POLLUTION PREVENTION INTERN PROGRAM

WORKING TOGETHER TO ACHIEVE ECONOMIC AND ENVIRONMENTAL RESULTS




2008
CASE SUMMARIES

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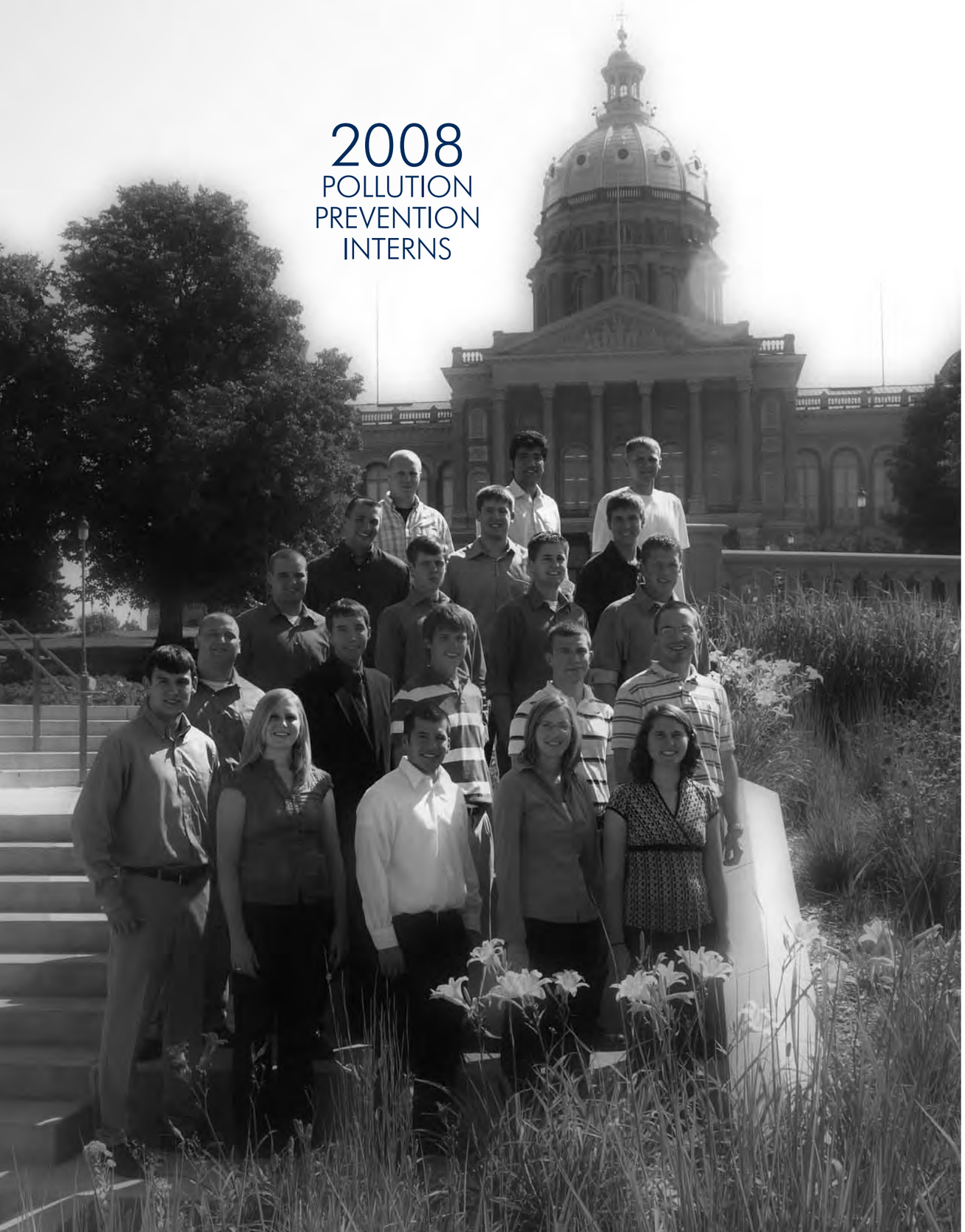


2008 POLLUTION PREVENTION INTERNS

CONTENTS

DIRECTOR'S NOTE

These are challenging times for Iowa businesses. Energy and resource costs are skyrocketing. At the same time, consumers are favoring products produced by responsible environmental stewards. For Iowa businesses to maintain a competitive edge and grow in an increasingly competitive global market, they will have to recognize these challenges as opportunities — opportunities to incorporate resource management practices that lower their input costs and the opportunity to reduce their environmental footprint.

Eight years ago, the Iowa Department of Natural Resources developed the Pollution Prevention Intern Program as a collaborative effort between government, business, and academia to develop cost-effective options for preventing or minimizing pollution from industrial processes. The program has been a phenomenal success. By placing qualified Iowa college students with Iowa companies to identify, research, and implement changes that result in environmental and financial savings, everyone wins.

In 2007, I established a Top 10 Priorities list as a means for identifying our top environmental priorities and acting on them. Pollution prevention is at the core of these priorities, and programs like the Pollution Prevention Intern Program help us act on those priorities practically across the board. Pollution Prevention Intern projects improve the way Iowa businesses manufacture, consume, reuse, and recycle materials. They also conserve water, improve water quality, improve air quality, and reduce greenhouse gas emissions to the atmosphere.

Since 2001, the implementation of Pollution Prevention Intern recommendations has saved over 1 billion gallons of water, 108,947 tons of solid waste, 942,332 gallons of hazardous waste, 100,601 tons of special waste, and over 221.5 million kilowatt hours and 2.29 million therms of electricity.

One of the concepts Pollution Prevention Interns are encouraged to practice is to look for continuous process improvements. During the summer of 2008, program administrators decided to use that concept to examine the Pollution Prevention Intern Program itself. Two former interns were hired to audit the program to see where improvements can be made and to identify opportunities for the future. With the goal of continuous improvement in mind, the interns' recommendations are being reviewed, and process improvements to the program will be implemented and made available for future interns to carry forward.

I encourage you to read the case studies and student testimonials that follow. You, too, can partner with the Iowa DNR by applying for our summer of 2009 Pollution Prevention Intern Program.

RICHARD A. LEOPOLD

2008 EXECUTIVE SUMMARY

2008 was a year of outstanding accomplishments for the award-winning Pollution Prevention Intern Program.

This year, 21 interns implemented projects that dramatically reduced solid and hazardous waste, water and energy use, air emissions, and greenhouse gases. The projects this year saved participating companies and institutions over 1.5 million dollars. Since the program's inception in 2001 Iowa businesses have saved more than 54.3 million dollars.

The program's unique partnership of government, academia, and industry make these achievements possible. With the Iowa Department of Natural Resources' (DNR) support, top Iowa students share their talent, hard work and fresh perspectives with companies and institutions dedicated to environmental excellence. In return, the students gain valuable training from experts in their fields and hands-on professional experience. All Iowans benefit from the lasting environmental impacts this partnership creates.

As the Pollution Prevention Intern Program evolves, the DNR continuously strives to improve our services. To that end, two of the 2008 interns performed on-site assessments at previous host companies and institutions. The interns followed up on project recommendations that had been made by past interns, and the companies and institutions generously shared their insights about the program's results and effectiveness. These assessments helped us to better understand company priorities, barriers to implementation, and environmentally sustainable trends. The evaluations strengthened our existing partnerships and will be extremely valuable as we gear up for future projects.

Typically, after one week of training, interns spend 11 weeks at the host facility. This year, two of our 2008 interns are undertaking 24-week projects, at Proctor and Gamble in Iowa City and West Liberty Foods in West Liberty, Iowa. After these projects are completed in November 2008, their summaries will be available online, at www.iowap2services.com. We will also include these projects in our 2009 case summary booklet.

The DNR thanks 2008's host companies and institutions for their leadership, vision, and environmental stewardship, and we commend the interns for tackling the important challenges summarized in this booklet.

