energy, environmental, economic and other costs associated with each technology or technique.

For a specific pollutant emitted by an emission unit, a BACT analysis can result in the selection of a specific control device or a design, equipment, work practice or operational standard. A numerical emissions limitation is typically established; however, in some cases a numerical emission limitation is not feasible, such as for work practice standards or when technical or economic factors limit the application of a measurement methodology.

The BACT analysis is performed on a pollutant-specific basis for each emission unit requiring BACT. This BACT analysis generally follows the widely-accepted, though not required, procedure referred to as the "top-down" BACT process. After identifying all available and technically feasible technologies or techniques that have been or can be applied to the type of emission unit under consideration or to a similar emissions source, the top-down BACT process starts with consideration of the technology that would achieve the maximum degree of emissions limitation (lowest emission rate). The top-ranked technology that is considered technically available may be eliminated based on costs, economics, environmental impacts and/or energy impacts. If the top-ranked technology is not chosen, then the BACT analysis proceeds to the next most stringent technology. This analysis continues until a BACT decision is reached.

The following steps provide a general outline of the top-down BACT process:

<u>Step 1 - Identify Potential Control Technologies</u>

The first step in the top-down BACT analysis is to define the spectrum of process and/or add-on emissions control alternatives that will be considered potentially

applicable to the emission unit. Under the statutory definition of BACT, "in no event shall application of 'best available control technology' result in emissions of any pollutants which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61." Consequently, an applicable New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP) emission limitation represents a "floor" or "baseline" when making a BACT determination. Consistent with this concept, this BACT analysis does not identify in Step 1 any control technology that, at a minimum, would not comply with NSPS and/or NESHAP emission limitations applicable to the emission unit.

Step 2 - Eliminate Technically Infeasible Options

The second step is to evaluate the technical feasibility of the alternatives identified in Step 1 and to eliminate any options that are technically infeasible based on engineering evaluation or due to chemical or physical principles. Criteria such as the following may be considered in determining technical feasibility: previous commercial scale demonstrations, precedents based on previous permits and technology transfer from similar emission units. Technologies which have not yet been applied to full scale operations need not be considered available; an applicant should be able to purchase or construct a process or control device that has already been demonstrated in practice.

When evaluating the technical feasibility of a technology that has been operated successfully on a type of source different than the source type under review, the Unites States Environmental Protection Agency (USEPA) has indicated that the "availability" and "applicability" of the technology to the source type under review should be considered in order to eliminate the technology as technically infeasible. For this situation, USEPA stated in its March 2011 PSD and Title V Permitting Guidance for Greenhouse Gases that it "considers a technology to be 'available' where it can be obtained through commercial channels or is otherwise available within the common meaning of the term." In the same document, USEPA stated that it "considers an available technology to be 'applicable' if it can reasonably be installed and operated on the source type under consideration."

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

In Step 3, the alternatives are rank-ordered into a control hierarchy from most to least stringent. To the extent practical, this involves an assessment and documentation of the emissions control level or emissions limit achievable with each technically feasible alternative, considering the specific operating constraints of the emission units undergoing review. Generally accepted control efficiencies or ranges of control efficiencies are presented where control efficiencies vary and/or detailed information for the specific emission unit is not available.

Step 4 - Evaluate Most Effective Control Options and Document Results

A top-ranked control alternative may be rejected as BACT based on a consideration of cost, economic, environmental and energy impacts. If the top-ranked alternative is not selected as BACT, the applicant should document the evaluation of the cost, economic, environmental and/or energy impacts that leads to its rejection. If a control technology is determined to be infeasible based on high cost effectiveness, or to cause adverse economic, energy or environmental impacts that would outweigh the benefits of the additional emissions reduction as compared to a lower ranked control, then the control technology is rejected as BACT and the next most stringent control alternative is considered in turn. Both average cost effectiveness and incremental cost effectiveness may be considered for the control alternatives. Cost effectiveness is the cost of control (in dollars ($)) divided by the mass of emissions (in tons) reduced or eliminated by that control. For a specific control technology, average cost effectiveness is the cost ($ per ton) that would be incurred compared with baseline conditions (i.e. either uncontrolled or at the control level that would be required in the absence of BACT, such as NSPS or NESHAP standards). Incremental cost effectiveness is the difference in cost per ton of emissions reduced at the next most stringent level of control, when comparing two control options.

Step 5 - Select BACT

BACT is identified as the option with the highest control effectiveness that was not eliminated in Step 4. Once the control technology, process or work practice is selected, a BACT emission limit is established, if appropriate, considering what is achievable over the range of operating conditions anticipated.

In practice, each step may not apply to each BACT analysis, and the steps may be overlapping, combined, or undertaken in a different order depending on the specific emission units and considerations involved.

The following table summarizes BACT analyses for all VOC emissions from emission units impacted by this project.

Table 3. Summary of BACT

Emission Unit	Source ID	BACT	VOC Emission Limit
North Plant 2 Booth	EU-2297F-B7	ECEs with an RTO and Compliance with the Aerospace NESHAP	24.48 tons per year (tpy)
Natural Gas Sludge Dryers	EU-55028-PM4 EU-5528-PM05	Clean burning fuels and good combustion practices	0.0054 lb/ MMBtu
IPB4 Spoven Booth	EU-3187S-B4	Compliance with the Aerospace NESHAP	2.68 tpy
IPB4 Spoven Oven	EU-3187S-B4	Clean burning fuels and good combustion practices	0.0054 lb/MMBtu

2.2 BACT for North Plant 2 Booth

North Plant 2 Booth will be used to coat parts in both the interior and exterior of Boeing 737 fuselages. The booth will operate 24 hours per day, 296 days per year and has an exhaust flow rate of 150,000 scfm.

Step 1 - Identify All Control Technologies

The first step in a top-down analysis is to identify all available control options. Available control options are air pollution control technologies or techniques with a practical potential for application to the emission units and emission limits being evaluated.

A control technology is technically feasible if it has been previously installed and operated successfully at a similar type of source of comparable size, or there is a technical agreement that the technology can be applied to the source. Available and applicable are the two terms used to define the technical feasibility of a control technology. Below is a list of sources reviewed for possible control technologies that are available on the market and proven practice in the aerospace industry:

- BACT database from USEPA RACT/BACT/LAER Clearinghouse (RBLC);
- BACT determinations from California Air Resources Board (CARB);
- BACT Determinations from South Coast Air Quality Management District (SCAQMD); and
- PSD permits issued by the State of Washington Department of Ecology.

RBLC

USEPA's RBLC was searched for the previous ten years (2006 – 2016) process 41.001 Aerospace Surface Coating and the list is included in Appendix C. Similar aerospace facilities identified determined compliance with the Aerospace NESHAP as BACT for their VOC emissions. No aerospace facilities were identified as using add-on control equipment for VOC control, so the search was expanded for the past twenty years (1996 - 2016). Several add-on technologies were identified, including thermal oxidizers (TO), adsorption systems, regenerative thermal oxidizers (RTO), concentrators with RTO and compliance with the Aerospace NESHAP.

CARB

The CARB BACT database did not contain any BACT determinations for aerospace coating operations. The search was expanded to include spray booths, a list is included in Appendix C. Several add-on technologies were identified, including TOs, RTOs, concentrators with an RTO and adsorption systems.

SCAQMD

Aerospace permits are included in the Spray Booth category in the SCAQMD database of BACT determinations, a list is included in Appendix C. Add-on controls for paint booths at these aerospace facilities include adsorption systems, TOs and a concentrator with an RTO.

State of Washington Department of Ecology

A search of the state of Washington's Department of Ecology website for aerospace facilities identified a PSD permit issued to Boeing's Everett facility on September 10, 2014. The permit identifies BACT for VOCs as complying with the Aerospace NESHAP. The large paint booths included in this PSD application are very similar to the North Plant 2 paint booth at Spirit. Three Boeing paint booths have an exhaust flow rate of over 140,000 scfm and VOC emissions exceeding 24 tpy each. Additionally, the Department of Ecology issued Boeing's Renton facility a PSD permit on February 19, 2013, that identified BACT as compliance with all applicable VOC emission standards of the Aerospace NESHAP.

Emissions Control Enclosures with an RTO

The unique operations at Spirit have allowed for the use of emissions control enclosures (ECEs). The cargo doors of a 737 fuselage can each be sealed with an ECE and emissions generated during coating operations inside the fuselage are routed through these to a filter bank and RTO. The RTO is sized to handle flow from the interior of the fuselage and therefore can be much smaller than a control device

sized to handle exhaust from the entire paint booth. This technology is essentially a booth within a booth and is only available for interior coating of the 737 fuselage.

List of Control Technologies

A combination of these searches determined that the control technologies below have been achievable and feasible:

1) TO;
2) Adsorption System;
3) RTO;
4) Concentrator with an RTO;
5) Compliance with the Aerospace NESHAP; and
6) ECEs with an RTO.

Step 2 - Eliminate Technically Infeasible Options

Step 2 involves the evaluation of identified available control technologies to determine their technical feasibility. All control options were determined to be technically feasible.

Step 3 - Rank Remaining Control Technologies by Effectiveness

The identified control technologies are listed below in order based on the control efficiencies achieved in practice.

Table 4. Identified Control Technologies

Control Technology	Control Efficiency	Control Efficiency Rank
RTO	99.3%	1
Adsorption System	99.3%	2
TO	98.9%	3
Concentrator with RTO	93.2%	4
ECEs with an RTO	48.9%*	5
Compliance with the Aerospace NESHAP	N/A	6

*As determined for the North Plant 2 Booth

Step 4 - Evaluate Most Effective Controls

Each technically feasible control technology was evaluated for cost effectiveness and energy, environmental and economic impacts. These are discussed for each control technology and summarized below.

RTO

RTOs use high-density media such as a ceramic-packed bed still hot from a previous cycle to preheat an incoming VOC-laden waste gas stream. The preheated, partially oxidized gases then enter a combustion chamber where they are heated by auxiliary fuel (natural gas) combustion to a final oxidization temperature typically between 1,400 and 1,500°F and maintained at this temperature to achieve maximum VOC destruction. Advantages include lower fuel requirements because of high energy recovery and higher VOC destruction due to high operating temperatures. Lower control efficiencies are generally associated with lower concentration flows. Cost estimates on the high end in USEPA's Incinerator Fact Sheet ($17,000 per ton of VOC removed, in 2002 dollars) are for low concentration waste streams (less than 100 ppmv).[1]

An RTO was evaluated for the Control Cost Effectiveness on the North Plant 2 Booth using USEPA guidance for incinerators.[2] Results are summarized below and in Appendix C.

Table 5. Cost Effectiveness of RTO for North Plant 2 Booth

Unit	Baseline Potential to Emit (PTE) Emissions (tpy)	RTO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	99.3%	0.34	47.56	$91,279.83

USEPA's cost model for incinerators applies to units with a flow rate of between 10,000-100,000 scfm. The cost of an incinerator is directly proportional to the flow rate. Since the North Plant 2 Booth exhaust flow rate is 150,000 scfm, an equation from Estimating Costs of Air Pollution Control, by William Vatavuk, was used.[3] As anticipated, USEPA's predicted values are high since the pollutant loading for North Plant 2 Booth is very low (less than 8 ppmv).

Based on the results above, Spirit rejects an RTO as BACT based upon the cost analysis.

[1] USEPA-CICA Air Pollution Control Technology Fact Sheet (EPA-452/F-03-021)
[2] VOC Destruction Controls (EPA/452/B-02-001) September 2000
[3] Estimating Costs of Air Pollution Control, William Vatavuk, 1990

Adsorption System

The next on the list of control technologies is an adsorption system. Adsorption systems remove gaseous pollutants from an air stream by transferring the pollutants to the solid surface of an adsorbent. Common adsorbents include activated carbon and zeolite.[4] Adsorption systems are useful for high-flow, low-concentration exhaust streams. USEPA has developed cost estimates for activated carbon only, not zeolite or any other type of media. Therefore, an active carbon adsorption system was evaluated for the control cost effectiveness on the North Plant 2 Booth based on USEPA's Control Cost Manual, September 1999 edition. Results are summarized below and in Appendix C.

Table 6. Cost Effectiveness of CAS for North Plant 2 Booth

Unit	Baseline PTE Emissions (tpy)	Carbon Adsorber Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	99.3%	0.34	47.56	$59,859.23

USEPA's cost model for carbon absorber applies to units with a flow rate up to 100,000 scfm. Since the North Plant 2 Booth exhaust flow rate is 150,000 scfm, costs for the carbon adsorption system are anticipated to be much higher. The costs for an adsorption system increase with the number of canisters required. Since North Plant 2 Booth's flow rate is so high, a large number of canisters is required for pollution control.

Based on the results above, Spirit determined that a carbon adsorption system is infeasible based upon the cost analysis.

Thermal Oxidizer

The next control option is thermal oxidation. Thermal oxidation is the process of oxidizing combustible materials by increasing the temperature of the material above its auto-ignition point in the presence of oxygen and maintaining it at high temperature for sufficient time to complete combustion to CO_2 and water. Typical gas flow rates range from 500 to 50,000 scfm. Thermal incinerators are not generally cost-effective for low-concentration, high flow organic vapor streams,

[4] Cfpub.epa.gov/oarweb/mkb/contechnique.cfm?ControlID=3

because auxiliary fuel is needed to maintain combustion temperatures in low concentration vapor streams.[5]

Since the VOC concentration in the exhaust flow is so low, the auxiliary fuel requirement is estimated to be 100% of the exhaust flow rate. This has inherent excessive energy, environmental and economic impacts, but a TO was still analyzed for cost effectiveness. A TO was evaluated using USEPA's Cost Control Manual, September, 2000 edition. Results are summarized below and in Appendix C.

Table 7. Cost Effectiveness of TO for North Plant 2 Booth

Unit	Baseline PTE Emissions (tpy)	TO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	98.9%	0.53	47.37	$9,208,332.86

USEPA's cost model for TO applies to units with a flow rate up to 50,000 scfm. Since the North Plant 2 Booth exhaust flow rate is 150,000 scfm, costs associated with a TO for control of the low-concentration, high flow from North Plant 2 Booth are excessive. The excessive costs are due to the annual natural gas requirement for the TO.

Based on the results above, Spirit rejects a TO for the North Plant 2 Booth based upon the cost analysis.

<u>RTO with Concentrator</u>

A concentrator is used when VOC exists in large air flow and must be concentrated before it can be incinerated economically.[6]

A concentrator with an RTO was evaluated for the control cost effectiveness on the North Plant 2 Booth. Since there is no guidance for estimating costs of a concentrator, an analysis was done for the existing RTO system with reduced control efficiency. Results are summarized below and in Appendix C.

[5] USEPA-CICA Fact Sheet, Thermal Incinerator. USEPA-452/F-03-022
[6] Technical Bulletin - Choosing an Adsorption System for VOC. USEPA 456/F-99-004. May 1999

Table 8. Cost Effectiveness of RTO with Concentrator for North Plant 2 Booth

Unit	Baseline PTE Emissions (tpy)	Concentrator with RTO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	93.2%	3.26	44.64	$97,254.16

Based on the results above, Spirit determined that a concentrator with an RTO is infeasible based upon the cost analysis.

ECEs with an RTO

The unique operations at Spirit allowed for development of an additional control technique, ECEs. The ECEs marry up to the cargo doors of the fully assembled fuselage and the passenger doors and windows are sealed so that the airflow and the paint emissions are isolated within the fuselage. This concentrates the VOC emissions before exhausting to an RTO. The RTO is sized for 25,000 scfm flow through the fuselage and not the entire booth. Results are summarized below and in Appendix C.

Table 9. Cost Effectiveness of RTO with ECEs for North Plant 2 Booth

Unit	Baseline PTE Emissions (tpy)	ECEs with RTO Control Efficiency	Controlled Emission Rate (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	48.9%	24.48	$19,438.26

Spirit has evaluated these control costs and has determined that these costs are acceptable.

