

# 2015 Pollution Prevention (P2) Intern Program

K-State Engineering Extension  
Pollution Prevention Institute



# Background

- Tenth year of program (2006 Pilot year)
- Partnership with EPA, KDHE, Engineering Extension
- Supported by
  - K-State faculty

# Purpose

- Designed to link top-level engineering and environmental sciences students with business and industry. These collaborations will focus on projects to reduce industrial emissions and wastes, while benefiting the Kansas environment.



# Real-world industry experience



# Real-World Impacts

- Waste diverted
- Energy saved
- Emissions reduced
- Dollars saved
- Water conserved



# Environmental Results

| IMPACTS                                | 2006  | 2007  | 2008   | 2009  | 2010  | 2011  | 2012  | 2013  | 2014   | 2015  | Total  |
|--|-------|-------|--------|-------|-------|-------|-------|-------|--------|-------|--------|
| Water (million gallons)                | N/A   | 25.4  | 187.1  | 9.9   | 22.2  | 6.0   | 11.8  | 7.8   | N/A    | 10.2  | 280    |
| Waste (tons)                           | 1,025 | 5,506 | 1,707  | 6,720 | 585   | 318   | 126   | 519   | N/A    | N/A   | 16,500 |
| Energy (MWh)                           | 1,533 | 7,066 | 26,019 | 8,705 | 6,158 | 5,723 | 6,548 | 4,322 | 487    | 2,859 | 69,422 |
| Operating/disposal \$ (million \$)     | \$0.4 | \$1.5 | \$3.5  | \$0.9 | \$1.2 | \$0.6 | \$0.7 | \$1.8 | \$0.05 | \$0.4 | \$11.0 |
| Greenhouse Gases (MTCO <sub>2</sub> e) | 1,089 | 5,079 | 18,921 | 6,207 | 7,080 | 3,996 | 2,608 | 4,260 | 346    | 2,843 | 52,400 |

- Implementation rate – 66% (soon to be 75%)

# Types of Projects (2015)

## ➤ 249 projects

- Energy – 139 (65%)
  - Water – 50 (20%)
  - Waste – 44 (18%)
  - Natural Gas – 10 (4%)
  - Chemical Replacement – 1 (0.4%)
  - Diesel – 1 (0.4%)
- ## ➤ Energy-related Projects – 199 (80%)

# Host Companies

- **Haldex Brake\***
- Columbian Chemicals Company
- Frontier Refining
- The Monarch Cement Company
- **Frito-Lay**
- Hallmark Cards
- Philips Lighting
- **Schwan's Global Supply**
- **Wolf Creek Nuclear Operation Corp.**
- **Via Christi**
- CertainTeed
- Unilever Foodsolutions
- Florence Manufacturing
- Associated Wholesale Grocers
- GTM Sportswear
- Compass Minerals
- K-State
- Robbie Fantastic Flexibles
- **The Coleman Company**
- Deffenbaugh Industries
- Johnson County Community College
- Prairie Band Potowotami Nation
- Associated Purchasing Services
- Bombardier Aerospace Learjet
- **CST Storage**
- Hill's Pet Nutrition
- Kansas Army National Guard
- Kickapoo Tribe in Kansas
- **Mercy Regional Health Center**
- Capstan Ag
- **Dillon's**

\*Companies participating multiple years

# Program Elements

- Pollution prevention training at K-State (Industrial Sustainability, Jan. 11-14, 2016)
- Placement x 10 weeks
- Support
  - Technical assistance
    - Site visit
    - Listserve
  - Equipment
- Intern retreat
- Final reports and presentations

# Schedule of Events

- Dec 15: applications due
  - \$6,000 (\$15/hr for 10 weeks), plus fringe
  - Terms and agreements
- Jan 12-14: intersession course (training)
- Feb 6-10: interview potential interns
- Feb 13-24: select interns, pair w/host companies, and make offers
- Mar 5-9: confirm interns
- May 26-Aug 3: interns with host companies
- Late July: draft report
- Early August: final report
- Mid-September: K-State presentations