CATEGORY	REDUCTION	COST SAVINGS
WATER CONSERVATION	12,887,600 GALLONS	$101,706
SOLID WASTE	581 TONS	$119,561
HAZARDOUS WASTE	95,850 GALLONS	$587,307
ENERGY	4,263,029 KWh 479,317 THERMS	$247,699 $471,636
TOTAL		$1,527,909

Note: Air emissions and greenhouse gases shown in the following case summaries are Life Cycle estimates and include external activities such as purchasing utilities. Totals do not solely represent emissions generated at the plant sites.

Air Emissions Avoided in Tons

	Total for all sectors
SO2	65.1942
CO	23.2098
NOX	37.9141
VOCs	9.8431
PM	12.1018

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	18945.98
CH4	2983.434
N2O	600.3354
CFC	163.0794

3M KNOXVILLE

COMPANY BACKGROUND

The 3M plant in Knoxville, Iowa specializes in creating pressure sensitive tapes and adhesives. The majority of these tapes and adhesives are developed on a custom basis to meet the demands of the individual customer. The applications of these tapes range across many industries, from attaching parts in the automotive industry, to tape for use in diapers, to the fasteners used to hold up the mirrors in the walkways of Chicago O'Hare Airport.

KNOXVILLE

HEATH VIGNES
MECHANICAL ENGINEERING
UNIVERSITY OF IOWA

PROJECT BACKGROUND

The project at 3M Knoxville consisted of recapturing heat from their regenerative thermal oxidizer with a waste heat boiler. The process would then provide the plant with "free" steam during the summer months and supplemental steam for their boiler during the winter months, when the plant requires more steam for its heating and processes.

INCENTIVES TO CHANGE

3M Knoxville undertook the opportunity to partner with the IDNR Pollution Prevention Intern Program based on the desire to cut costs at their plant. The reduction of pollutants was an added bonus since they were already well under their allowed permits for pollution. The need to cut energy costs was their main motivation with the rising prices of natural gas and oil. 3M Knoxville is currently experiencing the highest prices they have ever paid for natural gas and the prices are only expected to increase with the onset of winter.

RESULTS

Waste Heat Boiler: 3M Knoxville's regenerative thermal oxidizer produces exhaust air of 850°F to 1500°F to the atmosphere. The goal was to determine the most efficient method to recapture this heat and put it to a constructive use for the company. It was determined that the best option for effectively recovering this heat was to install a waste heat boiler to the hot air by-pass that comes off of the regenerative thermal oxidizer.

The regenerative thermal oxidizer does not consistently produce enough hot air that the hot air by-pass is continuously in use. Initially it was thought that it might be cost-effective to simply over-fire the burners in the regenerative thermal oxidizer to maintain a consistent flow of hot air to the waste heat boiler. This, however, was determined to be infeasible since it would cost the plant a substantial sum of money and natural gas to produce steam in this manner.

Because this option was not practical, the final recommendation was to install a 25,000-pound waste heat boiler with its own fuel line. This would allow for fluctuations in the amount of hot air bypass. The installation of a waste heat boiler would allow the plant to turn off both of its 60,000-pound boilers during the summer months and supplement the 60,000-pound boilers in the winter enough so that only one would need to be turned on.

It was also determined that the efficiency of the regenerative thermal oxidizer should be increased from 90 percent to 95 percent to gain even more energy from the waste heat. To do this, an additional 18 inches of ceramic media should be added to the regenerative thermal oxidizer, which should increase the efficiency to 95 percent.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	0.818
CO	1.51
NOX	0.875
VOC	1.86
PM	0.081

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	2519
CH4	482
N2O	1.22
CFCS	3.67

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WASTE HEAT BOILER	$317,172.91	264,310 THERMS	RECOMMENDED

ACUMENT GLOBAL TECHNOLOGY

COMPANY BACKGROUND

Acument Global Technologies is an internationally accomplished competitor in the mechanical fastening and assembly solution industry. Serving more than 150 countries, Acument's net sales exceed $1.8 billion. Acument adheres to a continuous improvement program and a Lean Manufacturing process to continue to ensure the growth of the company. Acument Decorah Operations' customers include a large telecommunications company and major vehicle and tools manufacturers. Current processes at Acument Decorah Operations include heading, threading, shaving, grinding, heat treating, and painting.

DECORAH

PHILLIP MANN
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

Acument Decorah Operations has hosted Pollution Prevention Program interns for five summers, and is interested in continuing the success it has experienced with the program. Each intern decreases the environmental footprint of Acument and provides annual cost savings. This year, the Decorah plant is focusing on waste heat reclamation and soap/water reuse.

INCENTIVES TO CHANGE

With rising prices of gas and water, environmental projects become even more important for sustainability and the growth of the company. Reduction at the source can be overlooked, as it is often not readily apparent. Locating these sources and finding feasible alternatives or solutions to implement will provide the host company with large annual savings.

RESULTS

Wash Treatment Systems: Most parts must pass through a wash treatment before they are packed. A majority of the parts wash machines were over-specified for the rated temperature for the type of soap they were using. Testing to find the most efficient temperature on these machines determined the natural gas and electricity that could be saved by operating closer to specifications. In addition, several machines had an excess concentration of soap. Using proportioners and cutting down on overuse will save Acument money on soap purchases and on wastewater treatment costs.

Soap Analysis: The soap currently used for the wash processes is a basic, inexpensive heavy-duty cleaner. Several tests were conducted to determine if more advanced or different soaps could perform better. Testing showed that low-temperature cleaners were appealing but not capable of the cleaning power of the current soap. However, a different alkaline soap showed positive results in cleaning better than the current soap at lower concentrations. This cleaner costs less and can be operated at lower concentrations to save on wastewater treatment as well.

Waste Heat Recovery: In the heat treating section at Acument, two furnaces and several other heaters exhaust an immense amount of heat through the roof. To conserve on energy and to recover the otherwise lost heat, a waste heat generator was investigated. Acument's exhaust qualifies it for a 50 kWh waste heat generator that would allow it to produce part of its own energy with a rate of return of about two years. If the project works at the Decorah Acument site, other sites with heat treat will begin their own waste heat projects

Wastewater Recovery: Under the current wastewater treatment system, a large amount of wastewater is sent to drain, treated or hauled off-site. Some water is merely used to cool or heat and then sent to drain without any sort of contamination or recycling. To cut down on the water use and treatment costs, a wastewater recovery system was recommended. The new system uses a reverse osmosis, hydrophilic cycle to distill and recover 95 percent to 98 percent of all water used. Not only does this drastically cut down on water consumption, but also on treatment and hauling costs.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	3.917
CO	0.468
NOX	1.876
VOC	0.23
PM	0.099

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	734.03
CH4	64.78
N2O	0.347
CFCS	9.0

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WASH TREATMENT SYSTEMS	$62,800	4,350 GAL SOAP 2362 CCF NATURAL GAS 61,800 KWH	IMPLEMENTED
SOAP ANALYSIS	$11,000	1500 GALLONS SOAP	IMPLEMENTATION IN PROGRESS, TESTING CONTINUES
WASTE HEAT RECOVERY	$39,900	420,000 KWH	IN PROGRESS
WASTEWATER RECOVERY	$24,160+	8,701,880 GALLONS	RECOMMENDED

AMERICAN PACKAGING CORPORATION

COMPANY BACKGROUND

American Packaging Corporation is a flexible packaging manufacturer servicing food, beverage, medical, personal care, household, pet food, agricultural chemical, and lawn and garden markets. American Packaging Corporation employs over 550 people and is one of the largest privately held packaging companies in the world. Its operations include rotogravure and flexographic printing, adhesive and extrusion laminating, hot and cold seal coating, pouching, and bagging. The Story City facility has 130 employees and produces intermediate and wide webbing using 2- to 3-ply adhesives lamination. They operate the latest slitting and rewinding equipment and have the ability to manufacture bags and pouches with a wide range of structures.

STORY CITY

JARED NOACK
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

American Packaging Corporation has implemented sustainable practices for the past decade. This summer the company partnered with the Pollution Prevention Program to help make progress on stalled projects as well as to identify and implement new projects to reduce the amount of energy consumed.