Compliance with Aerospace NESHAP

Aerospace NESHAP sets VOC limits in one of three ways: on a lb/gallon basis in primer and topcoats, requires a destruction efficiency in an emissions control system, or allows VOC limits through emissions averaging. Other requirements include specific paint application equipment, cleaning operations and good work practices. Paint applications include high efficiency methods equivalent to HVLP or electrostatic spray. Good work practices include storing coatings and solvents in

closed containers, bagging solvent wipe-cleaning rags when not in use and capturing and containing solvent used to clean equipment.

Spirit already complies with the Aerospace NESHAP for both North Plant 2 Booth. Spirit will continue to implement the use of low-VOC coatings, high-transfer-efficiency coating equipment and good work practices to minimize VOC emissions in compliance with the Aerospace NESHAP.

Step 5 - Select BACT

Based on the preceding analysis, Spirit proposes a combination of control technologies, ECEs and RTOs and compliance with the Aerospace NESHAP, as BACT for VOC emissions that result from coating operations in North Plant 2 Booth.

BACT VOC emission limits identified in the BACT databases discussed earlier range from tons per year to pounds per gallon. As stated in USEPA's Memorandum "Technology Review for Primer and Topcoat Application Operations in the Aerospace Source Category," dated Dec. 31, 2014:

> *"…as outlined in the Aerospace CTG [Control Technique Guidelines], the types of coatings used in the aerospace industry will vary significantly as each coating must meet individual performance standards particular to a specific design…Manufacturers of aerospace vehicles are constrained to using certain types of primers and topcoats based on the market segment for which the coating is intended…Other considerations that differ between and within market segments include the weight of the aircraft, aesthetics, the level of airworthiness and safety of the final product and many others."*

Therefore, Spirit proposes BACT to be the projected actual emissions from the North Plant 2 Booth resulting from coating 57 APM.

The table below presents the proposed BACT control technology and emission limits for North Plant 2 Booth.

Table 10. BACT for North Plant 2 Booth

Emission Unit	Source ID	BACT	Emission Limit
North Plant 2 Booth	EU-2297F-B7	ECEs with an RTO and Compliance with the Aerospace NESHAP	24.48 tpy

Spirit will continue to implement the use of low-VOC coatings, high-transfer-efficiency coating equipment and good work practices to minimize VOC

emissions in compliance with the Aerospace NESHAP. These requirements are listed in the following table:

Table 11. Aerospace NESHAP Requirements

North Plant 2 Booth
Handling and transfer of primers and topcoats shall be done in such a manner that minimizes spills. 40 CFR 63.745(b)
The RTOs shall reduce the VOC emissions to the atmosphere by > 81%, taking into account the capture and destruction efficiencies. 40 CFR 63.745(d)
The facility shall comply with the monitoring requirements specified in 40 CFR 63.751(b)(8) through (12), as applicable
In accordance with 40 CFR 63.6(e) and 63.743(b), a startup, shutdown and malfunction plan shall be prepared for each RTO

2.3 BACT for the IPB4 Spoven Booth

The IPB4 Spoven Booth will be used to coat parts for the Boeing 737 aircraft. The booth will operate three shifts per day, 250 days per year and has an average exhaust flow rate of 40,000 scfm. Parts will be coated in the IPB4 Spoven, the operators will then exit the booth, and switch the booth to cure mode which will turn on the indirect natural-gas-fired burners fed to the booth. Ventilation is used to comply with OSHA's chrome exposure standards.

Step 1 - Identify All Control Technologies

The same control technologies identified for the North Plant 2 Booth are applicable to the IPB4 Spoven Booth with the exception of the ECEs. The ECE technology is only available for booths that coat the interior of a complete 737 fuselage such as the North Plant 2 Booth and not booths that coat relatively small parts and assemblies like the IPB4 Spoven Booth.

List of Control Technologies

The control technologies below have been achievable and feasible:

1) TO;
2) Adsorption System;
3) RTO;
4) Concentrator with an RTO; and
5) Compliance with the Aerospace NESHAP.

Step 2 - Eliminate Technically Infeasible Options

Step 2 involves the evaluation of identified available control technologies to determine their technical feasibility. All control options were determined to be technically feasible.

Step 3 - Rank Remaining Control Technologies by Effectiveness

The identified control technologies are listed below in order based on the control efficiencies achieved in practice.

Table 12. Control Technologies Identified for the IPB4 Spoven Booth

Control Technology	Control Efficiency	Control Efficiency Rank
RTO	99.3%	1
Adsorption System	99.3%	2
TO	98.9%	3
Concentrator with RTO	93.2%	4
Compliance with the Aerospace NESHAP	N/A	5

Step 4 - Evaluate Most Effective Controls

Each technically feasible control technology was evaluated for cost effectiveness and energy, environmental and economic impacts. These are discussed for each control technology and summarized below.

RTO

An RTO was evaluated for the Control Cost Effectiveness on the IPB4 Spoven Booth using USEPA guidance for incinerators.[7] Results are summarized below and in Appendix C.

Table 13. Cost Effectiveness of the RTO on IPB4 Spoven Booth

Unit	Baseline PTE Emissions (tpy)	RTO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
IPB4 Spoven	2.68	99.3%	0.02	2.66	$225,878.53

[7] VOC Destruction Controls (EPA/452/B-02-001) September 2000

Based on the results above, Spirit rejects an RTO as BACT based upon the cost analysis.

Adsorption System

An activated carbon adsorption system was evaluated for control cost effectiveness on the IPB4 Spoven Booth based on USEPA's Control Cost Manual, September 1999 edition. Results are summarized below and in Appendix C.

Table 14. Cost Effectiveness of CAS for IPB4 Spoven Booth

Unit	Baseline PTE Emissions (tpy)	Carbon Adsorber Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
IPB4 Spoven Booth	2.68	99.3%	0.02	2.66	$260,894.15

Based on the results above, Spirit determined that a carbon adsorption system is infeasible based upon the cost analysis.

Thermal Oxidizer

A TO was evaluated for the control cost effectiveness on the IPB4 Spoven Booth using USEPA's Cost Control Manual, September, 2000 edition. Results are summarized below and in Appendix C.

Table 15. Cost Effectiveness of TO for the IPB4 Spoven Booth

Unit	Baseline PTE Emissions (tpy)	TO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
IPB4 Spoven Booth	2.68	98.9%	0.03	2.65	$43,922,850.16

The excessive costs are due to the annual natural gas requirement for the TO. Based on the results above, Spirit rejects a TO for the IPB4 Spoven Booth based upon the cost analysis.

RTO with Concentrator

A concentrator with an RTO was evaluated for the control cost effectiveness on the IPB4 Spoven Booth. Since there is no guidance for estimating costs of a concentrator, an analysis was done for the existing RTO system with reduced control efficiency. Results are summarized below and in Appendix C.

Table 16. Cost Effectiveness of RTO with Concentrator for IPB4 Spoven Booth

Unit	Baseline PTE Emissions (tpy)	Concentrator with TO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Technology Cost Effectiveness ($/ton VOC Removed)
IPB4 Spoven Booth	2.68	93.2%	0.18	2.50	$240,662.42

Based on the results above, Spirit determined that a concentrator with an RTO is infeasible based upon the cost analysis.

Compliance with Aerospace NESHAP

As with all other applicable booths across its facility, Spirit will continue to implement the use of low-VOC coatings, high-transfer-efficiency coating equipment and good work practices to minimize VOC emissions in compliance with the Aerospace NESHAP.

Step 5 - Select BACT

Spirit proposes the only viable control option for the IPB4 Spoven Booth, compliance with the Aerospace NESHAP, as BACT. Spirit proposes BACT to be the projected actual emissions from IPB4 Spoven Booth resulting from coating 57 APM.

The table below presents the proposed BACT control technology and emission limits for IPB4 Spoven.

Table 17. BACT for IPB4 Spoven Booth

Emission Unit	Source ID	BACT	Emission Limit
IPB4 Spoven Booth	EU-3187S-B4	Compliance with the Aerospace NESHAP	2.68 tpy

Spirit will continue to implement the use of low-VOC coatings, high-transfer-efficiency coating equipment and good work practices to minimize VOC emissions in compliance with the Aerospace NESHAP. These requirements are listed in the table below.

Table 18. Aerospace NESHAP Requirements for IPB4 Spoven Booth

IPB4 Spoven
Handling and transfer of primers and topcoats shall be done in such a manner that minimizes spills. 40 CFR 63.745(b)
Facility shall comply with coating content and application technique control requirements specified in 40 CFR 63.745 as appropriate.
VOC content level limits shall be demonstrated using the methods required by 40 CFR 63.750(e) or (f).

2.4 Sludge Dryers and IPB4 Spoven Oven BACT Review for VOCs

VOC emissions from natural gas-fired heaters are the result of incomplete combustion and can be reduced through the use of good combustion practices, including higher operating temperatures, longer residence times and turbulent mixing of fuel and combustion air. This section documents the top-down VOC BACT analysis conducted for the sludge dryers and the oven portion of the IPB4 Spoven.

Table 19. Emission Units Subject to BACT

Emission Unit	EU ID	Size
Natural Gas Sludge Dryers	EU-55028-PM4 EU-55028-PM5	0.408 MMBtu/hr each
IPB4 Spoven Oven	EU-3187S-B4	6 MMBtu/hr

<u>Step 1 - Identify Potential Control Technologies</u>

In a search of the RBLC database for the previous ten years (2006 - 2016), process 19.600 – Miscellaneous Boilers, Furnaces, Heaters, shown in Appendix C, only three potential BACT control options for VOC emissions were identified:

1) Gaseous fuels;
2) Good combustion practices; and
3) Combination of two previous options.

Step 2 - Elimination of Technically Infeasible Control Options

All three identified potential control technologies are found to be technically feasible and are considered in the remaining top-down BACT analysis.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

Because natural gas is the intended fuel as part of the initial project design and it is a gaseous fuel, no reductions are quantified for its use. The use of gaseous fuels is considered the base case, leaving good combustion practices as the only remaining and highest-ranking control technology option.

Step 4 - Evaluation of Cost and Other Impacts

The use of good combustion practices is an inherently efficient process, meaning there are no anticipated negative energy, environmental, or economic impacts associated with implementing this practice.

Step 5 - Selection of BACT

The VOC emission limit for similar units in RBLC ranges from 0.0033 to 0.008 lb/MMBtu (3.4 to 8.2 lb/MMcf). A third of the units proposed an emission limit of 0.0054 lb/MMBtu (5.5 lb/MMcf) or greater, based on the emission factor found in AP-42 Chapter 1.4.

Therefore, Spirit proposes to use the top ranked BACT option of clean burning fuels and good combustion practices as the control option for VOC emissions, with an annual average VOC emission limit of 0.0054 lb/MMBtu (5.5 lb/MMcf) for the natural gas sludge dryers and IPB4 Spoven Oven.

The table below presents the proposed BACT control technology and emission limits for Natural gas Sludge Dryers and IPB4 Spoven Oven.

Table 20. Summary of BACT for Combustion Units

Emission Unit	Source ID	BACT	Emission Limit
Natural gas Sludge Dryers	EU-55028-PM4 EU-5528-PM05	Clean burning fuels and good combustion practices	0.0054 lb/MMBtu
IPB4 Spoven Oven	EU-3187S-B4	Clean burning fuels and good combustion practices	0.0054 lb/MMBtu

3. ADDITIONAL IMPACTS ANALYSIS

In accordance with 40 CFR 52.21(o), Spirit analyzed the potential impairment to visibility, soils, and vegetation in the area that would occur as a result of the project, as well as the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the project.

40 CFR 52.21(p)(3) requires a visibility analysis if the project is located close to a Class I area. Although there are no Class I areas located within 300 km of Spirit, the potential for visibility impairment is discussed below.

3.1 Visibility, Vegetation and Soil Impacts

As required by the CAA amendments of 1990, EPA established secondary national ambient air quality standards (NAAQS) for pollutants to provide protection against decreased visibility and damage to animals, crops, vegetation, and buildings. EPA's New Source Review Workshop Manual states "For most types of soil and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects."[1] Only the VOC emissions from the project are subject to PSD review and VOC is regulated as a precursor to ozone. On October 1, 2015, EPA revised the primary and secondary ozone standard to 70 parts per billion (ppb).[2]

Ozone can affect vegetation through the direct exposure of plant to a gaseous pollutant in the ambient air. Effects of ozone can be classified as acute or chronic. Acute effects result from short-term exposures to relatively high concentrations while chronic effects result from exposure to lower concentrations for months to several years. Ozone also affects soil fertility by inhibiting plants' ability to metabolize carbon dioxide, which results in less carbon in the soil. Reduced carbon results in fewer soil microbes, and therefore, reduced microbial activities that are a function of soil fertility.

A study done by Kirk Baker estimates ozone impacts from hypothetical sources across the central and eastern U.S.[3] One hypothetical location is in south central Kansas, very close to the actual location of Spirit. The study

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[1] *United States Environmental Protection Agency.* New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting. *Web. 1990. <http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf>*

[2] https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf

[3] Baker, K.R., et al., Estimating ozone and secondary $PM_{2.5}$ impacts from hypothetical single source emissions in the central and eastern United States, Atmospheric Pollution Research (2015), http://dx.doi.org/10.1016/j.apr.2015.08.003

predicts a maximum daily 8-hour ozone peak impact of 0.1 ppb for an emission source of 500 tpy of VOCs. Additionally, modelling done for a permit application close to Oklahoma City for a facility with VOC emissions of 600 tpy found a maximum ozone increase of 0.1 ppb. A qualitative analysis of an ozone impact from emissions of 108 tpy estimates an increase of 0.02 ppb (0.1/500*(108)). An increase of 0.02 ppb of ozone is insignificant and unlikely to adversely affect vegetation in the area.

Assuming maximum impact of 0.1 ppb, and using the 3-year average of the 4th highest 8-hour ozone readings, the maximum ozone levels in the area are still protective of soils and vegetation, see table below.

Comparison of Background Ozone and Hypothetical Impacts

Monitor in Wichita MSA	Background (ppb)	Maximum Hypothetical Project Impact (ppb)	Background + Hypothetical Impact (ppb)	Secondary Ozone NAAQS (ppb)	Less than NAAQS?
Peck	67	0.1	67.1	70	Yes
Health Dept.	67		67.1		Yes
Sedgwick	67		67.1		Yes

Background data for ozone is from KDHE's Prevention of Significant Deterioration Permit Summary Sheet.

For visibility impairment, only some specific VOC species react to from secondary organic aerosols (SOAs). SOAs are a major component of fine particle pollution (PM2.5), the main cause of visibility impairment.[4] SOAs are formed when VOCs undergo gas-particle transfer in the atmosphere. Each VOC can undergo a number of atmospheric degradation processes to produce a range of oxidized products, which may or may not contribute to SOA formation and growth.[5] In general, aromatic species and biogenic species are the main SOA precursors. An analysis of the VOC speciation of the emissions from Spirit finds approximately 33% of the emissions are aromatic compounds. Considering only a small portion of these emissions will go on to further react and form SOAs, it is unlikely these emissions will impair visibility in the area.

In the state of Kansas in 2011, biogenic (natural emissions) of VOCs were 57% of total VOC emissions and industrial sources were 10% of VOC

[4] U.S. EPA Secondary Organic Aerosols (SOA) Research <*https://www.epa.gov/air-research/secondary-organic-aerosol-soas-research*>
[5] Hallquist, M., et al.,The formation, properties and impact of secondary organic aerosol: current and emerging issues, Atmos. Chem. Phys., 9, 5155–5236, 2009

emissions.[6] Total VOC emissions were 1,060,883 tpy, of which the project increase of 108 tons would be less than 0.01%.

As a result, impacts on local visibility, vegetation, and soils attributable to the project will be negligible.

3.2 Class I and Class II Areas

In August of 1977, the CAA designated national parks greater than 6,000 acres or national wilderness areas greater than 5,000 acres as Class I Areas with special protections.[7] These areas are granted the most stringent protection from deterioration of air quality. Protection of AQRVs in these areas is the responsibility of the Federal Land Managers (FLMs): U.S. Forest Service, National Park Service, and the U.S. Fish and Wildlife Service.