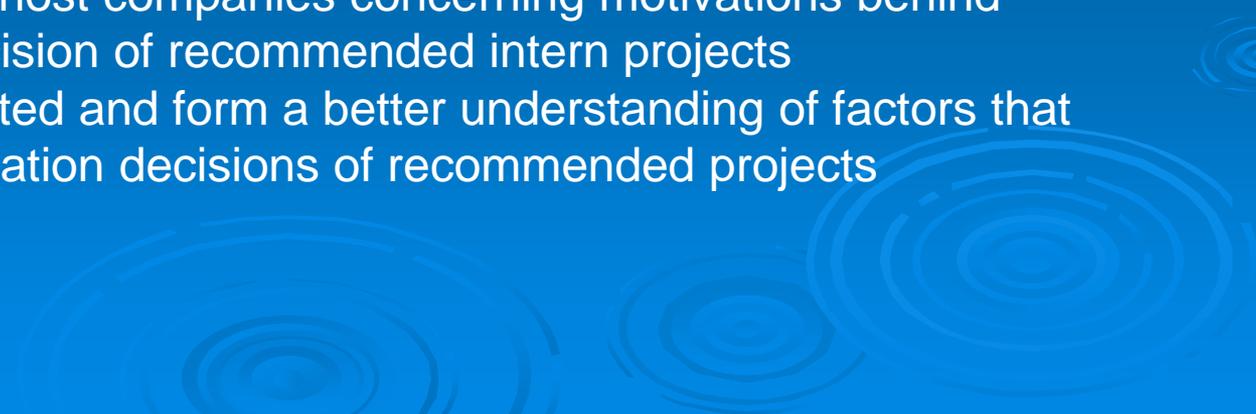


# Source Reduction Grant 2013-2014

## Objective

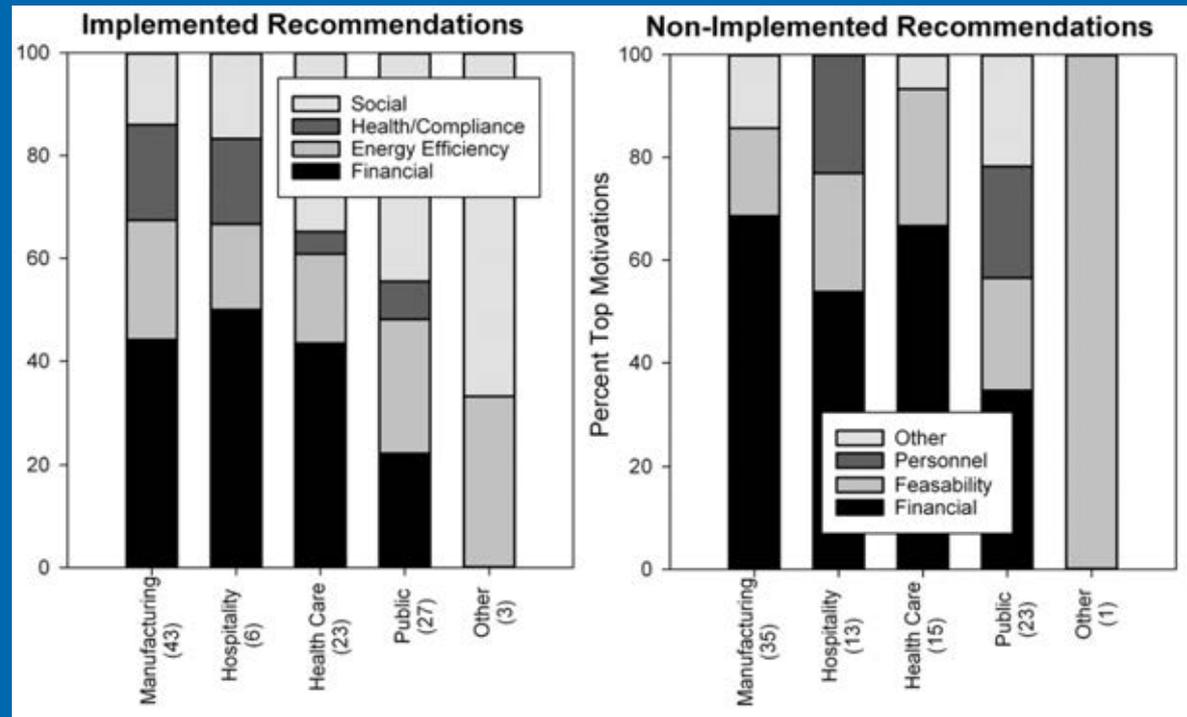
To obtain environmental outcomes through the reassessment of past, intern host companies