INCENTIVES TO CHANGE

American Packaging Corporation has divisional packaging "green team" members. Their goal is to help American Packaging become green and sustainable. In order for American Packaging to stay competitive, it must meet the demands of their customers, who are also transitioning to sustainable practices. That is why they are making great strides towards recycling every piece of their solid waste, and are looking for ways to reduce electricity, water, and gas consumption, as well as to reduce solid and hazardous waste.

RESULTS

Compressed Air: Every machine in the plant depends on and uses compressed air. The demand for air accounts for 16 percent of the electric bill. A leak detection program was implemented and 122 leaks were found. A repair program was implemented to fix all leaks. Continuing the leak detection and repair program will help reduce costs. A leak reporting program was introduced to the machine and maintenance workers to help them identify and repair the noticeable leaks.

Lighting: A lighting audit was done, revealing that the lighting conditions around the plant could be improved. The lighting conditions were impaired by inefficient lighting layouts and fixtures around the facility, which increased the electric bill. Re-lighting the facility with new T5 high output fluorescents will improve the lighting efficiency and provide a safer working environment. The new fluorescent lights will provide a more efficient lumen output. Placing occupancy sensors in the warehouse and in other infrequent traffic areas will reduce their kilowatt-hour usage. The EPACT tax credit of 2005 will help American Packaging reduce the installation cost of re-lighting the plant area.

Fixture Diversion: A local company with a more feasible application for metal halide fixtures has been contacted. The company will take the fixtures free of charge, thereby diverting 4.5 tons of solid waste from the landfill and saving disposal fees.

Boiler: A boiler replacement project would have a number of beneficial environmental impacts. The boiler is currently used for the drying process on one printing press. The process takes place more than 200 feet from where the boiler is located. Replacing the boiler with a direct gas-fired heat exchanger will save great quantities of water, chemicals, natural gas, and maintenance labor. The boiler itself emits temperatures of 250 degrees Fahrenheit. If the boiler is not replaced in the near future, insulation is recommended for both safety and energy conservation purposes.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	3.3749
CO	0.4708
NOX	1.6313
VOC	0.2167
PM	0.0891

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	637.886
CH4	114.564
N2O	33.5159
CFCS	7.8936

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR COMPRESSED AIR LEAKS	$26,339	376,270 KWH	IMPLEMENTING
RE-LIGHTING	$24,593	367,585 KWH	IMPLEMENTING
RE-LIGHTING	$2,892	611 THERMS	IMPLEMENTING
FIXTURE DIVERSION	$1,284	4.5 TONS	IMPLEMENTING
ELIMINATE BOILER	$1,317	19,551 KWH	RECOMMENDED
ELIMINATE BOILER - WATER	$10,992	25,550 GALLONS	RECOMMENDED
ELIMINATE BOILER - CHEMICAL	$1,041	11 GALLONS	RECOMMENDED
ELIMINATE BOILER	$14,739	21,168 THERMS	RECOMMENDED
INSULATE BOILER	$3,170	3,762 THERMS	RECOMMENDED

BURKE CORPORATION

COMPANY BACKGROUND

Burke Corporation, a subsidiary of Hormel Foods, manufactures and markets fully cooked meat products for businesses that include restaurant chains and convenience stores. Burke makes more than 1,500 different products and processes over 80 million pounds of meat a year. Burke makes consistent, convenient and safe products, with a forty-year history and commitment to service, quality and product development. Hormel Foods purchased Burke Corporation in 2007 and has continued the dedication to consistent, convenient and safe products.

NEVADA

SARA SCHMIEG
ENVIRONMENTAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

Burke Corporation has consistently advanced in finding new ways to conserve resources through the years, and has further improved its environmental sustainability through the Pollution Prevention Intern Program. Over the course of the summer, a water balance was begun to identify the highest water usage areas. This helped focus on the main projects: water conservation, chemical reduction and solid waste minimization.

INCENTIVES TO CHANGE

In order to combat the rising costs of energy and water, Burke has launched several projects to improve sustainability. The company is looking for new and innovative ways to continue to conserve resources and decrease costs for waste disposal. Over the past nineteen years, Burke has increased its production by 60 million pounds a year. In 2004, Burke was remodeled to help meet product requirements. To maintain efficient production, source reduction opportunities have been evaluated and implemented.

RESULTS

Water Conservation: The water conservation project included automation, process changes and mechanical modifications. A water and nozzle audit was performed in different areas and it was found that more than five million gallons of water can be saved a year with changes to nozzles and in the oven line. A water balance was initiated to determine the highest water usage areas, thereby establishing baseline usage and identifying waste.

Chemical and Treatment Reduction: All effluent water to the city is first treated at the pre-treatment plant. This means that any amount of water conserved directly impacts the cost of chemicals and treatment. Internal and external wastewater treatment is a major expense for Burke, since more than 30,000 gallons of chemicals are needed for the treatment process.

Grease Recovery: Through process changes, as well as installing catch pans, an additional 242,000 pounds of grease can be recovered a year. Recovering additional grease during sanitation not only reduces treatment costs, but also increases grease revenue.

Cardboard and Plastic Recycling: Burke currently has a baler to recycle some cardboard waste. If another baler were purchased to help with the recycling demand, a potential 440 tons of additional material could be diverted from the waste stream each year. The facility could also begin to recycle plastic material as well as cardboard.

Waste Heat Recovery: Insulation projects on the boilers and hot water lines can result in significant energy savings at Burke. With more than 350 feet of piping in need of insulation and a recommendation to install 93 insulating blankets, over 30,000 therms would be saved from natural gas heating and 27 tons of carbon dioxide emissions would be reduced annually.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WATER CONSERVATION: PROCESS AND MECHANICAL CHANGES	$80,900	7,700,000 GALLONS	IN PROGRESS
CHEMICAL AND TREATMENT REDUCTION	$67,800	30,000 GALLONS	IN PROGRESS
GREASE RECOVERY	$27,250	121 TONS	IN PROGRESS
CARDBOARD/PLASTIC RECYCLING	$73,700	360-660 TONS	IN PROGRESS
WASTE HEAT RECOVERY	$41,300	37,800 THERMS	RECOMMENDED

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	0.18
CO	0.31
NOX	0.17
VOC	0.47
PM	0.02

Green House Gases Diverted in Tons (CO_2 Equivalent)

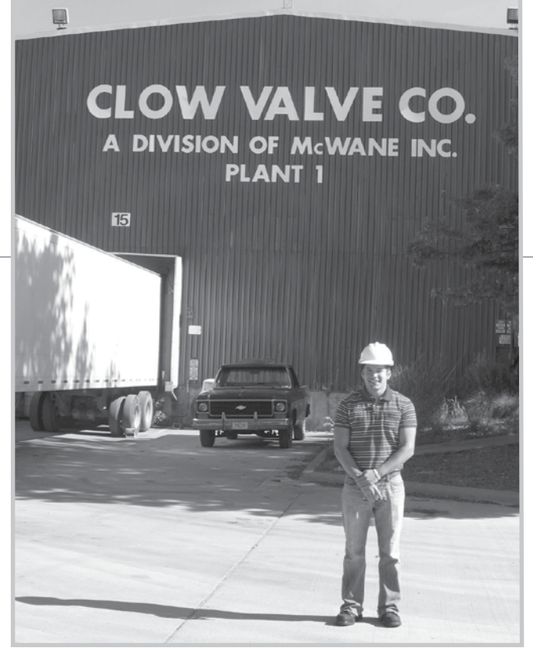
	Total for all sectors
CO2	81.6
CH4	393
N2O	181
CFCS	0.88

CLOW VALVE COMPANY

COMPANY BACKGROUND

Clow Valve Company dates back to 1878. Today, Clow Valve of Oskaloosa, Iowa has become a much larger company, producing valves and fire hydrants for clients around the world. The Oskaloosa site consists of two separate facilities: the machine shop and the metal casting facility. Clow has become increasingly committed to reducing its environmental footprint. In addition to participating in the Pollution Prevention Intern Program, Clow has been working with its electricity distributor on energy-saving techniques at both of its facilities within Oskaloosa.

OSKALOOSA



ERIC OSTRANDER
MATERIALS ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

This summer, Clow looked to improve the company's efficiency by reducing the volume of hazardous waste caused by machine coolant sludge, reducing the amount of cleaner used in a parts washer, and reducing/reusing non-contact single-pass cooling water in core-making machines and oil cooling.