The State of Kansas Air Quality State Implementation Plan for Regional Haze, dated Oct. 26, 2009, states that "VOC is not anticipated to be a large contributor to visibility impairment in the Class I areas surrounding Kansas." Additionally, as mentioned above, only some specific long chain VOC species are PM/visibility precursors, and there are very few anticipated of these in VOC emissions from Spirit.

The Federal Land Managers' Air Quality Related Values Work Group (FLAG) issued guidance in 2010 that includes initial screening criteria that exempts sources from conducting an AQRV impact analysis. The screening criteria is called the Q/D Method and is a threshold ratio of emissions to distance. Q is the project's maximum 24-hour emission rate in tons per day converted to an annual emission rate, and D is the distance of the project to the area of concern, in kilometres. If the Q/D value is less than 10, the EPA stated that it would be reasonable to conclude that the source would not be considered to cause or contribute to visibility impairment for emissions of NO_x or SO_2.[8] The FLMs further expanded the screening criteria to all AQRV, not just visibility, for emissions of SO_2, NO_x, PM_{10} and H_2SO_4.

Although VOC is not included as a pollutant in the FLM guidance, the Q/D values for the nearest Class I areas and selected Class II areas are included in the table below.

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[6] U.S. EPA The 2011 National Emissions Inventory <*https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data*>

[7] U.S. Fish & Wildlife Service, National Wildlife Refuge System. <*https://www.fws.gov/refuges/airquality/permits.html*>

[8] Federal Land Managers' Qir Quality Related Values Work Group (FLAG) Phase I Report – Revised 2010

Area	Distance from Spirit (km)	Net Emissions Increase divided by Distance Q/D* (tpy/km)
Mingo National Wildlife Refuge (Class I)	740.1	0.15
Wichita Mountains Wildlife Refuge (Class I)	402.3	0.27
Salt Plains National Wildlife Refuge (Class II)	149.6	0.72
Quivira National Wildlife Refuge (Class II)	138.4	0.78
Tallgrass Prairie National Reserve (Class II)	128.7	0.84

**Annual emissions (Q) are 108 tpy*

As seen in the table above, if VOC emissions were considered in the screening criteria, all Q/D values are less than 10, and the project would have no significant adverse impacts on Class I and Class II areas.

3.3 Growth Analysis

The growth analysis is intended to review the potential impact that the project will have on industrial growth and associated secondary emissions in the vicinity of the facility. Secondary emissions are those that can occur as a result of the project or operation of the facility but are not emissions from the facility itself. It is not anticipated that the construction and operation of the project will result in excess secondary emissions during either the construction phase or the general operation of the facility.

Though traffic will increase both during the construction phase of the project and during operation, it is not anticipated that this traffic will cause an excessive amount of emissions from either exhaust or entrainment of particulate matter from the roads.

The facility is expected to provide 300-500 full-time positions staffed with workers already in the area; therefore, no additional housing or transportation growth is anticipated as a result of employment at the facility. Since the estimated population of metro Wichita is approximately 650,000, the addition of 500 employees is less than 0.08% of the surrounding area. Furthermore, there is no anticipated impact on public services. The construction period is estimated to be two to four years and will create approximately 50-200 construction jobs; however, these will be short-term, temporary impacts. Attempts will be made to hire primarily local and regional construction workers to the extent feasible. Consequently, no adverse long-term air quality impacts due to growth in the area are expected.

Spirit plans to employ local public works for electricity, municipal water supply, and sewer services at the facility. Since these services exist in the area, the Project is not expected to significantly impact services or infrastructure provided by local governments or municipalities.

Kansas Department of Health and Environment
Bureau of Air and Radiation
Phone (785) 296-1570 Fax (785) 291-3953

Notification of Construction or Modification

(K.A.R. 28-19-300 Construction permits and approvals; applicability)

Check one: X Applying for a Permit under K.A.R. 28-19-300(a) Applying for an Approval under K.A.R. 28-19-300(b)*

1) Source ID Number: 1730309

2) Mailing Information:
Company Name: Spirit Aerosystems, Inc.
Address: P.O. Box 780008, MC K06-94
City, State, Zip: Wichita, KS 67278-0008

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3) Source Location:
Street Address: 3801 Oliver
City, County, State, Zip: Wichita, Sedgwick, KS, 67210
Section, Township, Range:
Latitude & Longitude Coordinates:

4) NAICSC/SIC Code (Primary): 3721

5) Primary Product Produced at the Source: Aircraft components

6) Would this modification require a change in the current operating permit for your facility? X Yes No

If no, please explain:

7) Is a permit fee being submitted? X Yes No

If yes, please include the facility's federal employee identification number (FEIN #)

8) Person to Contact at the Site: Mr. Greg Sanks Phone: (316) 393-7032
Title: Sr. Environmental Engineer

9) Person to Contact Concerning Permit: Mr. Greg Sanks Phone: (316) 393-7032
Title: Sr. Environmental Engineer

Email: greg.g.sanks@spiritaero.com Fax: (316) 523-3640

Please read before signing:

Reporting forms provided may not adequately describe some processes. Modify the forms if necessary. Include a written description of the activity being proposed, a description of where the air emissions are generated and exhausted and how they are controlled. A simple diagram showing the proposed activity addressed in this notification which produces air pollutants at the facility (process flow diagrams, plot plan, etc.) with emission points labeled must be submitted with reporting forms. Information that, if made public, would divulge methods or processes entitled to protection as trade secrets may be held confidential. See the reverse side of this page for the procedure to request information be held confidential. A copy of the Kansas Air Quality Statutes and Regulations will be provided upon request.

Name and Title: Mr. Chris Ladwig, Director

Address: P.O. Box 780008, MC K06-94
Wichita, KS 67278-0008

Signature: Date: 3/22/16 Phone: (316) 523-0862

March 15, 2006
Revision 6

CALCULATING THE CONSTRUCTION PERMIT APPLICATION FEE

[These requirements are found at K.A.R. 28-19-304(b).]

Calculate the construction permit application fee as follows:

Estimated capital cost of the proposed activity for which the application is made, including the total cost of equipment and services to be capitalized.	**Line 1** $ 149,730,000	
Multiply by .05% (.0005)	x .0005	
Total	**Line 2** $ 74,865	
If Line 2 is less than $100, enter $100 on Line 3. If Line 2 is greater than $4,000, enter $4,000 on Line 3.		
Otherwise, copy Line 2 to Line 3.		
Construction permit application fee.	**Line 3** $ 5,500 (includes PSD fee)	Minimum fee is $100

Certifier of Capital Cost

Chris Ladwig
(Print)

(Signature)

3-22-16
Date

K.A.R. 28-19-350 is a complex regulation pertaining to prevention of significant deterioration (PSD). An additional fee of $1,500 will be required if a PSD review is necessary. If you believe the proposed activity in this Notification of Construction or Modification will be subject to the requirements of K.A.R. 28-19-350, contact the Department for further evaluation.

For purposes of construction permit or approval applications, the following are not considered modifications:

1. Routine maintenance or parts replacement.
2. An increase or decrease in operating hours or production rates if:
   a. production rate increases do not exceed the originally approved design capacity of the stationary source or emissions unit; and
   b. the increased potential-to-emit resulting from the change in operating hours or production rates do not exceed any emission or operating limitations imposed as a permit condition.

SPIRIT AEROSYSTEMS, INC.
PO BOX 780008
WICHITA KS 67278-0008
316-523-1120

SUMMARY

PAGE:	1 OF 1
DATE:	03/18/2016
CHECK NUMBER:	5093093
CHECK AMOUNT:	$5,500.00
PAYEE:	KANSAS DEPT OF HEALTH & ENVIRONMENT

5034776 - 00003

KANSAS DEPT OF HEALTH & ENVIRONMENT
BUREAU OF AIR & RADIATION
1000 SW JACKSON ST STE 310
TOPEKA, KS 66612-1366
USA

Invoice Number Purchase Order Number	Invoice Date *IT (InvoiceText)/PS (Packing Slip)*	Disc/Deduct	Gross Amoun
03112016	03/11/2016 IT = 737 EXPANSION PERMIT/ PS = 03112016	$0.00	$5,500.0
		TOTAL	$5,500.0

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For questions - Please contact Spirit Aerosystems Inc., Accounts Payable - Wichita at: 316-523-1120
Attention: Accounts Payable K11-10, PO BOX 780008, WICHITA KS 67278-0008

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND. SECURITY FEATURES INCLUDE THERMOCHROMIC INK, MICROPRINTING, A VOID PANTOGRAPH, AND AN ARTIFICIAL WATERMARK AND SECURITY SCREEN ON THE BACK.

81-1769/815

SPIRIT AEROSYSTEMS

PO BOX 780008
WICHITA, KS 67278-0008
316-523-1120

5093093	03/18/2016
Check Number	Date

USD Amount
$******5,500.00

PAY EXACTLY *********5,500* DOLLARS AND * 00 * CENTS

TO THE ORDER OF:
KANSAS DEPT OF HEALTH & ENVIRONMENT
BUREAU OF AIR & RADIATION
1000 SW JACKSON ST STE 310
TOPEKA KS 66612-1366

This Account Protected By Positive Pay

usbank.
Memphis, MO

AUTHORIZED SIGNATURE

VOID VOID VOID

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

PAINTING AND COATING OPERATIONS
(Fiber Glass Resin Spraying, Surface Coating, Dip Tank)

1) Source ID Number: 1730309

2) Company/Source Name: Spirit AeroSystems, Inc.

3) Emission Unit Identification: EU-3187S-B4, IPB4 Spoven

4) Normal Operating Schedule: 6,000 hrs/yr

5) Coatings and VOC Contents (Attach MSDS for each coating):

Coating Name	Annual Coating Usage (gal/yr)	VOC Content (% by weight)	Solid Content (% by weight)	Coating Density (lb/gal)	Operating Hours (hrs coating applied/yr)
See attached calculations.					

6) Application Method:

Spray Booth:

Manufacturer: TBD

Model Number: Custom Serial Number: Custom

Height: 26 ft. Width: 21 ft. Depth: 46 ft.

Dip Tank:

Manufacturer: _____

Model Number: _____ Serial Number: _____

Length: _____ft.) Width: _____ft. Depth: _____ft.

Distance From Coating Surface To Top of Tank: _____ft.

Freeboard Ratio: _____

Covered: Yes _____; No _____

Other (Describe): _____

PAINTING AND COATING OPERATIONS
(Fiber Glass Resin Spraying, Surface Coating, Dip Tank)
(cont.)

7) If applying for an operating permit, provide the date of construction or last modification : _____

8) For oven drying processes, complete form number 6-4.0, the OVEN/DRYER form and duplicate as needed.

9) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

10) NSPS Applicability (40 CFR Part 60)

Subpart EE - Standards of Performance for Surface Coating of Metal Furniture

-Is the facility a metal furniture surface coating operation in which organic coatings are applied? Yes _____; No __X___

-Did construction, modification, or reconstruction commence after November 28, 1980? Yes _____; No _____

-Does the facility consume or is it projected to consume 3,842 liters or more of coating (as applied) per year? Yes _____; No _____

Subpart MM - Standards of Performance for Automobile and Light Duty Truck Surface Coating Operations

-Is the process a prime coat operation, a guide coat operation, or a top coat operation in an automobile or light duty truck assembly plant? Yes _____; No __X___

-Is the process used for the coating of plastic body components or all plastic automobile or light-duty truck bodies on separate coating lines? Yes _____; No _____

-Did construction, modification, or reconstruction commence after October 5, 1979? Yes _____; No _____

Subpart RR - Standards of Performance for Pressure Sensitive Tape and Label Surface Coating Operations

-Is the facility a coating line used in the manufacture of pressure sensitive tape and label materials? Yes _____; No __X___

-Is the input of VOCs to the coating process greater than 45 Mg per 12 month period? Yes _____; No _____

-Did construction, modification, or reconstruction commence after December 30, 1980? Yes _____; No _____

Subpart SS - Standards of Performance for Industrial Surface Coating: Large Appliances

-Is the process a surface coating operation in a large appliance surface coating line? Yes _____; No __X___

-Did construction, modification, or reconstruction commence after December 24, 1980? Yes _____; No _____

Subpart TT - Standards of Performance for Metal Coil Surface Coating

-Is the process a prime coat operation, a finish coat operation, or a prime and finish coat operation in a metal coil surface coating operation? Yes _____; No __X__

-Did construction, modification, or reconstruction commence after January 5, 1981? Yes _____; No _____

PAINTING AND COATING OPERATIONS
(Fiber Glass Resin Spraying, Surface Coating, Dip Tank)
(cont.)

Subpart WW - Standards of Performance for the Beverage Can Surface Coating Industry

-Is the process an exterior base coat operation, an over varnish coating operation, or an inside spray coating operation in a beverage can surface coating line? Yes _____; No __X___

-Did construction, modification, or reconstruction commence after November 26, 1980?

Yes _____; No _____

Subpart SSS - Standards of Performance for Magnetic Tape Coating Facilities

-Is the process a coating operation or a piece of coating mix preparation equipment?

Yes _____; No __X___

-Is the process a new coating operation which utilizes less than 38 m^3 of solvent per calendar year? Yes _____; No _____

-Is the process a modified or reconstructed coating operation that utilizes less than 370 m^3 of solvent per calender year? Yes _____; No_____

-Did construction, modification, or reconstruction commence after January 22, 1986?

Yes _____; No _____

Subpart TTT - Standards of Performance for Industrial Surface Coating: Surface Coating of Parts for Business Machines

-Is the facility a spray booth in which plastic parts for use in the manufacture of business machines receive prime coats, color coats, texture coats, or touch-up coats? Yes _____;No__X__

-Did construction, modification, or reconstruction commence after January 8, 1986?

Yes _____; No _____

Subpart VVV - Standards of Performance for Polymeric Coating of Supporting Substrates Facilities

-Is the process a coating operation or a piece of onsite coating mix preparation equipment used to prepare coatings for the polymeric coating of supporting substrates? Yes _____; No ___X__

-Is the amount of VOCs used at the facility less than 95 Mg per 12 month period?

Yes _____; No _____

-Did construction, modification, or reconstruction commence after April 30, 1987?

Yes _____; No _____

-Is the process a piece of coating mix preparation equipment used to manufacture coatings at one plant for use at another site? Yes _____; No _____

-Is the process used to prepare or apply waterborne coatings that contain 9 percent VOC or less by weight of the volatile fraction? Yes _____; No _____

-Is the process a web coating operation that prints an image on the surface of the substrate or any coating applied on the same printing line that applies the image? Yes _____; No _____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

OVEN / DRYER

1) Source ID Number: 1730309

2) Company/Source Name: Spirit AeroSystems, Inc.

3) Emission Unit Identification: EU-3187S-B4

4) Equipment type: Oven X Dryer ___
Manufacturer: TBD Model No.: Custom

Date of installation or latest modification: TBD
Heating unit operating schedule: 6,000 hours/year
Maximum design heat-input rate: 6,000,000 BTU/hr
Attach a diagram of the burner configuration if available.

5) Material dried/baked/cured: Coatings Plant operations: 8,760 hours/yr
Rated capacity (of material processed): _____ lbs. or tons/hr. (circle the appropriate units)
If process is cyclical: Length of drying cycle: _____ No. of cycles per day: _____
Otherwise: Hours in operation per year: 6,000

6) Primary Fuel: Natural Gas Secondary Fuel: None
or Heat used is recovered from: _____

7) Fuel Specific Data: Natural Gas - pipeline quality? Yes X If no, heating value: _____ BTU/cu. ft.
Coal: % Sulfur: _____ % Ash: _____ Heating value: _____ BTU/lb.
Fuel Oil: % Sulfur: _____ Grade: _____ Heating value: _____ BTU/gal.
Density: _____ lb. / gal.
Other (attach appropriate data): _____ % Sulfur: _____ % Ash: _____
Heating value: _____ BTU/gal. Density: _____ lb. / _____

8) Emissions discharged to atmosphere 43 ft. above grade through stack 3 ft. diameter at 70-80 °F temperature, with 40,000 cfm flow rate and 94 fps velocity.