## Project goals

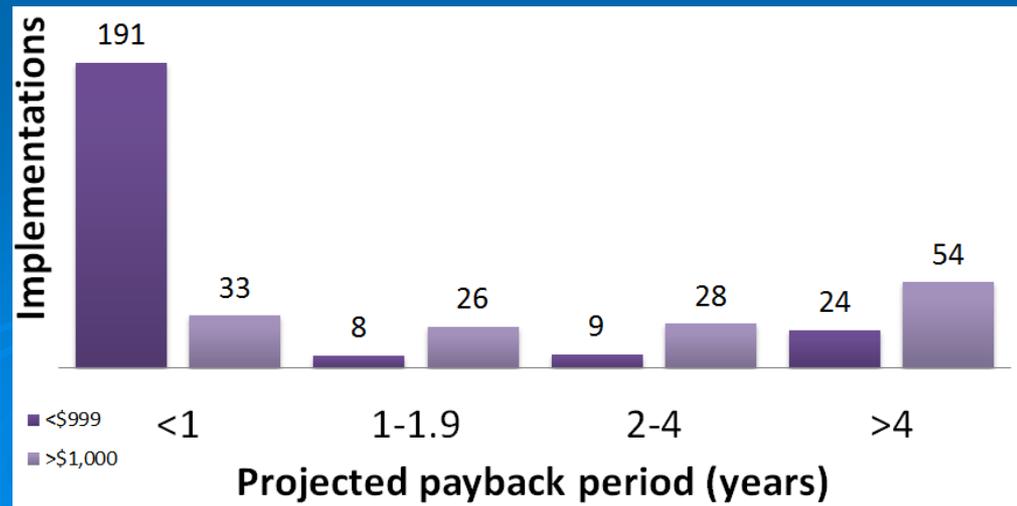
1. Reassess past, intern host companies to determine implementation rate and outcomes of recommended intern projects
  2. Survey past, intern host companies concerning motivations behind implementation decision of recommended intern projects
  3. Analyze data collected and form a better understanding of factors that motivate implementation decisions of recommended projects
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# Source Reduction Grant 2013-2014

Top motivations by client sector



Implementation by payback and initial cost



# Source Reduction Grant 2013-2014

## Impact of reassessments by program

| Program/impact                            | PPI         | UNL         |
|---|-------------|-------------|
| Cost savings (\$/year)                    | \$1,306,954 | \$1,116,765 |
| Electricity (kWh/year)                    | 7,002,923   | 2,102,400   |
| Natural gas (therms/year)                 | 181,825     | 126,575     |
| Solid waste (lbs/year)                    | 7,876       | 11,645,450  |
| Hazardous waste (lbs/year)                | 1,600       | 0           |
| Water (gallons/year)                      | 9,066,887   | 110,000     |
| GHG emissions (MMTCO <sub>2</sub> e/year) | 7,846       | 2,960       |



# Source Reduction Grant 2013-2014

## Conclusions

- Attractive finances result in higher implementation rate
  - Financial motivations not a major factor when accounting for other factors
  - Financial motivations are a motivating factor for nonimplementation
  - Large majority of impacts are from a small percentage of clients
    - Pareto principle/80-20 rule reflected
    - This is shown to be true in this analysis especially for solid waste, water and natural gas
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# Contact Information

Questions or recommendations?

Applications due **December 15th**

[www.sbeap.org](http://www.sbeap.org)

800-578-8898

[nlarson@ksu.edu](mailto:nlarson@ksu.edu)

316-660-0104

[dcarter@ksu.edu](mailto:dcarter@ksu.edu)

785-532-4998

# Jade Edmonds – CST Storage



How I pretend to look at work...



How I actually look at work...

# Pollution Prevention Institute 2015 Intern Project

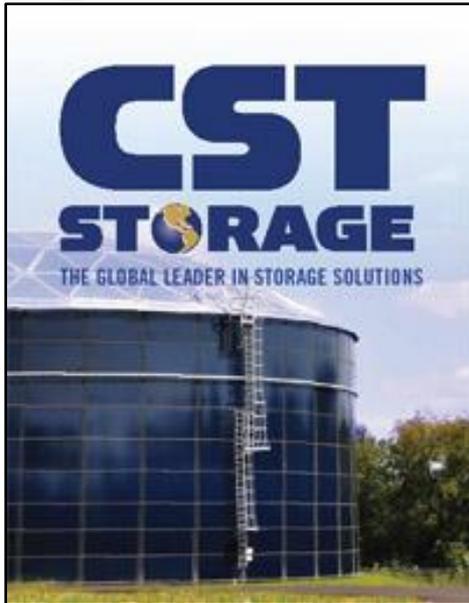


Jade Edmonds

# Overview

- Background
- Projects
  - Re-routing oven heat
  - Installing soft starts
  - Heater vs. heat exchanger
  - Fluidized sand scrubber
  - Air-leak audit
- Conclusions
- Questions