INCENTIVES FOR CHANGE

Clow's increasing costs of machining coolant disposal and parts cleaning solution drove the company to research options to improve upon its techniques and procedures. Clow also had high annual costs and expected price inflations for water, which motivated the company to investigate opportunities to cut back on usage and to recycle the water that was still used.

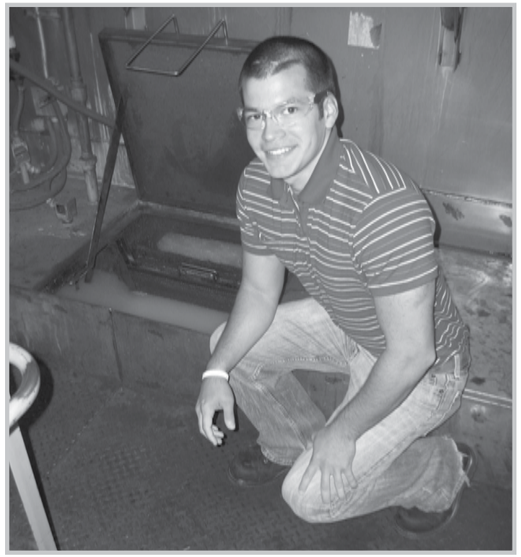
RESULTS

Coolant Waste Volume Reduction: Through the use of ultrafiltration, Clow can reduce the amount of waste sent out as "hazardous" by 90 percent per shipment. Extrapolating the current hazardous waste disposal costs from this situation, would save roughly $10,260 each year. In addition, the use of a reverse osmosis unit would reduce the volume from the source. The reverse osmosis unit could reduce or prevent coolant sludge volumes needed to be run through the ultrafiltration system.

Cleaner Reduction: With the use of ultrafiltration, reverse osmosis, air blades and an automatic controller, Clow can save approximately 1,293 gallons of cleaner annually. Ultrafiltration and reverse osmosis keep the cleaning solution clear of unwanted solids and oils. The air blades help retain solution, so it is not carried out of the station by parts on the conveyor. The automatic controller would maintain the concentration of the cleaner in solution throughout the day, replacing manual adjustment. Finally, turning off water and cleaner pumps during downtime will cut back on unnecessary operation costs. Cost savings realized by the reduced volume of cleaner would be approximately $21,577.

Water Reduction/Reuse: Through experimentation and observation, it was found that flow rates cooling certain machinery in Clow's metal casting facility could be lowered by 3.5 gallons per minute, on average. Using the tested rate on ten machines, there would be a savings of over 2,400,000 gallons of water per year. The volume of water saved equals $9,713 annually. In addition, the reduced water still in use was proposed to be piped to a furnace for further use. Roughly $1,051 would be saved by reusing the single-pass water.

After building modifications were made to the metal casting facility, discussions with the maintenance supervisor resulted in a proposal to further reduce the required volume of cooling water. These building modifications indirectly alleviated the need of the cooling water for oil cooling. Experimentally, the water was turned off and the oil never reached an overheating status. This solution would save over 5,100,000 gallons of water a year, which results in $20,806 worth of savings. However, if the experiment runs into any trouble, a cooling tower could be installed to limit the amount of water that is used in the system. The cooling tower system would still cut down on usage, by only demanding approximately .75 gallon of water per minute, saving $19,722 annually.



Air Pollutants Diverted in Tons

	Total for all sectors
SO2	0.106
CO	0.135
NOX	0.064
VOC	0.142
PM	0.011

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	46.161
CH4	158.761
N2O	82.473
CFCS	0.74

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
COOLANT VOLUME REDUCTION	$10,260	3,217 GALLONS OF HAZARDOUS WASTE	RECOMMENDED
CLEANER REDUCTION	$21,577	1,293 GALLONS OF CLEANER	RECOMMENDED
WATER REDUCTION IN CORE ROOM	$10,764	2,429,545 GALLONS OF WATER	RECOMMENDED
WATER REDUCTION FOR OIL COOLER	$20,806	5,187,600 GALLONS OF WATER	IMPLEMENTED

E.I. DUPONT

COMPANY BACKGROUND

E.I. du Pont de Nemours and Company (DuPont) was founded in 1802, originally as a gunpowder mill. Over the years DuPont transformed into a science based chemical company aimed at providing better, safer, healthier lives for people everywhere. With operations in over 70 countries, today DuPont offers products and services in agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation, and apparel. The Fort Madison plant specializes in ink-jet inks and performance polymers.

FORT MADISON

RYAN WENDT
MECHANICAL ENGINEERING
UNIVERSITY OF IOWA

PROJECT BACKGROUND

One of DuPont's sustainability goals is to reduce overall energy usage, focusing on boiler and air compressor efficiency. These process improvements are necessary to reduce the company's environmental footprint.

INCENTIVES TO CHANGE

As a world leader in science based chemical production, DuPont also prides itself on being a leader in finding better ways to protect the environment. The company is constantly creating new sustainability goals. These goals include reducing energy usage and using new forms of renewable energy that are inexpensive and clean burning, such as solar or wind energy. DuPont also continuously strives to further reduce carbon gas emissions, air carcinogen emissions and water consumption.

RESULTS

Steam Trap Maintenance Program: There are 326 total steam traps in the Fort Madison plant, with only about 250 currently in service. The failure rate for the facility was 8.5%, which is commendable. However, a few of the traps are relatively old models and need to be replaced in order to meet the standards of the rest of the plant's steam trap system. Setting up and maintaining a steam trap database is recommended for use in future steam trap surveys in order to keep records up-to date. With rising energy costs, implementing an annual steam trap survey program would help reduce lost energy due to insufficient or failed steam traps and would cut back on natural gas consumption.

Insulate Steam/Condensate Return Lines: Steam is a big energy consumer at the Fort Madison plant. DuPont uses steam for heating in its production of ink and polymers, and for space heating the plant itself in the fall and winter months. Hot condensate, or steam that has been condensed into liquid water form, is then returned back to the boilers to be reused. Bare, non-insulated pipe loses heat and energy to the atmosphere through convection and radiation. After analyzing the plant's steam and condensate return piping, 995 ft. of non-insulated steam pipe and 3,597 ft. of non-insulated condensate pipe were found. Using the U.S. Department of Energy's 3E Plus software, the intern was able to identify the best types of insulation for reducing energy loss and maximizing savings.

Compressed Air Leaks: Compressed air is regularly used throughout the plant and accounted for 25 percent of total electrical use for the last calendar year. The Fort Madison plant has two different systems for compressed air: process air and breathing air. Process air is used for general purposes throughout the facility, while breathing air is used to provide positive pressure in protective safety suits. After conducting a compressed air survey of the plant, a total of 211 leaks were found, amounting for 475 cubic feet of lost air per minute. Approximately 95 percent of the lost air was from the process air system, with the remaining 5 percent coming from the breathing air. Undertaking a continuous program of searching, identifying, and repairing compressed air leaks can save DuPont large amounts of electrical energy annually.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
STEAM TRAP MAINTENANCE PROGRAM	$62,862	89,555 THERMS	RECOMMENDED
INSULATE STEAM/CONDENSATE RETURN LINES	$24,102	35,665 THERMS	RECOMMENDED
FIX COMPRESSED AIR LEAKS	$31,504	552,694 KWH	IN PROGRESS
COMPRESSED AIR LEAK MAINTENANCE PROGRAM	$23,550	413,159 KWH	RECOMMENDED

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	7.72
CO	1.02
NOX	3.72
VOC	—
PM	—

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1458.32
CH4	—
N2O	—
CFCS	—

Note: These totals are Life Cycle estimates and include external activities such as purchasing utilities. Totals do not solely represent emissions generated at the plant site.

FRONTIER NATURAL PRODUCTS COOPERATIVE

COMPANY BACKGROUND

Frontier Natural Products Co-op specializes in natural and organic products. Frontier's products are found in natural products stores and specialty shops throughout the United States and Canada. By offering easy access to high-quality, competitively priced choices that are both environmentally friendly and socially responsible, Frontier seeks to lead the way in bringing nature — and peace of mind — to customers.