9) Did construction, modification, or reconstruction commence after April 23, 1986; and, is the plant associated with the minerals= industry? Yes ___ No X
If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart UUU.

10) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1730309

2) Company/Source Name: Spirit AeroSystems, Inc.

3) Fabric Filter/Baghouse identification number or designation: CE-3187S-B4

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. EU-3187S-B4, IPB4 Spoven
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: Paint overspray solids

6) Manufacturer: Purolator (or similar)
   Date of Manufacture: TBD
   Model No.: SuperSORB SSIII (or similar)
   Rated Control Efficiency: 99.6 %
   Capture Efficiency: 100 %
   Date of Installation: TBD

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: 70-80 °F

11) Gas Flow: 40,000 cfm at 70-80 °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? No
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) Replacement

15) Nominal Pressure Drop: 0.5 inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: Magnehelic Gauge

17) Emission discharge to atmosphere 43 ft. above grade through stack or duct 3 diameter at 70-80 °F temperature, with 40,000 cfm flow rate and 94 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1730309

2) Company/Source Name: Spirit AeroSystems, Inc.

3) Fabric Filter/Baghouse identification number or designation: CE-2280J-PM53

4) What emission unit(s) or source(s) of emissions is(are) vented to the fabric filter/baghouse?
   a. EU-2280J-PM53, Trim and Drill Machine
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: Particulate from sanding operation

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: Custom
   Rated Control Efficiency: 99.5 %
   Capture Efficiency: 99 %
   Date of Installation: TBD

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: ambient °F

11) Gas Flow: 5,000 cfm at ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? _____
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) _replacement_____

15) Nominal Pressure Drop: _0.5_ inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? _Yes___
If yes, specify device: __Magnehelic Gauge_____

17) Emission discharge to atmosphere _12_ ft. above grade through stack or duct __12__ diameter at _ambient_ °F temperature, with _5,000___cfm flow rate and _106_ fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1730309

2) Company/Source Name: Spirit AeroSystems, Inc.

3) Fabric Filter/Baghouse identification number or designation: CE-3187S-PM23

4) What emission unit(s) or source(s) of emissions is(are) vented to the fabric filter/baghouse?
   a. IA-3178S-PM23, Sanding Booth
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: Particulate from sanding operation

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: Custom
   Rated Control Efficiency: 99.5 %
   Capture Efficiency: 99 %
   Date of Installation: TBD

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: ambient °F

11) Gas Flow: 36,000 cfm at ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? _____
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) replacement

15) Nominal Pressure Drop: 0.5 inches of H_2O

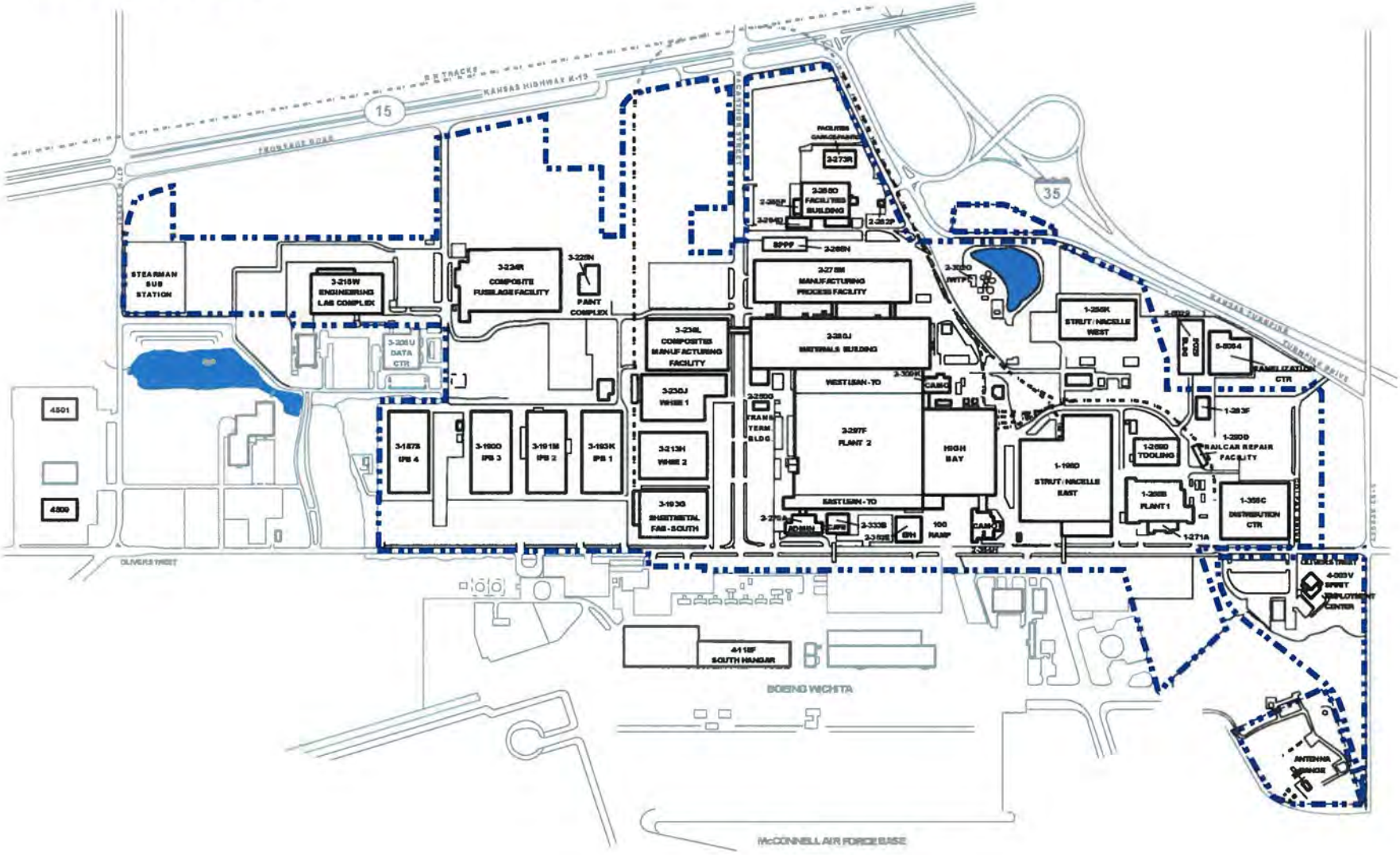
16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: Magnehelic Gauge

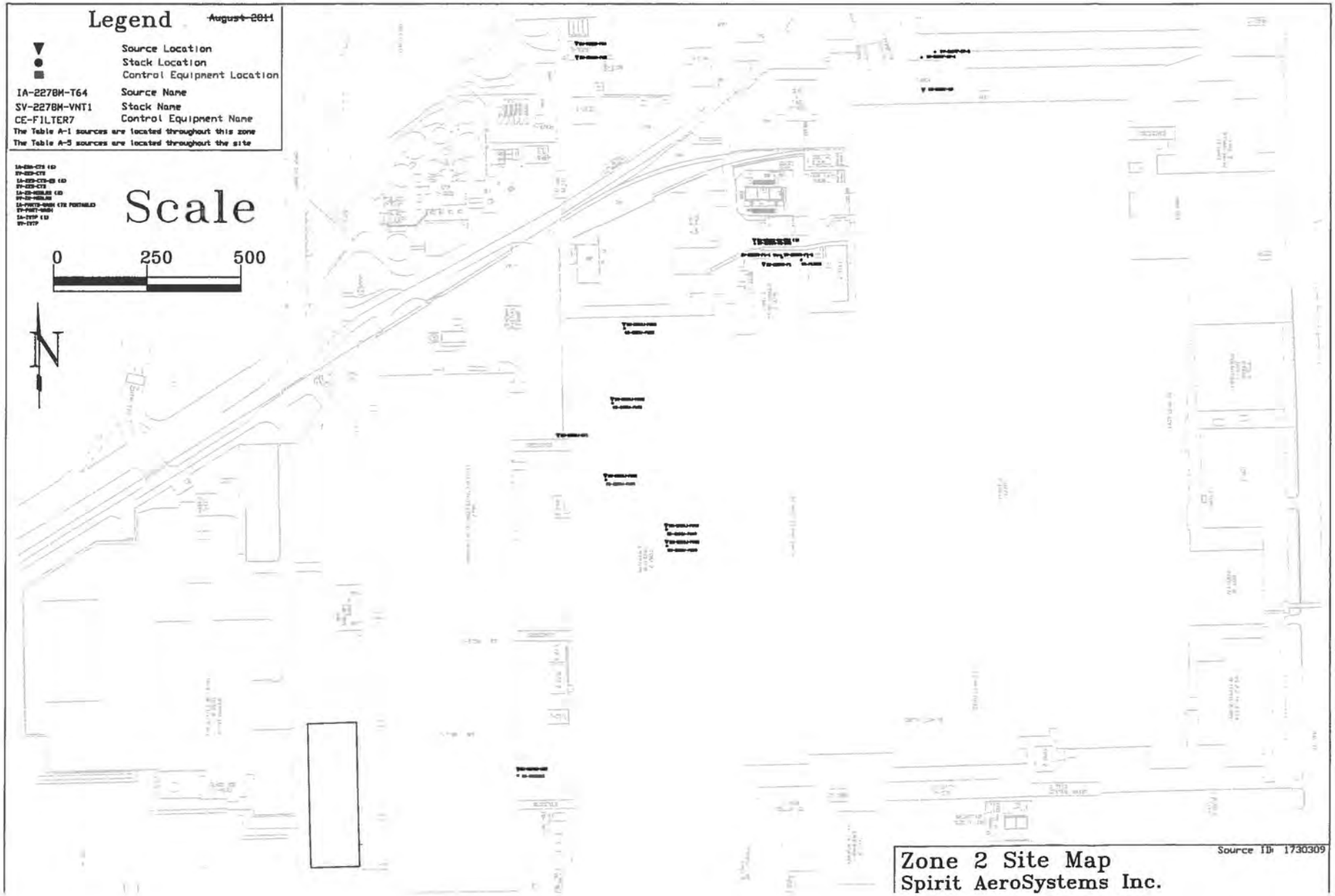
17) Emission discharge to atmosphere 12 ft. above grade through stack or duct 36 diameter at ambient °F temperature, with 36,000 cfm flow rate and 85 fps velocity.

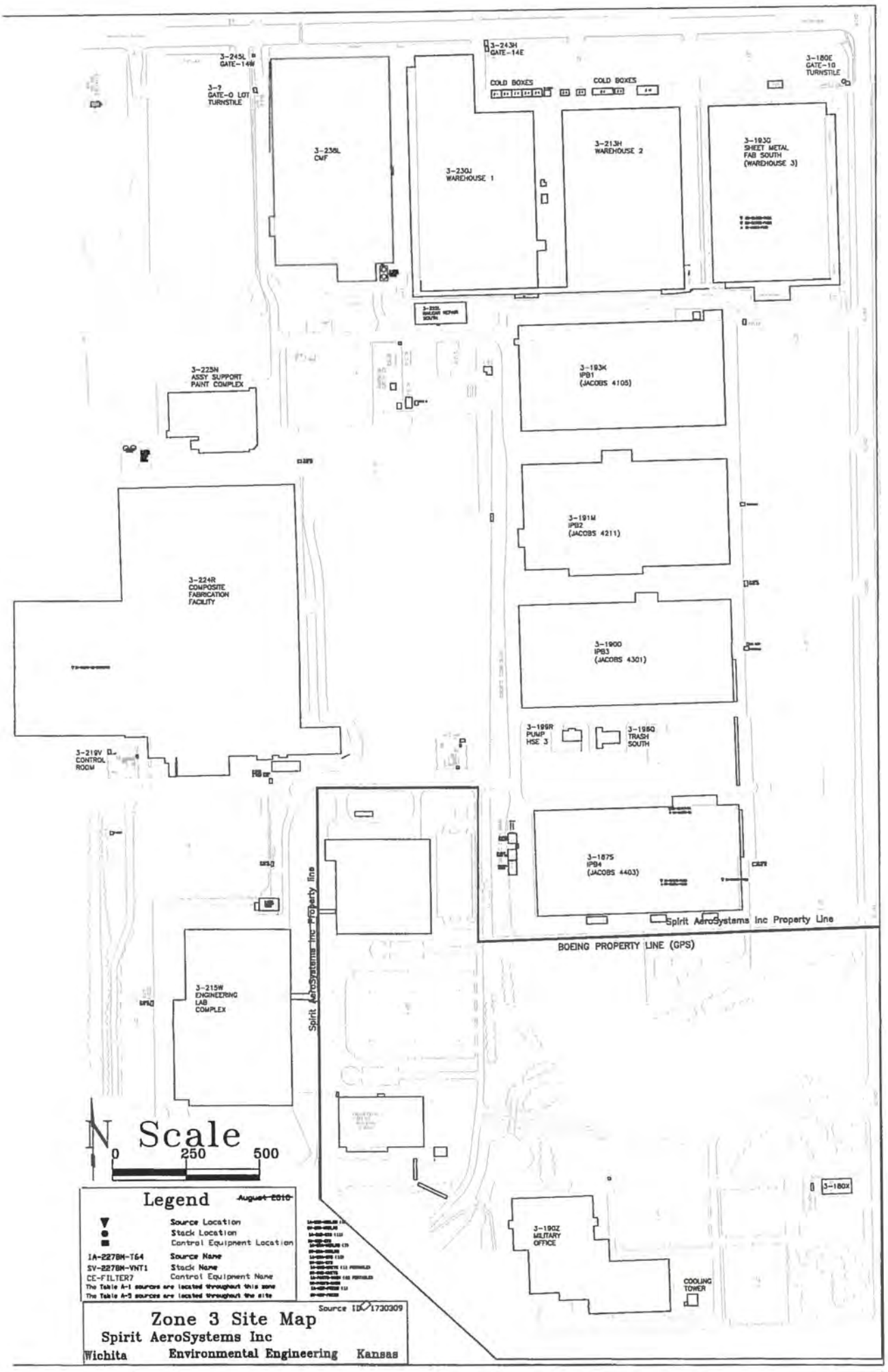
APPENDIX A
Figures

SPIRIT AEROSYSTEMS™

Wichita Site




Legend
~~August 2011~~
Source Location
Stack Location
Control Equipment Location
IA-2278M-T64 Source Name
SV-2278M-VNT1 Stack Name
CE-FILTER7 Control Equipment Name
The Table A-1 sources are located throughout this zone
The Table A-5 sources are located throughout the site
Scale
0
250
500
N
Source ID: 1730309
Zone 2 Site Map
Spirit AeroSystems Inc.