# Background



- CST is a manufacturing plant that specializes in bolted storage tanks.
- CST started the PPI intern program in 2011.
- Two important goals of the PPI program:
  - CST leaves less of an impact on the environment
  - cost effective in updates

# Re-Routing Oven Heat

- The Industrial Assessment Center (IAC) was brought in to do an energy audit.
- Re-routing oven heat would reduce overall energy consumption.



IAC performing the energy audit.

# Installing Soft Starts

- CST has three air-compressors, two of which have soft starts already installed.
- From Westar's data tracking website, the intern observed the first two soft starts dropped the average peak energy usage of the plant by 73.07 kW.

- $Energy\ Savings = 189,493.10\ kWh\ per\ year$   
 $= \$16,675.39\ per\ year$

- $Simple\ Payback\ Period = \frac{Initial\ Cost}{Annual\ Savings} \rightarrow$

$$\left( \frac{\$4498}{(\$16,675.39\ per\ year)} \right) = .270\ years$$

$$.270\ years \left( \frac{365\ days}{1\ year} \right) = 98.55\ days$$

# Heater vs. Heat Exchanger

- CST uses a gas-fueled heater and an electric heater to heat water used in their washer, and would like to determine if the current system would be more efficient if it was updated to a heat exchanger.



- This would potentially be a project for a future PPI intern.

# Fluidized Sand Scrubber

- CST uses a burn-off oven to remove paint from conveyer hooks.



- A sand scrubber would allow CST to re-work steel parts that are now being scraped.
- <http://www.dinamecsystems.com/>

# Fluidized Sand Scrubber (cont.)



Overview of sand scrubber.



Inside of sand scrubber, gas ignited.



Before scrubbing process.



After scrubbing process.

## Fluidized Sand Scrubber

Energy Savings

226 MMBTU

Annual Savings

\$84,935.36

Simple Payback Period

4.67 years

# Air-Leak Audit

- Performing the air-leak audit the intern found 13 air leaks.
- By fixing the air leaks CST would decrease energy consumption by 90,884 kWh per year and save \$9,088.36.



# Conclusions

| PROJECT DISCRIPTION  | ANNUAL ESTIMATED ENVIRONMENTAL IMPACTS | ANNUAL ESTIMATED COST SAVINGS | STATUS               |    |   |                 |                 |                  |     |
|--|--|-------------------------------|----------------------|----|---|-----------------|-----------------|------------------|-----|
| Re-Routing Heat From Ovens   | -                                      | -                             | More Research Needed |    |   |                 |                 |                  |     |
| Air-Compressors: Soft Starts   | 189,415.33 kWh                         | \$16,668.55                   | Recommended          |    |   |                 |                 |                  |     |
| Heater vs Heat Exchanger   | -                                      | -                             | More Research Needed |    |   |                 |                 |                  |     |
| Fluidized Sand Scrubber  | 266 MMBTU                              | \$84,935.36                   | Recommended          |    |   |                 |                 |                  |     |
| Air Leak Audit   | 90,884 kWh                             | \$9,088.36                    | Recommended          |    |   |                 |                 |                  |     |
| <b>Total Savings</b>   | <b>280, 299.33 kWh, 266 MMBTU</b>      | <b>\$110,692.27</b>           |                      |    |   |                 |                 |                  |     |
| <b>Conventional Air Pollutants and Green House Gases Diverted in Standard Tons</b> |  |                               |                      |    |   |                 |                 |                  |     |
| SO <sub>2</sub>  | CO                                     | NO <sub>x</sub>               | VOC                  | PM | MTCO <sub>2</sub> e                       | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | CFC |
|  |  |                               |                      |    | 288.32                                    |                 |                 |                  |     |
| <b>GHG Reductions</b>  |  |                               |                      |    | <b>288.32 metric tons CO<sub>2</sub>e</b> |                 |                 |                  |     |

# QUESTIONS?