As the world's largest global supplier of organic herbs and spices, Frontier holds a leadership position, not only in the marketplace, but also in the effort to convert food producers to sustainable farming and production practices. Their work is driven by the belief that fostering environmental responsibility is crucial to the world's future.

TRENT PAYNE
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

Frontier Natural Products Co-op has achieved ongoing benefits by partnering with Pollution Prevention Services. In 2006, a program engineer conducted a lighting survey for the Norway site that produced large financial savings and improved efficiency. This year, at the Norway site, Frontier conducted a comprehensive survey of the operations equipment and machinery, including compressors, to detect the causes of high peak demand during normal, day-to-day operations.

INCENTIVES TO CHANGE

After finishing phases I and II of the lighting retrofit projects during the 2007 fiscal year, Frontier began to look for other opportunities to improve efficiency. Frontier decided to undertake an assessment of its operating equipment after consulting with the energy provider and Pollution Prevention Program Services about kWh trends.

RESULTS

HVAC: HVAC is used widely throughout the facility and accounts for approximately 40 percent of total electrical usage. There are 16 rooftop HVAC units controlled individually on buildings 5, 6 and 7 at the plant. Frontier must maintain an environment of 65 degrees Fahrenheit and 65 percent relative humidity for food products. A previous survey of the newest warehouse concluded that there was an overcapacity of HVAC. However, each rooftop unit is controlled individually, and is run only as needed. Roughly 60 percent of the HVAC rooftop units are running on buildings 5, 6 and 7 at any point in time. When they begin to fall behind, others turn on to maintain the required temperature. It is recommended that ice storage be used to reduce the cooling load of air conditioning units during peak hours. Ice storage units will divert 95 percent of the cooling load to lower-emitting, less costly off peak hours.

Compressors: Frontier uses compressed air for many small processes throughout the facility. Compressor usage accounts for 6 percent to 14 percent of the production's electrical cost. Equipment cycling can cause an increase in compressor inefficiencies if the required volume is not stored close to the area of use. It is recommended that 5 gallons of storage be used for every cfm of air generated. Air system maintenance and usage is difficult to control, resulting in approximately 25 percent loss to leaks, 25 percent used marginally and 50 percent used beneficially. An ongoing compressed air leak program is recommended and could save Frontier a large amount of energy in the future.

Motors: The production areas consist of many electric motors ranging from 40 horsepower down to fractions of horsepower. The majority of the larger motors ranging from 10 horsepower to 30 horsepower are in processing. These motors, while still running as rated, are older motors. It is recommended that the older motors be replaced with new, premium efficiency motors. Each motor would increase efficiency by three percent.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	0.86
CO	0.088
NOX	0.409
VOC	0.014
PM	0.021

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	158.963
CH4	5.977
N2O	0.080
CFCS	1.955

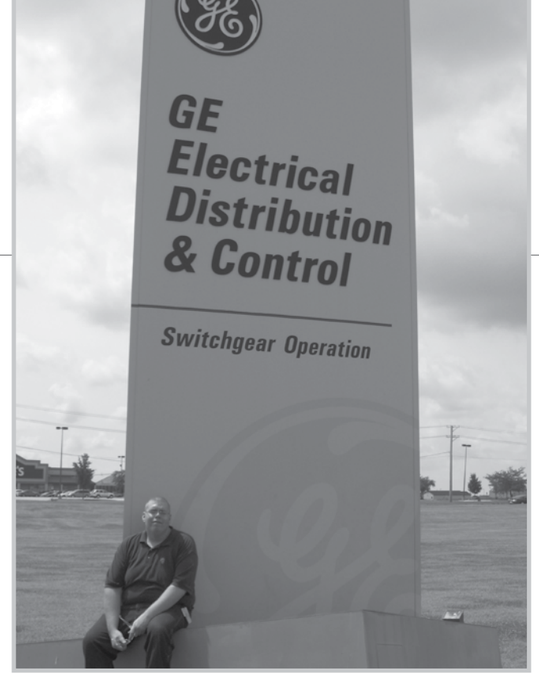
PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
ICE-ENERGY PER UNIT	$4,100 (6 MONTHS USE)	6,615 KWH DIVERTED	RECOMMENDED
COMPRESSOR: AIR STORAGE	$8,200	93,100.8 KWH	RECOMMENDED

GE CONSUMER & INDUSTRIAL

COMPANY BACKGROUND

General Electric (GE) is a global technology and services conglomerate based out of New York. GE produces a wide variety of products ranging from medical software to aircraft jet engines. The company's roots reach back to 1878 when founder Thomas Edison formed the Edison General Electric Company. In 1892 Edison General Electric Company merged with rival Thomson-Houston Electric Company to form the General Electric Company.

WEST BURLINGTON



JESSE SHUCK
CHEMICAL ENGINEERING
UNIVERSITY OF IOWA

PROJECT BACKGROUND

The West Burlington facility uses roughly 4 million gallons of water annually. Sixty percent of water discharge is from plating processes. The aim of this project was to cut water-associated costs in half by implementing water reduction and reuse projects.

INCENTIVES TO CHANGE

It costs approximately 37 cents to treat a gallon of water using an on-site waste treatment facility. With the facility currently downsizing, there is an incentive to lower operating costs. The waste treatment facility utilizes flocculation to treat water, which generates roughly 39 tons of dry sludge a year.

RESULTS

Tin Plating Loop Closure: Currently the tin plating line uses three rinse tanks, each overflowing at 1 gpm. By redoing the plumbing so the tanks cascade into one another, the flow can be reduced from 3 gpm to 1 gpm. By installing a 1/15 hp pump, a small tank, a level control mechanism and an ion exchange unit, the loop can be closed, further reducing the outgoing water.

Silver Reclamation: Installing a carbon pack on the silver plating line and closing the loop will save 0.5 gpm of water from going to the wastewater treatment facility. The silver cyanide collected on the carbon then can be sent to a refinery to generate over $200 dollars a week in recovered silver.

VIPO Waste Water Reuse: A current overflow rate of 7 to 8 gpm in the VIPO process yields an opportunity to save up to 1,920,000 gallons of water per year by reusing the water in another process. Reusing the water in the E-coat process appears to be such an opportunity. The company will evaluate the transferring requirements at a later date. Additional research might be considered for recovery and reuse within the process if the production levels do not remain equal.

E-coat Alkaline Cleaner Recovery: Prior to plant size reduction, a project to install a baffle tank to separate oil from the alkaline cleaner used in E-coat had been considered. By redesigning the model of the original baffle tank, 1.5 barrels of cleaner can be saved per quarter.

Waste Cost Treatment Reduction: By employing methods to reduce the amount of chemical usage, the cost of treating a gallon of water can be decreased substantially. One method would be to use proportional pumps to provide tighter control on pH adjustment. In addition, modifying overhanging chemical lines by adding an elbow to them would reduce the amount wasted when the pump switches off. Finally, by conducting jar tests with equipment found on site the amount of chemical used can be optimized to reduce chemical purchasing expenditures.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
TIN PLATING LINE LOOP CLOSURE	$19,980	540,000 GALLONS OF WATER	RECOMMENDED
SILVER RECLAMATION	$16,488	90,000 GALLONS OF WATER	RECOMMENDED
VIPO WASTE WATER REUSE	$71,040	1,920,000 GALLONS OF WATER	RECOMMENDED
ALKALINE CLEANER RECOVERY	$3,600	—	RECOMMENDED
WASTE TREATMENT COST REDUCTION	$35,000 PER YEAR PER $0.01 REDUCTION	—	RECOMMENDED

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	38.83
CH4	508.2
N2O	268.4
CFCS	816.2

GLOBAL ETHANOL

COMPANY BACKGROUND

Global Ethanol produces four primary products: fuel grade denatured ethyl alcohol, or ethanol; Distillers Dried Grains with Solubles (DDGS) for the feed market; Wet Distillers Grains with Solubles (WDGS); and corn oil that can be sold as a feed ingredient or further processed into bio-diesel.