3-245L
GATE-14W
3-?
GATE-O LOT
TURNSTILE
3-243H
GATE-14E
3-180E
GATE-10
TURNSTILE
COLD BOXES
COLD BOXES
3-236L
CMF
3-230J
WAREHOUSE 1
3-213H
WAREHOUSE 2
3-193G
SHEET METAL
FAB SOUTH
(WAREHOUSE 3)
3-225N
ASSY SUPPORT
PAINT COMPLEX
3-193K
IPB1
(JACOBS 4105)
3-191M
IPB2
(JACOBS 4211)
3-224R
COMPOSITE
FABRICATION
FACILITY
3-190D
IPB3
(JACOBS 4301)
3-199R
PUMP
HSE 3
3-195Q
TRASH
SOUTH
3-219V
CONTROL
ROOM
3-187S
IPB4
(JACOBS 4403)
Spirit AeroSystems Inc Property Line
BOEING PROPERTY LINE (GPS)
Spirit AeroSystems Inc Property line
3-215W
ENGINEERING
LAB
COMPLEX
N
Scale
0
250
500
3-180X
3-190Z
MILITARY
OFFICE
COOLING
TOWER
Legend
August 2010
Source Location
Stack Location
Control Equipment Location
IA-2278M-T64 Source Name
SV-2278M-VNT1 Stack Name
CE-FILTER7 Control Equipment Name
The Table A-1 sources are located throughout this zone
The Table A-3 sources are located throughout the site
Source ID 1730309
Zone 3 Site Map
Spirit AeroSystems Inc
Wichita Environmental Engineering Kansas

APPENDIX B

Emissions Calculations

See attached electronic files for complete calculations

APPENDIX C
BACT Lists and Calculations

RBLC Search 19.600 Misc. Boilers, Furnaces, Heaters

RBLCID	FACILITY_NAME	PERMIT_ISSUANCE_DATE	PROCESS_NAME	POLLUTANT	CONTROL_METHOD_DESCRIPTION	EMISSION_LIMIT_1	EMISSION_LIMIT_1_UNIT
AL-0221	LOUISIANA PACIFIC CORPORATION	6/14/2006	BURNER, START UP/SHUT DOWN, NG	(VOC)	GOOD DESIGN/OPERATION	0.2	LB/H
CA-1211	COLUSA GENERATING STATION	3/11/2011	WATER BATH HEATER	(VOC)		7	PPMVD
FL-0303	FPL WEST COUNTY ENERGY CENTER UNIT 3	7/30/2008	TWO NOMINAL 10 MMBTU/H NATURAL GAS-FIRED PROCESS HEATERS	(VOC)		2	GS/100 SCF
*MD-0042	WILDCAT POINT GENERATION FACILITY	4/8/2014	AUXILLARY BOILER	(VOC)	THE EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, LIMITED HOURS OF OPERATION, AND GOOD COMBUSTION PRACTICES	0.0033	LB/MMBTU
*MD-0042	WILDCAT POINT GENERATION FACILITY	4/8/2014	DEW POINT HEATER	(VOC)	USE OF EFFICIENT DESIGN OF THE HEATER, EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS ONLY, AND APPLICATION OF GOOD COMBUSTION PRACTICES	0.005	LB/MMBTU
*MI-0393	RAY COMPRESSOR STATION	10/14/2010	Pipeline heaters	(VOC)		0.9	LB/H
*MI-0393	RAY COMPRESSOR STATION	10/14/2010	Auxiliary Boiler	(VOC)		0.05	LB/H
*MI-0410	THETFORD GENERATING STATION	7/25/2013	FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each	(VOC)	Efficient combustion; natural gas fuel.	0.008	LB/MMBTU
*MI-0410	THETFORD GENERATING STATION	7/25/2013	FG-FUELHTRS: 2 natural gas fuel heaters, 12 MMBTU/H each	(VOC)	Efficient combustion; natural gas fuel.	0.008	LB/MMBTU
OK-0118	HUGO GENERATING STA	2/9/2007	WASTEWATER (BRINE) SPRAY DRYER	(VOC)	GOOD COMBUSTION CONTROL	0.03	LB/H
PA-0274	ALLEGHENY LUDLUM CORPORATION - BRACKENRIDGE FACILITY	2/16/2010	THREE (3) WALKING BEAM REHEAT FURNACES (S-201, S-202, AND S-203)	(VOC)	THE PERMITTEE SHALL EMPLOY EFFECTIVE COMBUSTION AND OPERATIONAL CONTROL PRACTICES TO MINIMIZE EMISSIONS OF VOC.	0.0054	LB/MMBTU
PA-0274	ALLEGHENY LUDLUM CORPORATION - BRACKENRIDGE FACILITY	2/16/2010	ACTIVE HEAT PANEL (S-205)	(VOC)	THE PERMITTEE SHALL EMPLOY EFFECTIVE COMBUSTION AND OPERATIONAL CONTROL PRACTICES TO MINIMIZE EMISSIONS OF VOC.	0.0053	LB/MMBTU
PA-0274	ALLEGHENY LUDLUM CORPORATION - BRACKENRIDGE FACILITY	2/16/2010	FOUR (4) ANNEALING FURNACES (S-208, S-209, S-210, AND S-211)	(VOC)	THE PERMITTEE SHALL EMPLOY EFFECTIVE COMBUSTION AND OPERATIONAL CONTROL PRACTICES TO MINIMIZE EMISSIONS OF VOC.	0.005	LB/MMBTU
PA-0274	ALLEGHENY LUDLUM CORPORATION - BRACKENRIDGE FACILITY	2/16/2010	FOUR (4) CAR BOTTOM FURNACES (S-212, S-213, S-214, S-215)	(VOC)	THE PERMITTEE SHALL EMPLOY EFFECTIVE COMBUSTION AND OPERATIONAL CONTROL PRACTICES TO MINIMIZE EMISSIONS OF VOC.	0.005	LB/MMBTU
*PA-0281	TEXAS EASTERN TRANS LP/HOLBROOK STATION	2/23/2010	7 MISCELLANEOUS GAS HEATERS (<0.5 MMBTU/HR EACH)	(VOC)		0.02	TPY
*PA-0288	SUNBURY GENERATION LP/SUNBURY SES	4/1/2013	AUXILIARY BOILER (REPOWER)	(VOC)		0.005	LB/MMBTU
*PA-0288	SUNBURY GENERATION LP/SUNBURY SES	4/1/2013	DEW POINT HEATER	(VOC)		0.006	LB/MMBTU
*PA-0296	BERKS HOLLOW ENERGY ASSOC LLC/ONTELAUNEE	12/17/2013	Fuel Preheater	(VOC)		0.05	LB/MMBTU
*PA-0296	BERKS HOLLOW ENERGY ASSOC LLC/ONTELAUNEE	12/17/2013	Auxiliary Boiler	(VOC)		0.14	TPY
TX-0501	TEXSTAR GAS PROCESS FACILITY	7/11/2006	POWER STEAM BOILER	(VOC)		0.46	LB/H
TX-0501	TEXSTAR GAS PROCESS FACILITY	7/11/2006	BOTTOM HEATERS (2)	(VOC)		0.09	LB/H
*TX-0728	PEONY CHEMICAL MANUFACTURING FACILITY	4/1/2015	Ammonia Start-Up Heater	(VOC)	use of gaseous fuel	0.27	LB/H

RBLC Search 41.001 Aerospace Coating

RBLCID	FACILITY_NAME	PERMIT ISSUANCE DATE	PROCESS NAME	POLLUTANT	CONTROL METHOD CODE	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	EMISSION LIMIT UNIT
CA-0771	CALIFORNIA AIR NATIONAL GUARD, FRESNO	1/22/1997	HVLP APPLICATOR USED TO COAT AEROSPACE PARTS	VOC	P	LOWEST AVAILABLE VOC CONTENT WHICH MEETS MILITARY SPECIFICATIONS	20.9	LB/DAY
CA-0881	HUCK INTERNATIONAL - DEUTSCH OPERATIONS	2/29/1996	FOUR SPRAY BOOTHS	VOC	A	BACT DETERMINATION IS TELLKAMP SYSTEMS REGENERATIVE THERMAL OXIDIZER WITH A 1.6 MMBTU/H NAT GAS BURNER AND 3 MMBTU/H STAND-BY BURNER. PERMIT LIMIT IS LB VOC/DAY LIMIT	59	LB/D
CA-0889	KAL-GARD COATING & MFG., E/M CORP	1/6/1999	SPRAY BOOTHS, NINE BRINKS, DEVILBISS & BLEKKER	VOC	P	BACT DETERMINATION IS USE OF ZEOLITE CONCENTRATOR AND THERMAL OXIDIZER. PERMIT LIMIT IS LB VOC/DAY FACILITY LIMIT	216	LB/D
CA-0901	TIME AVIATION SERVICES, INC.	6/18/1999	SPRAY BOOTHS, TWO DRY FILTER	VOC	P	PERMIT LIMIT IS USAGE LIMIT AND USE OF SCAQMD REGULATION XI COMPLIANT MATERIALS. LISTINGS OF VOC LIMITS FOR INDIVIDUAL AEROSPACE COATING TYPES CAN BE FOUND AT WWW.AQMD.GOV/RULES/HTML/R1124.HTML	3	GAL/D
CA-0977	KAL-GUARD COATINGS & MANUFACTURING	5/28/1997	AEROSPACE METAL PART COATING OPERATION	VOC	A	ZEOLITE CONCENTRATOR AND THERMAL OXIDIZER	216	LB/D
CA-1045	KAL-GARD COATING & MFG. E/M	1/6/1999	SPRAY BOOTH	VOC	A	A ZEOLITE CONCENTRATOR AND THERMAL OXIDIZER	216	LB/D
IN-0126	DEAN BALDWIN PAINTING LP	9/21/2011	REFINISH OPERATION	VOC	P	MANGAMENT AND WORK PRACTICES	4.5	LB/GAL
*OK-0171	MIDWEST CITY AIR DEPOT	11/18/2015	CHEMICAL DEPAINTING/AIRCRAFT PAINT STRIPPING/AIRCRAFT PARTS PAINT STRIPPING	VOC	P	1.Low VOC vapor pressure cleaning solvents and strippers (<45 mm Hg @ 20 C or as specified in NESHAP GG) 2.Low pressure or hand application 3.Good Work Practices per Subpart GG.	1605.56	TONS
*OK-0172	MIDWEST CITY AIR DEPOT	11/19/2015	CHEMICAL DEPAINTING/AIRCRAFT PAINT STRIPPING/AIRCRAFT PARTS PAINT STRIPPING	VOC	P	1.Low VOC vapor press. cleaning solvents and strippers(<45 mm Hg @ 20 C or as specified per NESHAP GG) 2.Low pressure or hand application 3.Good Work Practices per Subpart GG.	333.38	TONS
UT-0058	HILL AIR FORCE BASE	12/15/1997	SURFACE COATING, MILITARY AIRCRAFT OPERATIONS	VOC	A	ZEOLITE ADSORPTION SYSTEM - M&W CONDESORB FOB - 26ZEOLITE ADSORPTION CELLS - 100,000 ACFM@80 DEGREESFARENHEIT - MAX LOADING 122 LB VOC/HR	201	T/YR
WA-0340	BOEING EVERETT	7/27/2007	PAINT HANGAR/FINAL EXTERIOR COATING	VOC	P		412	T
WA-0344	RENTON	10/7/2008	PAINT BOOTH/HANGAR	VOC	P	COMPOLIANCE WITH 40 CFR PART 63, SUBPART GG AND LOW VOC VAPOR PRESSURE CLEANING SOLVENTS AND STRIPPERS WITH LOW PRESSURE APPLICATORS OR MANUAL APPLICATION FOR DEPAINTING.	40.8	T/YR
*WA-0347	BOEING RENTON	2/19/2013	Floor Activities	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	458	TONS
*WA-0347	BOEING RENTON	2/19/2013	New Vertical Wing Booth (PB5)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	65	LB PER WING
*WA-0347	BOEING RENTON	2/19/2013	New Vertical Wing Booth (PB6)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	65	LB PER WING
*WA-0347	BOEING RENTON	2/19/2013	New Vertical Wing Booth (PB7)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	65	LB PER WING
*WA-0347	BOEING RENTON	2/19/2013	New Corrosion Inhibitor Compound Booth (CB1)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	7.7	LB/WING
*WA-0347	BOEING RENTON	2/19/2013	New Corrosion Inhibitor Compound Booth (CB2)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	7.7	LB PER WING
*WA-0347	BOEING RENTON	2/19/2013	New Corrosion Inhibitor Compound Booth (CB3)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	7.7	LB PER WING
*WA-0347	BOEING RENTON	2/19/2013	New Paint Hangar (P-7/P-8)	VOC	P	Boeing must comply with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on February 19, 2013	1350	LB PER PLANE
*WA-0348	BOEING RENTON	2/19/2013	Final exterior coating Building 5-50	VOC	P	low VOC primers, coatings, and solvents. Application requirements. composite vapor pressure of 45 mm Hg @ 20 degree C	40.8	TONS

California Environmental Protection Agency - Air Resources Board BACT Determinations

Source Category	Function	Control Technology	Company	Permit Date	Location	Control Efficiency	Emission Limit	Notes
Aerospace	--- No determinations found in this source category ---							
Spray Booth	Coating of Aluminum extrusion parts	RTO	Arcadia, Inc.	2/6/2001	Los Angeles Co.	99.3	667 lb/month	Four Spray booths in series.
Spray Booth	Coating of aerospace fasteners	Zeolite concentrator and thermal oxidizer	Kal-Gard Coating & Mfg.	1/6/1999	Los Angeles Co.	97	216 lb/day	
Spray Booth	Coating of rubber parts		DA/PRO Rubber Inc.	7/30/1999	Los Angeles Co.		Equipment shall use no more than 200 gal/year of coating	
Spray Booth	Vinyl application to large-area molds	RTO and baghouse	Stewart Filmscreen Corporation	9/3/1999	Los Angeles Co.	98	Film must be cured in place for 2 days before handling	
Spray Booth	Recreational vehicles chassis undercoating	Carbon absorber, water-based enamel	Lippert Components, Inc.	9/12/2000	San Bernardino	85.5	85.5% VOC control	
Spray Booth	Auto parts coating		Wondries Collision Center	7/1/1999	Los Angeles Co.		22 lb/day (facility wide)	
Spray Booth	powder coating onto preheated metal parts		Fletcher Coating	2/19/1997	Orange		Powder coating is a low-VOC method of coating	
Spray Booth	Spa manufacturing line	CAS, steam desorption, TO	Watkins Manufacturing Corp	8/20/2001	San Diego	98.9	95	
Spray Booth	VOC Concentrator and RTO		NASSCO	10/14/2008	San Diego		2 tpy	No construction has taken place
Spray Booth	Motor vehicle and mobile equipment coating spray booth	low VOC coatings	Fleet Refinish	7/25/2005	Sacramento		< 40 lb/day	

RBLC Search Heaters < 100 MMBtu/hr

RBLCID	FACILITY_NAME	PERMIT ISSUANCE DATE	PROCESS NAME	POLLUTANT	EMISSION LIMIT	EMISSION LIMIT UNIT
*AK-0083	KENAI NITROGEN OPERATIONS	01/06/2015	Primary Reformer Furnace	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
*AK-0083	KENAI NITROGEN OPERATIONS	01/06/2015	Three (3) Package Boilers	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
*AK-0083	KENAI NITROGEN OPERATIONS	01/06/2015	Five (5) Waste Heat Boilers	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
*AK-0083	KENAI NITROGEN OPERATIONS	01/06/2015	Startup Heater	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
*AK-0083	KENAI NITROGEN OPERATIONS	01/06/2015	Three (3) Flares	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS -FIRED ANNEALING FURNACE (LA43) (MULTIPLE EMISSION PO	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	2 ACID REGENERATION LINES EACH WITH CAUSTIC SCRUBBERS & COMN	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	DEGREASING WITH WET SCRUBBER (LO52) (MULTIPLE EMISSION POINTS)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	DEGREASING WITH WET SCRUBBER (MULTIPLE EMISSION POINTS)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED BATCH ANNEALING FURNACES (LA63, LA64)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED PASSIVE ANNEALING FURNACE (LO41)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED REHEAT FURNACE (LA21) (MULTIPLE EMISSION POINTS)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED REHEAT FURNACE (LA21) (MULTIPLE EMISSION POINTS)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED REHEAT FURNACE (LA21) (MULTIPLE EMISSION POINTS)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	BAL STEAM SWEEP WITH MIST ELIMINATOR (LA66) (MULTIPLE EMISSION PO	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	3 NATURAL GAS-FIRED BOILERS WITH ULNB & EGR (537-539)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0230	THYSSENKRUPP STEEL AND STAINLESS USA, LLC	08/17/2007	NATURAL GAS-FIRED BATCH ANNEALING FURNACE (535)	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0231	NUCOR DECATUR LLC	06/12/2007	TWO (2) ELECTRIC ARC FURNACES AND THREE (3) LADLE METALLURGY FURN	Volatile Organic Compounds (VOC)	0.13	LB/T
AL-0231	NUCOR DECATUR LLC	06/12/2007	VACUUM DEGASSER BOILER	Volatile Organic Compounds (VOC)	0.0026	LB/MMBTU
AL-0231	NUCOR DECATUR LLC	06/12/2007	GALVANIZING LINE FURNACE	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
AL-0231	NUCOR DECATUR LLC	06/12/2007	VACUUM DEGASSER	Volatile Organic Compounds (VOC)	0.005	LB/T
*AL-0280	LENZING FIBERS, INC.	12/06/2011	Natural Gas Fired Broiler #3	Volatile Organic Compounds (VOC)	5.5	LB/MMSCF
*AL-0282	LENZING FIBERS, INC.	01/22/2014	Natural Gas Fired Boilers (3)	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
AR-0090	NUCOR STEEL, ARKANSAS	04/03/2006	LADLE DRYER	Volatile Organic Compounds (VOC)	0.0006	LB/MMBTU
AR-0090	NUCOR STEEL, ARKANSAS	04/03/2006	PICKLE LINE BOILERS, SN-52	Volatile Organic Compounds (VOC)	0.2	LB/H
AR-0090	NUCOR STEEL, ARKANSAS	04/03/2006	ANNEALING FURNACES SN-61	Volatile Organic Compounds (VOC)	0.3	LB/H
AR-0090	NUCOR STEEL, ARKANSAS	04/03/2006	GALVANIZING LINE, SN-54	Volatile Organic Compounds (VOC)	0.5	LB/H
AR-0090	NUCOR STEEL, ARKANSAS	04/03/2006	MISCELLANEOUS NATURAL GAS FIRED BURNERS AND DRYERS	Volatile Organic Compounds (VOC)	0.0006	LB/MMBTU
FL-0285	PROGRESS BARTOW POWER PLANT	01/26/2007	ONE GASEOUS-FUELED 99 MMTU/HR AUXILIARY BOILER	Volatile Organic Compounds (VOC)	2	GR S/100 SCF
FL-0285	PROGRESS BARTOW POWER PLANT	01/26/2007	FIVE 3 MM BTU/HR GASEOUS-FUELED PROCESS HEATERS	Volatile Organic Compounds (VOC)	2	GR S/100 SCF GAS
FL-0286	FPL WEST COUNTY ENERGY CENTER	01/10/2007	TWO 99.8 MMBTU/H GAS-FUELED AUXILIARY BOILERS	Volatile Organic Compounds (VOC)	2	GS/100 SCF GAS
FL-0286	FPL WEST COUNTY ENERGY CENTER	01/10/2007	TWO GAS-FUELED 10 MMBTU/H PROCESS HEATERS	Volatile Organic Compounds (VOC)	2	GR S/100 SCF GAS
FL-0335	SUWANNEE MILL	09/05/2012	Four(4) Natural Gas Boilers - 46 MMBtu/hour	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
IA-0088	ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	INDIRECT-FIRED DDGS DRYER	Volatile Organic Compounds (VOC)	98	% REDUCTION
IA-0088	ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	NATURAL GAS BOILER (292.5 MMBTU/H)	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
IA-0102	DAVENPORT WORKS	02/01/2012	Pusher Preheat Furnace	Volatile Organic Compounds (VOC)	0	
IA-0102	DAVENPORT WORKS	02/01/2012	Annealing Furnace	Volatile Organic Compounds (VOC)	0	
IA-0102	DAVENPORT WORKS	02/01/2012	88" Continuous Heat Treat Line	Volatile Organic Compounds (VOC)	0	
*IA-0106	CF INDUSTRIES NITROGEN, LLC - PORT NEAL NITROGEN	07/12/2013	Startup Heater	Volatile Organic Compounds (VOC)	0.0014	LB/MMBTU
*IA-0106	CF INDUSTRIES NITROGEN, LLC - PORT NEAL NITROGEN	07/12/2013	Boilers	Volatile Organic Compounds (VOC)	0.0014	LB/MMBTU
*IA-0107	MARSHALLTOWN GENERATING STATION	04/14/2014	auxiliary boiler	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
*IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	12/03/2012	TWO (2) NATURAL GAS AUXILIARY BOILERS	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
LA-0240	FLOPAM INC.	06/14/2010	Boilers	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
*LA-0272	AMMONIA PRODUCTION FACILITY	03/27/2013	PRIMARY REFORMER FURNACE (101-B)	Volatile Organic Compounds (VOC)	6.19	LB/H
*LA-0272	AMMONIA PRODUCTION FACILITY	03/27/2013	AMMONIA START-UP HEATER (102-B)	Volatile Organic Compounds (VOC)	0.38	LB/H
*LA-0272	AMMONIA PRODUCTION FACILITY	03/27/2013	COMMISSIONING BOILERS 1 & 2 (CB-1 & CB-2)	Volatile Organic Compounds (VOC)	1.41	LB/H
*MA-0039	SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	Volatile Organic Compounds (VOC)	11.8	PPMVD@3% O2
MD-0036	DOMINION	03/10/2006	FUEL GAS PROCESS HEATER	Volatile Organic Compounds (VOC)	143	PPMVD
MD-0040	CPV ST CHARLES	11/12/2008	BOILER	Volatile Organic Compounds (VOC)	0.002	LB/MMBTU
MD-0040	CPV ST CHARLES	11/12/2008	HEATER	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
*MD-0041	CPV ST. CHARLES	04/23/2014	AUXILLARY BOILER	Volatile Organic Compounds (VOC)	0.002	LB/MMBTU

RBLCID	FACILITY_NAME	PERMIT ISSUANCE DATE	PROCESS NAME	POLLUTANT	EMISSION LIMIT	EMISSION LIMIT UNIT
*MD-0041	CPV ST. CHARLES	04/23/2014	FUEL GAS HEATER	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
*MD-0042	WILDCAT POINT GENERATION FACILITY	04/08/2014	AUXILLARY BOILER	Volatile Organic Compounds (VOC)	0.0033	LB/MMBTU
*MD-0042	WILDCAT POINT GENERATION FACILITY	04/08/2014	DEW POINT HEATER	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
*MI-0393	RAY COMPRESSOR STATION	10/14/2010	Auxiliary Boiler	Volatile Organic Compounds (VOC)	0.05	LB/H
*MI-0393	RAY COMPRESSOR STATION	10/14/2010	Dehydrator (with reboiler)	Volatile Organic Compounds (VOC)	4.2	LB/H
*MI-0393	RAY COMPRESSOR STATION	10/14/2010	Reboiler (dehydrator with reboiler)	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
*MI-0410	THETFORD GENERATING STATION	07/25/2013	FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each	Volatile Organic Compounds (VOC)	0.008	LB/MMBTU
*MI-0410	THETFORD GENERATING STATION	07/25/2013	FG-FUELHTRS: 2 natural gas fuel heaters, 12 MMBTU/H each	Volatile Organic Compounds (VOC)	0.008	LB/MMBTU
*MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREE	12/04/2013	Fuel pre-heater (EUFUELHTR)	Volatile Organic Compounds (VOC)	0.03	LB/H
*MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREE	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	Volatile Organic Compounds (VOC)	0.008	LB/MMBTU
*MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREE	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	Volatile Organic Compounds (VOC)	0.008	LB/MMBTU
MO-0082	ARCHER DANIELS MIDLAND-MEXICO	10/05/2010	DUAL-FIRED 85.6 MMBTU/HR WATER-TUBE BOILER	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
MS-0085	DART CONTAINER CORPORATION LLC	01/31/2007	NATURAL GAS FIRED BOILER	Volatile Organic Compounds (VOC)	0.81	TONS/YR
NJ-0079	WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	Volatile Organic Compounds (VOC)	0.14	LB/H
NJ-0080	HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	Volatile Organic Compounds (VOC)	0.27	LB/H
NV-0044	HARRAH'S OPERATING COMPANY, INC.	01/04/2007	COMMERCIAL/INSTITUTIONAL-SIZE BOILERS	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
NV-0046	GOODSPRINGS COMPRESSOR STATION	05/16/2006	COMMERCIAL/INSTITUTIONAL BOILER	Volatile Organic Compounds (VOC)	0.0052	LB/MMBTU
NV-0047	NELLIS AIR FORCE BASE	02/26/2008	BOILERS/HEATERS - NATURAL GAS-FIRED	Volatile Organic Compounds (VOC)	0.0062	LB/MMBTU
NV-0048	GOODSPRINGS COMPRESSOR STATION	05/16/2006	COMMERCIAL/INSTITUTIONAL-SIZE BOILER (<100 MMBTU/H)	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT HA08	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT FL01	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT BA01	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT BA03	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT CP01	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT CP03	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT CP26	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009	BOILER - UNIT IP04	Volatile Organic Compounds (VOC)	0.0053	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	BOILERS - UNITS CC001, CC002, AND CC003 AT CITY CENTER	Volatile Organic Compounds (VOC)	0.0024	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	BOILERS - UNITS CC004, CC005, AND CC006 AT CITY CENTER	Volatile Organic Compounds (VOC)	0.0048	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	WATER HEATERS - UNITS NY037 AND NY038 AT NEW YORK - NEW YORK	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	EMERGENCY GENERATORS - UNITS LX024 AND LX025 AT LUXOR	Volatile Organic Compounds (VOC)	0.0003	LB/HP-H
NV-0050	MGM MIRAGE	11/30/2009	BOILER - UNIT MB090 AT MANDALAY BAY	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	BOILERS - UNITS BE102 THRU BE105 AT BELLAGIO	Volatile Organic Compounds (VOC)	0.0054	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	BOILER - UNIT BE111 AT BELLAGIO	Volatile Organic Compounds (VOC)	0.0048	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	BOILERS - UNITS CC026, CC027 AND CC028 AT CITY CENTER	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
NV-0050	MGM MIRAGE	11/30/2009	PAINT SPRAY BOOTH - UNIT MG39 AT MGM GRAND	Volatile Organic Compounds (VOC)	1368	LB/MONTH
NV-0050	MGM MIRAGE	11/30/2009	BOILERS - UNITS NY42, NY43, AND NY44 AT NEW YORK - NEW YORK	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
OH-0309	TOLEDO SUPPLIER PARK- PAINT SHOP	05/03/2007	PAINT SLUDGE DRYER	Volatile Organic Compounds (VOC)	0.01	LB/H
OH-0309	TOLEDO SUPPLIER PARK- PAINT SHOP	05/03/2007	BOILER (2), NO. 2 FUEL OIL	Volatile Organic Compounds (VOC)	0.03	LB/H
OH-0323	TITAN TIRE CORPORATION OF BRYAN	06/05/2008	BOILER	Volatile Organic Compounds (VOC)	0.27	LB/H
*OH-0350	REPUBLIC STEEL	07/18/2012	Steam Boiler	Volatile Organic Compounds (VOC)	0.35	LB/H
*OH-0352	OREGON CLEAN ENERGY CENTER	06/18/2013	Auxillary Boiler	Volatile Organic Compounds (VOC)	0.59	LB/H
*OH-0355	GENERAL ELECTRIC AVIATION, EVENDALE PLANT	05/07/2013	4 Indirect-Fired Air Preheaters	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
OK-0128	MID AMERICAN STEEL ROLLING MILL	09/08/2008	Ladle pre-heater and refractory drying	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
OK-0128	MID AMERICAN STEEL ROLLING MILL	09/08/2008	Electric Arc Furnaces	Volatile Organic Compounds (VOC)	0.3	LB/T SCRAP
OK-0128	MID AMERICAN STEEL ROLLING MILL	09/08/2008	Ladle Metallurgy Furnace	Volatile Organic Compounds (VOC)	0.035	LB/T
OK-0129	CHOUTEAU POWER PLANT	01/23/2009	AUXILIARY BOILER	Volatile Organic Compounds (VOC)	0.54	LB/H
OK-0129	CHOUTEAU POWER PLANT	01/23/2009	FUEL GAS HEATER (H2O BATH)	Volatile Organic Compounds (VOC)	0.1	LB/H
OK-0135	PRYOR PLANT CHEMICAL	02/23/2009	BOILERS #1 AND #2	Volatile Organic Compounds (VOC)	0.5	LB/H
*OK-0164	MIDWEST CITY AIR DEPOT	01/08/2015	Heaters/Boilers	Volatile Organic Compounds (VOC)	7.1	TONS PER YEAR
*OR-0050	TROUTDALE ENERGY CENTER, LLC	03/05/2014	Auxiliary boiler	Volatile Organic Compounds (VOC)	0.005	LB/MMBTU
*PA-0291	HICKORY RUN ENERGY STATION	04/23/2013	AUXILIARY BOILER	Volatile Organic Compounds (VOC)	0.0015	LB/MMBTU

RBLCID	FACILITY_NAME	PERMIT ISSUANCE DATE	PROCESS NAME	POLLUTANT	EMISSION LIMIT	EMISSION LIMIT UNIT
*PA-0291	HICKORY RUN ENERGY STATION	04/23/2013	EMERGENCY GENERATOR	Volatile Organic Compounds (VOC)	0.7	LB/H
*PA-0296	BERKS HOLLOW ENERGY ASSOC LLC/ONTELAUNEE	12/17/2013	Fuel Preheater	Volatile Organic Compounds (VOC)	0.05	LB/MMBTU
*PA-0296	BERKS HOLLOW ENERGY ASSOC LLC/ONTELAUNEE	12/17/2013	Auxiliary Boiler	Volatile Organic Compounds (VOC)	0.14	TPY
SC-0111	FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MD	12/22/2009	SANDERDUST BOILER	Volatile Organic Compounds (VOC)	0.1	LB/MMBTU
SC-0111	FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MD	12/22/2009	FACE PRIMARY DRYER	Volatile Organic Compounds (VOC)	0	
SC-0111	FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MD	12/22/2009	CORE PRIMARY DRYER	Volatile Organic Compounds (VOC)	0	
SC-0112	NUCOR STEEL - BERKELEY	05/05/2008	VACUUM DEGASSER BOILER	Volatile Organic Compounds (VOC)	0.0026	LB/MMBTU
SC-0112	NUCOR STEEL - BERKELEY	05/05/2008	TUNNEL FURNACE BURNERS	Volatile Organic Compounds (VOC)	0.0055	LB/MMBTU
SC-0114	GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	Volatile Organic Compounds (VOC)	0.11	LB/H
SC-0115	GP CLARENDON LP	02/10/2009	75 MILLION BTU/HR BACKUP THERMAL OIL HEATER	Volatile Organic Compounds (VOC)	0.39	LB/H
SC-0115	GP CLARENDON LP	02/10/2009	ROTARY FLAKE DRYER #1	Volatile Organic Compounds (VOC)	116.39	LB/H
SC-0115	GP CLARENDON LP	02/10/2009	ROTARY FLAKE DRYER #2	Volatile Organic Compounds (VOC)	116.39	LB/H
SC-0115	GP CLARENDON LP	02/10/2009	ROTARY FINES DRYER	Volatile Organic Compounds (VOC)	116.39	LB/H
SC-0115	GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	Volatile Organic Compounds (VOC)	0.11	LB/H
SC-0149	KLAUSNER HOLDING USA, INC	01/03/2013	NATURAL GAS BOILER EU003	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
SC-0149	KLAUSNER HOLDING USA, INC	01/03/2013	NATURAL GAS BOILER EU004	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
SC-0149	KLAUSNER HOLDING USA, INC	01/03/2013	NATURAL GAS BOILER EU005	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
SC-0149	KLAUSNER HOLDING USA, INC	01/03/2013	NATURAL GAS BOILER EU006	Volatile Organic Compounds (VOC)	0.003	LB/MMBTU
*SC-0160	US8 FACILITY	12/13/2012	BOILERS (BL01) & (BL02)	Volatile Organic Compounds (VOC)	0.18	LB/H
TX-0501	TEXSTAR GAS PROCESS FACILITY	07/11/2006	POWER STEAM BOILER	Volatile Organic Compounds (VOC)	0.46	LB/H
TX-0501	TEXSTAR GAS PROCESS FACILITY	07/11/2006	BOTTOM HEATERS (2)	Volatile Organic Compounds (VOC)	0.09	LB/H
*TX-0663	JACKSON COUNTY GAS PLANT	05/25/2012	Heaters	Volatile Organic Compounds (VOC)	0	
*TX-0663	JACKSON COUNTY GAS PLANT	05/25/2012	Heaters	Volatile Organic Compounds (VOC)	0	
*TX-0663	JACKSON COUNTY GAS PLANT	05/25/2012	Heaters	Volatile Organic Compounds (VOC)	0	
*TX-0772	PORT OF BEAUMONT PETROLEUM TRANSLOAD TERMI	11/06/2015	Commercial/Institutional-Size Boilers/Furnaces	Volatile Organic Compounds (VOC)	5.42	T/YR
*TX-0772	PORT OF BEAUMONT PETROLEUM TRANSLOAD TERMI	11/06/2015	Commercial/Institutional-Size Boilers/Furnaces	Volatile Organic Compounds (VOC)	0.3	T/YR
*WY-0075	CHEYENNE PRAIRIE GENERATING STATION	07/16/2014	Auxiliary Boiler	Volatile Organic Compounds (VOC)	0.0017	LB/MMBTU