Global Ethanol employs over 50 people at two locations, including Lakota, Iowa. Production at Lakota requires approximately 34 million bushels of corn annually. At the two production sites, over 160 million gallons of ethanol are manufactured.

LAKOTA

ROBERT GIPPLE
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

The intern focused on several project areas to improve process efficiency and optimize resource allocation. These included dryer optimization, energy and water recovery opportunities, and water conservation.

INCENTIVES TO CHANGE

Global Ethanol is positioning itself to be a global leader in the renewable fuels industry through operational excellence, strategic capacity expansion, technology enhancements, pre-eminent risk management, marketing and distribution capabilities.

RESULTS

Dryer Instrumentation: Dryers are the largest single use gas consumer at Global Ethanol. Repair or calibration of all instruments associated with dryer operation can improve efficiency between 1 and 5 percent.

Hydroheater Control: Steam injection is used to heat cook slurry and break down carbohydrates. Process modifications can reduce steam injection and reduce enzyme requirements, lower energy demand for the dryers, and conserve water.

Tank Level Control: Overflow of a process tank can result in product losses. Installation of make-up water flow controls would result in significant savings.

Stack Economizer: Energy and water can be recovered by installing a condensing economizer on the TO stack.

Lighting Controls: Sensors and controls to regulate lighting when an area is not occupied will save electricity.

Mechanical Insulation: Removable insulation pads on steam piping will substantially reduce heat losses.

Heat Exchangers: Replacing the direct steam injection system with heat exchangers will reduce boiler pre-heating requirements as hot condensate is returned to the deaerator.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DRYER INSTRUMENTATION	$86,000	11,168 MMBTU	IN PROGRESS
HYDROHEATER CONTROL	$670,000	41,558 MMBTU 5.25 MGAL WATER	RECOMMENDED
TANK LEVEL CONTROL	$250,000	**	RECOMMENDED
STACK ECONOMIZER	$280,000	36,364 MMBTU 30 MGAL WATER	NOT RECOMMENDED AT THIS TIME
LIGHTING CONTROLS	$600	15,000 KWH	IMPLEMENTED
MECHANICAL INSULATION	TBD	TBD	IN PROGRESS
HEAT EXCHANGERS	$480,000	62,338 MMBTU	RECOMMENDED

**Savings are realized from avoided costs of land application.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	2.98
CO	5.5
NOX	3.2
VOC	6.78
PM	0.298

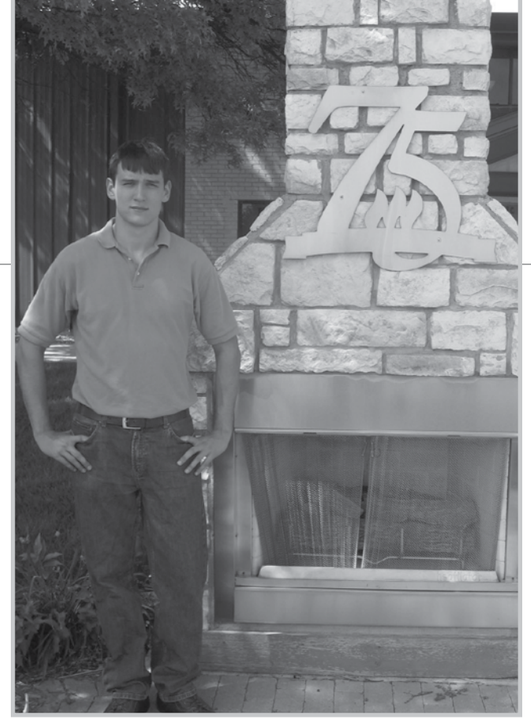
Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1067
CH4	1760
N2O	4.47
CFCS	13.42

HEARTH & HOME TECHNOLOGIES

COMPANY BACKGROUND

Hearth & Home Technologies (HHT) is a member of HNI Corporation and a Fortune 1000 member with sales of more than $460 million in 2007. Located in Mt. Pleasant, IA, HHT employs over 400 people, has three sister plants across the country, and specializes in the manufacturing of fireplaces and accessories. HHT owns four brand names that date back as far as 1927.



SCOTT SALSBERY
MECHANICAL ENGINEER
UNIVERSITY OF IOWA

PROJECT BACKGROUND

The internship was focused on the compressed air system at HHT. Analysis of the entire system was performed to determine viable options for improving efficiency of generation and use of compressed air. Also of interest is recovering the heat from the compressors during the colder portions of the year. This is the first year HHT has participated in the Pollution Prevention Internship Program.

INCENTIVES TO CHANGE

Hearth & Home Technologies stands to make significant gains in maximizing both profit potential and environmentally friendly operations. HHT is committed to forward thinking as part of its solidly-founded rapid continuous improvement program. As energy prices rise, HHT will benefit greatly from sustainable practices.

RESULTS

Operational Improvements: Compressed air is a primary utility for HHT. Therefore it is a priority to ensure that it is generated as efficiently as possible. Purchasing a variable speed compressor and properly sequencing existing compressors at full power is crucial to achieving that efficiency. Managing all the compressors will require a robust control system that will automatically turn base compressors on and off while the variable speed compressor matches the supply to the demand.

Laser Operation: A robotic laser operates during times when the main plant is offline and during such times it is important to supply the compressed air needs of the unit most efficiently. To this end, it was recommended that a high efficiency, variable speed compressor be purchased to satisfy this unique demand. It is also important to note that the laser requires higher pressure than the rest of the plant, so a dedicated compressor would be optimal.

Distribution: Part of a robust management strategy for compressed air would come in the form of a new distribution system. Once installed, the system would have no leaks and would allow certain areas or cells of the plant to be cut off from the compressed air system when they are not in production, thereby eliminating losses in those areas.

Heat Recovery: It was determined that there are 28,300 BTU per minute produced by the after-coolers on the compressors. During the colder portions of the year it is recommended that the heat be ducted back into the building to aid in heating the building. This should provide significant savings on HHT's heating costs.

Loss Reduction: There are several places in the plant where small adjustments can add up to major savings. Properly sizing pipe to end uses would remove restrictions and allow the compressors to operate at a lower pressure. Replacing air sensors on spot nail machines with proximity sensors would eliminate waste. Air knives used to dry paint on fireboxes that are not given enough time to benefit from the air can be removed, along with an air bar used to blow chimney pipe down a table to where it is packaged, as these are unnecessary uses.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	7.842
CO	0.802
NOX	3.717
VOC	0.129
PM	0.194

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1445
CH4	54.49
N2O	0.726
CFCS	17.76

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
OPERATIONAL SAVINGS	$31,569.84	268,272 KWH	RECOMMENDED
LASER PROPOSAL	$27,165.29	232,320 KWH	RECOMMENDED
DISTRIBUTION REPLACEMENT	$34,128.87	359,251 KWH	RECOMMENDED
HEAT RECOVERY	$27,168	32,907 THERMS	RECOMMENDED
LOSS REDUCTION	$25,258.84	235,089 KWH	RECOMMENDED

HY-VEE, INC.

COMPANY BACKGROUND

Hy-Vee, Inc. is a supermarket chain with over 220 stores in seven states and more than 51,000 employees. The company is the largest private employer in Iowa. It is in the top 30 supermarket chains in the country and has annual sales of more than $5.6 billion. The main distribution center is located in Chariton, Iowa, where there are three warehouses: a dry goods warehouse (grocery), a refrigerated warehouse (perishables) and a health and beauty care warehouse (HBC) totaling about 1.2 million square feet.

CHARITON

ANDREA SIEFERS
B.S MATERIALS ENGINEERING 2008
ENVIRONMENTAL ENGINEERING
(GRAD STUDENT)
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

The project was to develop a model for increasing the efficiency of the facility's waste reduction and handling procedures. This included collecting data regarding waste generation handling and disposal methods, reviewing options for non-recycled materials, and developing recommendations for reducing waste. The project focused on four materials: cardboard, paper, organics and plastic. The model developed may be applied to other distribution centers or even some of the Hy-Vee stores.