SCAQMD BACT Database - Paint Booths

SCAQMD ID	Facility	Project Description	Permit Issuance Date	BACT Determination
A/N 322432	Fletcher Coating	Powder Coating	10/27/1993	PM Limitation
A/N 347744	Arbek Mfg	Wood	5/26/1999	Super low VOC, 346 lb/day
A/N 342981	Arcadia, Inc.	Metal w/ control	8/10/2001	RTO, 98% DRE of VOC, 667 lb/mo, little supplemental fuel is needed because of high VOC loading
A/N 342981	Stewart Filmscreen	Vinyl lacquers	9/16/1998	1500 bl/day (facility 118,800 lb/month) baghouse & TO, 98% DRE
A/N 230731	Sierra Aluminum	Metal w/ control	9/26/1989	TO, 66 lb/day, DRE 98%
A/N 183205	Frontier Aluminum	Metal w/ control	4/25/1989	RTO, 68 lb/day, DRE 96%
A/N 228182	Northrop	Aerospace w/ control	2/25/1991	CAS, 90% DRE, 414 lb/day - NO LONGER OPERATING
A/N 369278	Lippert Components	RV Chassis w/ control	9/12/2000	22 lb/day, DRE 85.5% CAS
A/N 176076	Kaiser Marquardt	Metal w/ control	11/8/1988	Direct-flame afterburner, DRE 88%, 16 gal/day coating & solvent
A/N 249798	Crown City Plating	Metal w/ control	7/1/1991	TO, DRE 92.5%, 25 gal/day coating & solvent
A/N 280817	Intl Extrusion	Metal, with Control	9/2/1993	RTO, DRE 92.5%, 2.6 lb/hr
A/N 335644	Wondries Ford	Auto Refinish w/ control	2/4/1998	CatOx w/ concentrator, DRE 83%, 30 lb/day
A/N 328007	Kal Gard	Aerospace w/ control	12/22/98, 1/5/99, 1/6/99	TO w/ concentrator, 216 lb/day
A/N 273236	US Ordnance	Metal w/ control	1/24/1992	RTO, 30 lb/day
A/N 320641	Certified Enameling	Metal w/ control	9/17/1997	TO, 420 lb/day facility limit
A/N 287160	Douglas Prod Div	Aerospace w/ control	3/30/1994	Zeolite concentrators, TO, 341 gal/day coatings, fuel tank coating
A/N 298582	Huck Intl.	Aerospace w/ control	3/1/1995	TO, 59 lb/day
A/N 272587	Barry Controls	Aerospace adhesives w/ control	12/17/1992	TO, 400 lb/month, rubber to metal bonding
A/N 324505	Bristol Fiberlite	Polyester Resin w/ control	5/28/1997	Concentrator w TO, 264 lb/day
A/N 354640	Wondries Collision	Auto Refinish w/ control	7/1/1999	CAS w/ concentrator, 22 b/day, 85% DRE
A/N 352925	Wondries Collision	Auto Refinish no control	7/1/1999	15 lb/day
A/N 352922	Wondries Collision	Auto Refinish no control	7/1/1999	Facility wide limit 22 b/day
A/N 352660	Cannon Safe	Metal no control	5/25/1999	Facility wide limit 667 lb/mo
A/N 352478	MacDonald Mfg	Metal no control	6/11/1999	Facility wide limit 667 lb/mo
A/N 352716	Artsian Resources	Plastics no control	5/18/1999	Facility wide limit 667 lb/mo
A/N 353357	Time Aviation	Aerospace, no control	6/18/1999	Facility usage 3 gal/day, no control on paint booths
A/N 356063	DA/PRO Rubber	Rubber no control	7/30/1999	Equipment limited to 200 gal/year

http://www.aqmd.gov/home/permits/bact/guidelines/i—scaqmd-laer-bact

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Table C-1
Spirit Aerosystems
737 Expansion Project - Paint Booths
TO, RTO, Concentrator with TO Average Cost Effectiveness ($/ton)

Thermal Oxidizer: Summary of Average Cost Effectiveness ($/ton)

Unit	Baseline PTE Emissions (tpy)	TO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Total Capital Investment	Total Annual Cost	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	98.9%	0.53	47.37	$ 509,695.53	$ 353,808,153.61	$7,468,545.52
IPB4 Spoven	2.68	98.9%	0.03	2.65	$ 373,358.86	$ 53,243,672.82	$20,088,010.21

Regenerative Thermal Oxidizer: Summary of Average Cost Effectiveness ($/ton)

Unit	Baseline PTE Emissions (tpy)	RTO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Total Capital Investment	Total Annual Cost	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	99.3%	0.34	47.56	$ 19,911,361.54	$ 4,259,278.72	$89,547.05
IPB4 Spoven	2.68	99.3%	0.02	2.66	$ 2,043,172.45	$ 537,942.26	$202,139.70

Zeolite Concentrator with RTO: Summary of Average Cost Effectiveness ($/ton)

Unit	Baseline PTE Emissions (tpy)	Concentrator with TO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Total Capital Investment	Total Annual Cost	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	93.2%	3.26	44.64	$ 19,911,361.54	$ 4,259,278.72	$95,407.97
IPB4 Spoven	2.68	93.2%	0.18	2.50	$ 2,043,172.45	$ 537,942.26	$215,369.87

ECEs with a RTO: Summary of Average Cost Effectiveness ($/ton)

Unit	Baseline PTE Emissions (tpy)	ECEs with RTO Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Total Capital Investment	Total Annual Cost	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	48.9%	24.48	23.42	$ 1,494,255.62	$ 441,474.65	$18,851.69

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Table C-2
Spirit Aerosystems
737 Expansion Project - Paint Booths
TO & RTO Cost Basis

Thermal Oxidizer & RTO - Costs[1]

	North Plant 2 Booth			IPB4 Spoven		
Data Description	**TO**	**RTO**	**ECEs with RTOs**	**TO**	**RTO**	**Source**
Direct Capital Costs (DCC)						
Purchased Equipment Costs						Engineering Estimate RTO: EC = 2.204 X 10^5 +11.57 Qtot , Equip Cost, FOB, 1999 Dollars [Flow rate 10,000- 100,000] (Equation 2.33). TO: EC = 10,294 $Qtot^{0.2355}$, FOB, 1999 Dollars [Flow rate 500 - 50,000 scfm] (Equation 2.29)
Incinerator + auxiliary equipment (A)	$ 170,432.99	$ 6,658,000.00	$ 509,650.00	$ 124,844.46	$ 683,200.00	Estimating Costs of Air Pollution Control, Equation 6.11 and 6.14; USEPA 2000, Section 3, Chapter 2, Equation 2.32
Instrumentation (0.10A)	$ 17,043.30	$ 665,800.00	$ 50,965.00	$ 12,484.45	$ 68,320.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Sales Tax (0.03A)	$ 5,112.99	$ 199,740.00	$ 15,289.50	$ 3,745.33	$ 20,496.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Freight (0.05A)	$ 8,521.65	$ 332,900.00	$ 25,482.50	$ 6,242.22	$ 34,160.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Purchased Equipment Costs (PEC) (B = 1.18A)	$ 201,110.92	$ 7,856,440.00	$ 601,387.00	$ 147,316.47	$ 806,176.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
1999 to 2015 Escalation Factor =	1.44	1.44	1.44	1.44	1.44	US Dept. of Labor Statistics; http://www.bls.gov/data/inflation_calculator.htm
Purchased Equipment (B)	$ 289,599.73	$ 11,313,273.60	$ 865,997.28	$ 212,135.71	$ 1,160,893.44	
Direct Installation Costs (DIC)						
Foundation and Supports (0.08B)	$ 23,167.98	$ 905,061.89	$ 69,279.78	$ 16,970.86	$ 92,871.48	USEPA 2000, Section 3, Chapter 2, Table 2.8
Handling & erection (0.14B)	$ 40,543.96	$ 1,583,858.30	$ 121,239.62	$ 29,699.00	$ 162,525.08	USEPA 2000, Section 3, Chapter 2, Table 2.8
Electrical (0.04B)	$ 11,583.99	$ 452,530.94	$ 34,639.89	$ 8,485.43	$ 46,435.74	USEPA 2000, Section 3, Chapter 2, Table 2.8
Piping (0.02B)	$ 5,791.99	$ 226,265.47	$ 17,319.95	$ 4,242.71	$ 23,217.87	USEPA 2000, Section 3, Chapter 2, Table 2.8
Insulation for ductwork (0.01B)	$ 2,896.00	$ 113,132.74	$ 8,659.97	$ 2,121.36	$ 11,608.93	USEPA 2000, Section 3, Chapter 2, Table 2.8
Painting (0.01B)	$ 2,896.00	$ 113,132.74	$ 8,659.97	$ 2,121.36	$ 11,608.93	USEPA 2000, Section 3, Chapter 2, Table 2.8
Direct Installation Costs (DIC) (0.3B)	$ 86,879.92	$ 3,393,982.08	$ 259,799.18	$ 63,640.71	$ 348,268.03	
Site Preparation (as required, SP)	$43,440	$1,696,991		$31,820	$174,134	Assume 50% of DIC (modifications to roof, natural gas infrastructure)
Buildings (As required, Bldg.)			$ 100,000.00			ECEs (doghouses) are estimated to cost $100,000
Total Direct Capital Costs (DCC)	$419,920	$16,404,247	$1,225,796	$307,597	$1,683,295	Adjusted from cost year 1999 to 2015 using escalation factor
Indirect Installation Costs (IIC)						
Engineering (0.10B)	$ 28,959.97	$ 1,131,327.36	$ 86,599.73	$ 21,213.57	$ 116,089.34	USEPA 2000, Section 3, Chapter 2, Table 2.8
Construction and feld expenses (0.05B)	$ 14,479.99	$ 565,663.68	$ 43,299.86	$ 10,606.79	$ 58,044.67	USEPA 2000, Section 3, Chapter 2, Table 2.8
Contractor fees (0.10B)	$ 28,959.97	$ 1,131,327.36	$ 86,599.73	$ 21,213.57	$ 116,089.34	USEPA 2000, Section 3, Chapter 2, Table 2.8
Start-up (0.02B)	$ 5,791.99	$ 226,265.47	$ 17,319.95	$ 4,242.71	$ 23,217.87	USEPA 2000, Section 3, Chapter 2, Table 2.8
Performance test (0.01B)	$ 2,896.00	$ 113,132.74	$ 8,659.97	$ 2,121.36	$ 11,608.93	USEPA 2000, Section 3, Chapter 2, Table 2.8
Contingencies (0.03B)	$ 8,687.99	$ 339,398.21	$ 25,979.92	$ 6,364.07	$ 34,826.80	USEPA 2000, Section 3, Chapter 2, Table 2.8
Total Indirect Costs (IC) (0.31B)	$ 89,775.92	$ 3,507,114.82	$ 268,459.16	$ 65,762.07	$ 359,876.97	
Total Capital Investment (TCI)	**$ 509,695.53**	**$ 19,911,361.54**	**$ 1,494,255.62**	**$ 373,358.86**	**$ 2,043,172.45**	

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Table C-2
Spirit Aerosystems
737 Expansion Project - Paint Booths
TO & RTO Cost Basis

Thermal Oxidizer & RTO - Costs[1]

	North Plant 2 Booth			IPB4 Spoven		
Data Description	**TO**	**RTO**	**ECEs with RTOs**	**TO**	**RTO**	**Source**
Direct Annual Costs						
Operating labor						
Operator (0.5 hr/shift) Unit Cost $$	$ 17,760.00	$ 10,000.00	$ 10,000.00	$ 15,600.00	$ 15,600.00	USEPA 2000, Section 3, Chapter 2, Table 2.8, (North Plant 2 Booth: assume 3 shifts/day, 296 d/yr, $40/hr) (IPB4 Spoven: assume 3 shfts/day, 260 d/yr, $40/hr)
Supervisor (15% of Operator)	$ 2,664.00	$ 1,500.00	$ 1,500.00	$ 2,340.00	$ 2,340.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Operating Materials						
Maintenance						
Labor (0.5 hr/shift)	$ 17,760.00	$ 10,000.00	$ 10,000.00	$ 15,600.00	$ 15,600.00	USEPA 2000, Section 3, Chapter 2, Table 2.8, (North Plant 2 Booth: assume 3 shifts/day, 296 d/yr, $40/hr) (IPB4 Spoven: assume 3 shfts/day, 260 d/yr, $40/hr)
Materials (100% of maintenance labor)	$ 17,760.00	$ 10,000.00	$ 10,000.00	$ 15,600.00	$ 15,600.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Utilities						
Electricity $Power_{fan}$ = 1.17 * 10^{-4} Qwi ΔP / ε	117.00	438.75	117.00	31.20	117.00	Q_{wi} = volumetric flow rate (acfm), ΔP = Pressure drop (4 in H2O for TO, 15 in H2O for RTO) Table 2.11, ε = combined motor/fan efficiency (assume 60%)
Electricity cost ($/kWhr)	$0.072	$0.072	$0.072	$0.072	$0.072	http://www.eia.gov/state/data.cfm?sid=KS (Kansas industrial; Oct. 2015)
Total Electric cost	$ 59,594.75	$ 223,480.30	$ 59,594.75	$ 8,948.16	$ 33,555.60	kW * annual operating hours * electricity cost
Natural Gas Usage (Mcf/yr)	63,936,000	63936	10656	9600000	9600	Usage = fuel usage rate (scf/min) * 60 min/hr * hrs/year
Natural Gas Cost ($/Mcf)	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	http://www.eia.gov/state/data.cfm?sid=KS (Kansas industrial; Oct. 2015)
Total Fuel Cost	$353,566,080	$353,566.08	$58,927.68	$53,088,000.00	$53,088.00	
Total Direct Annual Costs	**$ 353,681,618.75**	**$ 608,546.38**	**$ 150,022.43**	**$ 53,146,088.16**	**$ 135,783.60**	
Indirect Annual Costs						
Overhead (60% of sum of operating, supervisor & maintenance, labor & maintenance materials)	$ 33,566.40	$ 18,900.00	$ 18,900.00	$ 29,484.00	$ 29,484.00	USEPA 2000, Section 3, Chapter 2, Table 2.8
Administrative Charges (2% TCI)	$10,194	$398,227	$29,885	$7,467	$40,863	USEPA 2000, Section 3, Chapter 2, Table 2.8
Property taxes (1% of TCI)	$5,097	$199,114	$14,943	$3,734	$20,432	USEPA 2000, Section 3, Chapter 2, Table 2.8
Insurance (1% TCI)	$5,097	$199,114	$14,943	$3,734	$20,432	USEPA 2000, Section 3, Chapter 2, Table 2.8
Capital recovery [CRF = 0.1424] TCI*CRF	$72,581	$2,835,378	$212,782	$53,166	$290,948	Assuming 10 year equipment life and 7% interest rate
Total Indirect Annual Costs	$ 126,534.86	$ 3,650,732.34	$ 291,452.23	$ 97,584.66	$ 402,158.66	
Total Annual Costs	**$ 353,808,153.61**	**$ 4,259,278.72**	**$ 441,474.65**	**$ 53,243,672.82**	**$ 537,942.26**	DAC + IAC