INCENTIVES TO CHANGE

According to its sustainability mission statement, Hy-Vee is "committed to doing business in a manner that promotes the well-being of our customers, employees, communities and the global environment". Given the company's commitment to the environment and the current costs related to waste disposal, the project was implemented to review current practices and initiate positive change.

RESULTS

Cardboard: It was found that a total of approximately 1,000 tons per year of cardboard is generated by the three warehouses and only 60 percent is being recycled. By installing baling systems in each warehouse, most of the remaining cardboard can be recovered and recycled and all cardboard will receive higher rebates. A horizontal baler is recommended for the HBC warehouse and vertical balers are recommended at both the grocery and perishables warehouses. A potential 388 tons per year can be diverted from the landfill. In the first five years, an average of $100,275 can be saved annually and all the necessary equipment would be paid off in less than two years.

Paper: Between the offices, print shop, and warehouses, there is an estimated 200 tons per year of paper waste. Only 17 percent is being recycled. By implementing an office paper recycling program and increasing the types of paper recycled by the print shop, an estimated 40 tons per year can be diverted. In the first five years, an average of $2,600 can be saved annually.

Organics: The perishables warehouse handles produce, dairy and frozen items. There is about 300 tons per year of out-of-date and damaged goods that are currently sent to the landfill, at least 80 tons of which are fruits and vegetables. An in-vessel composting container that would be located on site is recommended for all the organic waste. About 250 tons per year could be composted using this equipment. Increased labor would be needed to unpackage the waste to eliminate the inorganics. In the first five years, an average of $12,785 can be saved annually and the necessary equipment would be paid off in five years.

Plastic: Stretch wrap from incoming pallets is collected in sleeves and wooden bins in the warehouses. Shopping bags are collected in the stores and shipped back to the distribution center. These two sources of plastic account for about 440 tons per year. Plastic is mixed, baled and sold to a plastic recycling company. About 87 percent of the plastic is recycled in this way. Most of the plastic that is not recovered is due to employees throwing stretch wrap into dumpsters that are more easily accessible than the plastic collection sleeves and bins. More wooden bins in place of sleeves are recommended. If half of the plastic that is currently thrown away can be recovered in more numerous wooden bins, a disposal savings and additional rebates of $15,485 per year can be realized.

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1916
CH4	—
N2O	—
CFCS	—

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
CARDBOARD RECYCLING	$100,275	388 TONS DIVERTED	RECOMMENDED
PAPER RECYCLING	$2,600	40+ TONS DIVERTED	IMPLEMENTED
ORGANIC WASTE	$12,785	252 TONS DIVERTED	RECOMMENDED
PLASTIC RECYCLING	$15,485	27 TONS DIVERTED	RECOMMENDED

JENNIE EDMUNDSON HOSPITAL

COMPANY BACKGROUND

Jennie Edmundson Hospital is a 255-bed regional hospital that serves approximately 250,000 residents living in western Iowa and is one of the oldest hospitals in the region. The hospital employs more than 700 people and offers many opportunities for volunteers to help serve the community.
The hospital specializes in maternal/child health services, cardiology, orthopedics and sports medicine, rehabilitative services, occupational health and behavioral health, and contains an accredited cancer center.

STEVEN NELSON
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

After researching the Pollution Prevention Intern Program, Jennie Edmundson Hospital realized there were many potential areas for savings. The main goal of the intern project was to create a cardboard recycling program and, time permitting, to develop a more efficient lighting system.

INCENTIVES TO CHANGE

Jennie Edmundson Hospital is a privately funded non-profit organization. Unlike many hospitals in the area, it receives no governmental funding. One of the hospital's goals is to develop a more environmental-friendly building, which would yield financial benefits, as well. Prior to its partnership with the Pollution Prevention Intern Program, Jennie Edmundson Hospital did not participate in recycling. The hospital recognized the potential benefits of recycling and reducing energy use.

RESULTS

Cardboard Recycling: The intern's initial focus was cardboard recycling. After developing a baseline of the procedures and quantities used by the hospital, it was estimated that 30 tons of cardboard and 170 tons of other recyclables are generated by the hospital per year, none of which are recycled. By obtaining a baler on a rent-to-own basis and selling the cardboard to a local recycling company, the hospital could save approximately $2,580 per year in waste removal costs for the first five years. After that, annual savings would increase to about $6,840.

Paper Disposal: The Methodist Heath System, of which Jennie Edmundson Hospital is a member, uses over 28,800 pounds of confidential paper annually. The intern recommended that the hospital change confidential paper destruction companies, which would save the health system more than $1,580 per year.

Material Recycling: The intern also recommended starting another recycling program to recycle other materials in the hospital. The program would divert 170 tons of waste from the landfills and save the hospital almost $360 per month on waste removal costs.

Replacing lighting fixtures in the parking lot with "shoebox" style fixtures that cast light down and out instead of dispersing light in every direction, as the present fixtures do would reduce energy costs. In addition to increased efficiency, this measure would provide better lighting at night. Another recommended energy conservation project is the use of occupancy sensors in such places as restrooms, mechanical rooms and storage rooms.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
CARDBOARD RECYCLING	$2,580 – 6,840	30 TONS OF CARDBOARD	IMPLEMENTING
NEW CONFIDENTIAL PAPER DISPOSAL	$1,580	28,800 POUNDS OF PAPER	IMPLEMENTING
ALL MATERIALS RECYCLING	$4,320	70 TONS OF RECYCLABLES	RECOMMENDED

JOHN DEERE ENGINE WORKS

COMPANY BACKGROUND

John Deere is the world's leading provider of advanced products and services for agriculture. Deere & Company entered the tractor business in 1918 when it purchased the Waterloo Gasoline Engine Company. The Engine Works facility in Waterloo, Iowa makes advanced off-highway diesel engines that are used in John Deere equipment and other applications.

CARMI SPICER
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

John Deere is striving to become an industry leader in reducing greenhouse emissions. By working with a Pollution Prevention intern in the past, John Deere Engine Works implemented a plastics recycling program as well as a wastewater treatment plan. This year, John Deere continued its partnership with the Iowa Department of Natural Resources by hosting another Pollution Prevention Intern, who focused on reducing compressed air consumption.

INCENTIVES TO CHANGE

John Deere is a world industry leader producing high quality engines that surpass today's emission standards. The company also recognizes the need to reduce plant energy consumption. With today's rising energy prices, reducing energy consumption not only benefits the environment but it saves the company tens of thousands of dollars per year. John Deere has been painting its tractors green for many years and will now be able to paint itself in the same color when referring to its environmental achievements.

RESULTS

Compressed Air: John Deere Engine Works in Waterloo uses three primary compressors. Each compressor has a 600 HP electric motor. The compressors are kept above the manufacturing floor and are monitored by a control system that determines the load for each compressor and how many compressors to run. Typically the system runs two compressors that average about 70 percent loaded. The compressor system itself needs little improvement. The air intakes are located outside and have filters to strain particulate out of the air, which is excellent. A chiller is located next to the compressors. Both the chiller and compressors are cooled by a plant coolant. The only improvement that could be made in the compressor room is to increase the size of the current storage tank to help minimize load change on the compressors.

The compressed air distribution of the plant has no visible problems.

Leaks: The Pollution Prevention intern found many compressed air leaks. Suppressing those leaks would provide a savings of roughly $25,000 annually as well as reduce the amount of emissions released by the power plant. Leak surveys are only effective if they are done often to make sure new leaks are suppressed before becoming bigger issues. A proactive leak prevention plan is essential in a factory due to the variety of manufacturing equipment and the many uses for its compressed air.

Shut Off: John Deere uses compressed air for many applications. Some compressed air tasks only take a few minutes of an entire shift, but the air stays on the entire day. Controls that automatically shut air off when it is not needed will give John Deere savings that will quickly pay back the project cost. Other compressed air uses could easily be replaced with rags or brooms.