TO & RTO - BACT Design Basis

Description	North Plant 2	IPB4 Spoven	ECEs with RTO	Notes/References
Flow rate through incinerator (scfm)	150,000	40,000	25,000	EPA/452/B-02-001 demonstrates that flow in and flow out are approxmately the same (see page 2-24). Incinerator cost is proportional to the air flow through the device.
Hours per year	7,104.0	4,000.0	7,104.0	
Baseline VOC emission rate (lb/hr) Pre-control	13.49	1.34		
Baseline VOC emission rate (ppm) Pre-control	6.285	2.342		Assuming all VOC is toluene, MW = 92.14
	TO			
Auxiliary Fuel Requirement (scfm)	150,000	40,000		Assume equal to incoming flow (essentially all air)
	RTO			
Auxiliary Fuel Requirement (scfm)	150	40	25	Assume 0.1% of total flow

Table C-4
Spirit Aerosystems
737 Expansion Project - Paint Booths
Carbon Adsorption Average Cost Effectiveness ($/ton)

Carbon Adsorption: Summary of Average Cost Effectiveness ($/ton)

Unit	Baseline PTE Emissions (tpy)	Carbon Adsorber Control Efficiency	Controlled Emission Rate (tpy)	VOC Reduction (tpy)	Total Capital Investment	Total Annual Cost	Technology Cost Effectiveness ($/ton VOC Removed)
North Plant 2 Booth	47.90	99.3%	0.34	47.56	$13,653,748	$ 2,803,452.34	$58,939.77
IPB4 Spoven	2.68	99.3%	0.02	2.66	$3,125,592	$ 660,213.31	$248,084.85

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Table C-5
Spirit Aerosystems
737 Expansion Project - Paint Booths
Adsorption Cost Basis

Adsorption - Cost[1]

Data Description	North Plant 2	IPB4 Spoven	Source
Direct Capital Costs (DCC)			
Purchased Equipment Costs			
Adsorber + auxiliary equipment (A)	$ 4,990,930.26	$ 1,142,514.94	Engineering Estimate
Instrumentation (0.10A)	$ 499,093.03	$ 114,251.49	USEPA 1999, Section 3, Chapter 1, Table 1.3
Sales Tax (0.03A)	$ 149,727.91	$ 34,275.45	USEPA 1999, Section 3, Chapter 1, Table 1.3
Freight (0.05A)	$ 249,546.51	$ 57,125.75	USEPA 1999, Section 3, Chapter 1, Table 1.3
Purchased Equipment Costs (PEC) (B = 1.18A)	$ 5,889,297.71	$ 1,348,167.62	USEPA 1999, Section 3, Chapter 1, Table 1.3
1999 to 2015 Escalation Factor =	1.44	1.44	US Dept. of Labor Statistics; http://www.bls.gov/data/inflation_calculator.htm
Purchased Equipment (B)	$ 8,480,588.70	$ 1,941,361.38	
Direct Installation Costs (DIC)			
Foundation and Supports (0.08B)	$ 678,447.10	$ 155,308.91	USEPA 1999, Section 3, Chapter 1, Table 1.3
Handling & erection (0.14B)	$ 1,187,282.42	$ 271,790.59	USEPA 1999, Section 3, Chapter 1, Table 1.3
Electrical (0.04B)	$ 339,223.55	$ 77,654.46	USEPA 1999, Section 3, Chapter 1, Table 1.3
Piping (0.02B)	$ 169,611.77	$ 38,827.23	USEPA 1999, Section 3, Chapter 1, Table 1.3
Insulation for ductwork (0.01B)	$ 84,805.89	$ 19,413.61	USEPA 1999, Section 3, Chapter 1, Table 1.3
Painting (0.01B)	$ 84,805.89	$ 19,413.61	USEPA 1999, Section 3, Chapter 1, Table 1.3
Direct Installation Costs (DIC) (0.3B)	$ 2,544,176.61	$ 582,408.41	
Site Preparation (as required, SP)			
Buildings (As required, Bldg.)			
Total Direct Capital Costs (DCC)	$ 11,024,765.31	$ 2,523,769.79	Adjusted from cost year 1999 to 2016 using escalation factor
Indirect Installation Costs (IIC)			
Engineering (0.10B)	$ 848,058.87	$ 194,136.14	USEPA 1999, Section 3, Chapter 1, Table 1.3
Construction and feld expenses (0.05B)	$ 424,029.43	$ 97,068.07	USEPA 1999, Section 3, Chapter 1, Table 1.3
Contractor fees (0.10B)	$ 848,058.87	$ 194,136.14	USEPA 1999, Section 3, Chapter 1, Table 1.3
Start-up (0.02B)	$ 169,611.77	$ 38,827.23	USEPA 1999, Section 3, Chapter 1, Table 1.3
Performance test (0.01B)	$ 84,805.89	$ 19,413.61	USEPA 1999, Section 3, Chapter 1, Table 1.3
Contingencies (0.03B)	$ 254,417.66	$ 58,240.84	USEPA 1999, Section 3, Chapter 1, Table 1.3
Total Indirect Costs (IC) (0.31B)	$ 2,628,982.50	$ 601,822.03	
Total Capital Investment (TCI)	**$ 13,653,747.80**	**$ 3,125,591.82**	Does not include initial carbon cost or carbon replacement cost

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Table C-5
Spirit Aerosystems
737 Expansion Project - Paint Booths
Adsorption Cost Basis

Adsorption - Cost[1]

Data Description	North Plant 2	IPB4 Spoven	Source
Direct Annual Costs			
Operating labor			
Operator (0.5 hr/shift) Unit Cost $$	$ 17,760.00	$ 15,000.00	USEPA 1999 Section 3 Chapter 1 (North Plant 2 Booth: assume 3 shifts/day, 296 d/yr, $40/hr) (IPB4 Spoven: assume 3 shfts/day, 250 d/yr, $40/hr)
Supervisor (15% of Operator)	$ 2,664.00	$ 2,250.00	USEPA 1999, Section 3, Chapter 1, Table 1.6
Operating Materials			
Maintenance			
Labor (0.5 hr/shift)	$ 17,760.00	$ 10,000.00	USEPA 1999, Section 3, Chapter 1, Table 1.6
Materials (100% of maintenance labor)	$ 17,760.00	$ 10,000.00	USEPA 1999, Section 3, Chapter 1, Table 1.6
Replacement Parts, Carbon			5-year life
Replacement Labor	$ 39.90	$ 1.59	0.2439 * ($0.05/lb * Mc lb*1.42)
Carbon Cost	$ 1,747.85	$ 69.84	0.2439 * (Cc * 1.08)
Utilities			
Total Electric cost	$ 97,415.63	$ 14,473.56	See CAS Design Basis
Steam	$ 482.45	$ 26.99	See CAS Design Basis
Cooling Water	$ 12,420.85	$ 694.95	See CAS Design Basis
Total Fuel Cost	$ 110,318.93	$ 15,195.50	
Total Direct Annual Costs	$ 278,369.69	$ 67,712.51	
Indirect Annual Costs			
Overhead (60% of sum of operating, supervisor & maintenance, labor & maintenance materials)	$ 34,639.05	$ 22,392.86	USEPA 1999, Section 3, Chapter 1, Table 1.6
Administrative Charges (2% TCI)	$ 273,074.96	$ 62,511.84	
Property taxes (1% of TCI)	$ 136,537.48	$ 31,255.92	
Insurance (1% TCI)	$ 136,537.48	$ 31,255.92	
Capital recovery [CRF = 0.1424]	$ 1,944,293.69	$ 445,084.28	Assuming 10 year equipment life and 7% interest rate. EPA/452/B-02-001
Total Indirect Annual Costs	$ 2,525,082.65	$ 592,500.81	
Total Annual Costs	**$ 2,803,452.34**	**$ 660,213.31**	DAC + IAC

[1] Cost estimate done for activated carbon adsorption system since EPA has not developed cost estimates for other adsorption media

1.08 factor is for freight and sales tax

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Table C-6
Spirit Aerosystems
737 Expansion Project - Paint Booths
Carbon Adsorption BACT Design Basis

Carbon Adsorption - BACT Design Basis

Description	North Plant 2	Notes/References	IPB4 Spoven	Notes/References
Basline VOC emission rate (tpy) Pre-control	47.90		2.68	
Basline VOC emission rate (lb/hr) Pre-control	13.49	m_{voc}	1.34	m_{voc}
Hours per year θs	7,104.0		4,000	
Flow rate to vessel Q (scfm)	150,000		40,000	
Equilibrium adsorptivity (lb/lb carbon)	0.198	$m_e = ap^b$ (a = 0.551, b = 0.110) Table 1.1	0.178	$m_e = ap^b$ (a = 0.551, b = 0.110) Table 1.1
Partial pressure of toluene at 77 F (psia)	0.00009	=ppm/1000000 * (14.696)	0.000034	=ppm/1000000 * (14.696)
Carbon Requirement				$M_{ci} = m_{voc}/w_e$ (θ) Equation 1.13
Working capacity (we) lb VOC/lb carbon	0.099	Assumed to be 50% of equilibrium capacity (equation 1.15)	0.089	Assumed to be 50% of equilibrium capacity (equation 1.15)
Carbon Requirement (total)	2,303.97	$W_c = W_{ci}*(1+N_d/N_a)$ Equation 1.14	92.06	$W_c = W_{ci}*(1+N_d/N_a)$ Equation 1.14
in adsorbing vessels (lb)	1,631.98	Assuming 12 hours adsorbing and 5 hours desorbing	75.32	Assuming 5 hours adsorbing and 1 hour desorbing
Number of adsorbing beds required	16.6	Assume maximum vessel diameter is 12 ft. and 9050 maximum fow rate per vessel	16.64	Assume maximum vessel diameter is 6 ft
Desorption time θd	5	hours	1	hours
Adsorption time θa	12	hours	5	hours
			2403.3	maximum flow rate per vessel Q = (π /4)*(vb)*D^2
Number of desorbing beds required	6.9		3.3	Nd = Na*td/ta
Adsorbing beds (rounded up)	17		9	
Desorbing beds (rounded up)	7		2	
Cost of carbon	2	$/lb (1999 dollars) - EPA 456/F-99-004	2	$/lb (1999 dollars) - EPA 456/F-99-004
Cost of the carbon Cc	**$ 4,607.94**		**$ 184.11**	
Adsorber Dimensions				
Maximum bed depth	3.14	max bed depth = π D/12 (assume max diameter of 12 ft)	1.57	max bed depth = π D/12 (assume max diameter of 6 ft)
Superficial bed velocity (vb)	85	Assumed (ft/min)	85	Assumed (ft/min)
Diameter (D)	12	Assume maximum of 12 ft diameter on pre-fab vessels	6.000	Assume diameter of 6 ft
Carbon requirement (per vessel) Mc	96.00		8.37	
Flow rate (per adsorbing vessel)	8823.5	acfm	4444.4	acfm
Length (L)	75.0	Assume maximum of 75ft per vessel	50.0	Assume 50ft for each vessel
Surface Area (S)	3053.63	S = π D (L + D/2)	999.03	S = π D (L + D/2)
Cost of the Vessel Cv	$ 139,365.81	$Cv = 271*S^{0.778}$ F.O.B. cost from vendor, fall 1999 $	$ 58,430.58	$Cv = 271*S^{0.778}$ F.O.B. cost from vendor, fall 1999 $
Total vessel cost	$ 3,344,779.46		$ 642,736.37	
R (scaling factor for equipment costs)	$ 1.19	$Rc = 5.82*Q^{-0.133}$ - includes fans, pumps, condenser, decanter, instrumentation, piping. Equation 1.26	$ 1.42	$Rc = 5.82*Q^{-0.133}$ - includes fans, pumps, condenser, decanter, instrumentation, piping. Equation 1.26
Adsorber Equipment Cost Ca	**3,989,058**		**$ 913,864.66**	**Ca = 5.82 Q -0.0133 [Cc + (NA +ND)*Cv]**
Cost of Auxiliary Equipment	**997,264**	**Assume 25% of Ca (see page 1-33)**	**228,466.16**	**Assume 25% of Ca (see page 1-33)**
Total Direct Costs (A)	**$ 4,990,930.26**		**$ 1,142,514.94**	

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Table C-6
Spirit Aerosystems
737 Expansion Project - Paint Booths
Carbon Adsorption BACT Design Basis

Carbon Adsorption - BACT Design Basis

Description	North Plant 2	Notes/References	IPB4 Spoven	Notes/References
Electricity Requirement				
System fan size requirement (hp)	251.78	hp = 0.746kW/hp * 2.5e-4 * Q * ΔP Equation 1.32	67.14	hp = 0.746kW/hp * 2.5e-4 * Q * ΔP Equation 1.32
		drying/cooling requirement 50-150 ft3/lb carbon		
θs	7104.00	operating time cf = 0.4*θD *(Na*θs/θa) Equation 1.33	4000.00	
kWh	1,334,302.76	power consumption	200,345.76	power consumption
Gas flow cooling fan (acfm)	767.99	100 ft3/lb carbon * Mc / θd	153.43	100 ft3/lb carbon * Mc / θd
Bed drying/cooling fan (hp)	1.29	hp = 0.746kW/hp * 2.5e-4 * Q * ΔP Equation 1.32	0.26	
Hours per year	2841.60	Assume 0.4 of system time Equation 1.33	1600.00	operating time cf = 0.4*θD *(Na*θs/θa) Equation 1.33
kWh	2732.62	power consumption	307.39	power consumption
Cooling water pump size requirement (hp)	6.80	hpcw = 2.52e-4 * qcw * H * s / n Equation 1.34	0.68	hpcw = 2.52e-4 * qcw * H * s / n Equation 1.34
Required head (H)	100.00	assume 100 feet of water, see Equation 1.34	100.00	assume 100 feet of water, see Equation 1.34
Cooling water flow (qcw) (gal/min)	161.89	G = 3.43 S (ibid page 168)	16.09	G = 3.43 S (ibid page 168)
Steam requirement S (lb/hr)	47.20	Assume 3-4 lb/lb adsorbent captured (ibid page 168)	4.69	Assume 3-4 lb/lb adsorbent captured (ibid page 168)
specific gravity of fluid relative to water (s)	1.00		1.00	
Combined pump-motor efficiency n	0.60		0.60	
Pump annual operating time (hours)	4262.40	Assume 0.6 of system time	2400.00	Assume 0.6 of system time
kWh	21620.57		1209.67	
Electricity (system fan, bed drying/cooling fan, cooling water pump) (kWhr/yr)	1,358,656		201,863	
Electricity cost ($/kWhr)	$0.072		$0.072	
Electrical Cost	$ 97,415.63		$ 14,473.56	
Pressure drop (inches)	9	Assume 9 inches w.c. pressure drop (corresponds to a superficial bed velocity of 80 ft/min)* [page 165]	9	Assume 9 inches w.c. pressure drop (corresponds to a superficial bed velocity of 80 ft/min)* [page 165]
Steam Requirement (lb/yr)	335,300	S * system operating time	18,760	S * system operating time
Steam price ($/Mgal)	$ 12.00	$6/1000 gal in 1988 - scaled up CPI =2	$ 12.00	$6/1000 gal in 1988 - scaled up CPI =2
Steam Cost	$ 482.45		$ 26.99	
Natural Gas Cost ($/Mscf)	$ 5.53		$ 5.53	
Cooling Water Requirement ($/year)	$ 12,420.85	Assuming 0.3/1000 gal	$ 694.95	Assuming 0.3/1000 gal

*Estimating Costs of Air Pollution Control, William Vatavuk

Table C-7
Spirit Aerosystems
737 Expansion Project - Paint Booths
Baseline VOC emissions

Paint Booth Complying with the Aerospace NESHAP

Unit/Service Description	Type Of Control	Uncontrolled PTE Emissions (TPY)
North Plant 2 Booth	Base case - Compliance with the Aerospace NESHAP	47.90
IPB4 Spoven Booth	Base case - Compliance with the Aerospace NESHAP	2.68

NOTES
from Spirit 737 Expansion Booth and RTO Calcs 57APM

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