Air Guns: Air guns are used throughout the plant for cleaning and drying purposes. As compressed air guns are loud and prone to leak, brooms, reusable rags, or other manual tools should be considered as cleaning and drying alternatives.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	4.14
CO	—
NOX	7
VOC	0.14
PM	10

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	2381
CH4	0.12
N2O	0.1
CFCS	—

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
AIR LEAKS	$24,143	603,575 KWH	IMPLEMENTED
AIR PREVENTATIVE MAINTENANCE PLAN	$20,000	500,000 KWH	RECOMMENDED
AIR TOOLS	$5,000	125,000 KWH	RECOMMENDED
AIR GUNS	$10,000	250,000 KWH	RECOMMENDED
AIR ON DEMAND	$40,000	1,000,000 KWH	IN PROGRESS

JOHN DEERE OTTUMWA WORKS

COMPANY BACKGROUND

Deere & Company, founded in 1837 (collectively called John Deere), has grown from a one-person blacksmith shop into a corporation that today conducts business worldwide and employs approximately 52,000 people. John Deere operates four major business segments: agricultural equipment, commercial & consumer equipment, construction & forestry and credit, along with support operations of parts and power systems. It is one of the oldest industrial companies in the United States, and was named one of the "100 Best Corporate Citizens" in 2007 by CRO (Corporate Responsibility Officer) magazine.

ZACH RODENBURG
CHEMICAL ENGINEERING
THE UNIVERSITY OF IOWA

PROJECT BACKGROUND

Integrity, quality, commitment and innovation are the core values John Deere holds highest. Motivated by these values, the environmental department at John Deere Ottumwa Works (JDOW) continually strives to improve processes and practices, and exceed government regulations. Specifically, reducing greenhouse gas emissions is a top priority at JDOW. Earlier this year, Deere & Company announced plans to further reduce its total greenhouse gas emissions by 25 percent per dollar of revenue from 2005 to 2014.

INCENTIVES TO CHANGE

On-site wastewater pretreatment has been under consideration at JDOW for many years. However, due to the time and expense required to install and maintain a reliable on-site treatment process, the facility has been using disposal methods that are convenient, yet costly. Process wastewater at JDOW is currently shipped to another John Deere facility, over 100 miles away, for treatment. Annually, this system currently costs the company approximately $151,000 in combined costs and emits over 1,000 tons of greenhouse gases.

RESULTS

Eliminate Wastewater Shipping & Off-site Treatment: The transportation and off-site treatment of metal finishing wastewater is a costly process for JDOW. Shipment from the Ottumwa factory to an off-site treatment location currently costs the company approximately $30,000 annually. This transported waste, which totaled close to 400,000 nominal gallons in 2007, costs 24 cents per gallon, or roughly $100,000, in off-site treatment fees. Combined, these activities cost nearly $130,000 for one year's wastewater shipping and treatment. With rising prices of both transportation fuel and treatment (which, for 2008, increased to 31 cents per gallon), these numbers are projected to reach $151,000 or more for the current fiscal year, assuming stable wastewater generation.

Although the elimination of shipping and off-site treatment would result in significant annual savings, the wastewater that JDOW generates would still require pretreatment in order to facilitate municipal disposal. The $151,000 in savings is money that could be applied to on-site treatment costs. The goal of this project was to conduct a feasibility study to determine if on-site wastewater pretreatment is an economically viable solution for the Ottumwa factory, given current outsourcing costs. With the elimination of $30,000 in shipping costs and associated emissions, the end goal of pollution prevention is achievable.

Determining the economic feasibility of a wastewater pretreatment system (in the form of chemical treatment reactors, a semi-permeable or ion-exchange membrane system, or an electrolytic precipitation system) has required the analysis of current and future process operations and associated materials chemistry. Should an on-site process be deemed practical, the estimated return on investment (ROI) would be approximately 2 to 4 years. This estimate considers the costs of capital investment, energy, labor, and chemical needs. Savings after the repayment period are anticipated to far exceed the initial transportation savings, and would later add additional value to JDOW operations.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	0.0363
CO	4.257
NOX	0.3278
VOC	0.3245
PM	0.0143

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	66.22
CH4	2.574
N2O	0.9295
CFCS	0.1628

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
ELIMINATE WASTEWATER SHIPPING & OFFSITE TREATMENT	$151,000	EMISSIONS REDUCTION	RECOMMENDED

KRAFT FOODS GLOBAL, INC.

COMPANY BACKGROUND

Kraft Foods Inc. is the largest branded food and beverage company headquartered in the United States. Kraft's 2007 net revenue was $37 billion with nine brands having revenue over $1 billion including Oscar Mayer, Philadelphia cream cheese, Maxwell House coffees, Nabisco cookies and crackers, and Oreo cookies. The company employs more than 103,000 people in 180 manufacturing and processing facilities worldwide. The facility in Mason City, Iowa employs approximately 250 people and produces ready-to-eat Jell-O desserts and pudding cups.

MASON CITY

TIM HILL
INDUSTRIAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

Kraft has demonstrated a strong commitment to reducing its environmental footprint through the implementation of many previous pollution prevention projects. Kraft utilized three Pollution Prevention Program interns in the past and all have realized huge savings both environmentally and financially. This year, their goals focused on reducing water consumption, energy use, wastewater and scrap product.

INCENTIVES TO CHANGE

As the price of natural gas increases, it becomes more and more expensive to operate the boilers with the limitations of the current system. With the expectation of significant increases in the price of natural gas over the next five years, it is important to increase the efficiency of the boilers as much as possible to minimize the amount of wasted energy.

It is also becoming increasingly important to look for alternatives in the disposal of sludge. Over the last few years the acceptance of land application of waste materials has diminished. Kraft uses chemicals known as GRAS (Generally Regarded as Safe) so there is no chemical risk to the environment through land application, but finding a higher end use for this material is very attractive.

RESULTS

Steam Trap Program: There are nearly 1000 steam traps in Kraft's Mason City facility. Sample surveys conducted by Kraft employees in the past have shown a 30 percent failure rate, but the surveys were never finished. A database of steam traps has now been created to aid in future surveys. A steam trap maintenance program conducted by an outside source could quickly produce savings in energy through reduction in steam losses.

Boiler Waste Heat Economizers: The plant has three boilers with maximum steam capacities of 25,000 pph each. Two boilers are online at any given time meeting the average steam demand of 25,000 pph. These boilers produce an average stack temperature of 400°F, and current feed water is pumped into the boiler at a temperature of 210°F. If boiler economizers were installed on all three stacks, feed water temperature could be increased to nearly 260°F by using the waste heat leaving the stacks. Using the waste heat creates an opportunity to save 130,000 therms per year with an annual cost savings of $135,000. Economizers provide the opportunity to lower the fuel requirements of a boiler by five to ten percent, and would reduce the combustion exhaust released to the atmosphere.

An indirect contact condensing economizer is very similar to a feed water economizer. The main difference is that the water being heated in the economizer would be used in process. If Kraft were able to heat process water with waste heat leaving the feed water economizer, the demand for steam in the heat exchangers would be reduced. This is a more feasible alternative to a direct fire water heater because it eliminates the fear of water contamination. If a condensing economizer were installed, it could raise the efficiency of the boiler up to ten percent and save Kraft 200,000 therms per year with an annual cost savings of $190,000.

Sludge Dewatering: Currently Kraft land applies 20,000 tons of sludge from wastewater treatment annually. A sludge dewatering system would reduce the volume by 60 percent. Contact has been made with an area hog farmer to use the cake as hog feed if the dried cake is determined to have nutritional value. The farmer would take the cake at no cost to Kraft and this would divert all sludge from land application. Sludge in the current wet state serves no benefit to the farmer due to the volume and consistency of the wet sludge.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	26.039
CO	3.855
NOX	12.645
VOC	3.359
PM	0.664

Green House Gases Diverted in Tons (CO_2 Equivalent)

	Total for all sectors
CO2	4989.511
CH4	844.788
N2O	2.143
CFCS	60.856

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
STEAM TRAP PROGRAM	$213,000	225,000 THERMS	IN PROGRESS
BOILER FEED WATER ECONOMIZER	$135,000	130,000 THERMS	IN PROGRESS
INDIRECT CONTACT CONDENSING ECONOMIZER	$190,000	200,000 THERMS	RECOMMENDED
SLUDGE DEWATERING	$155,000	20,000 TONS OF SOLID WASTE DIVERTED FROM LAND APPLICATION	RECOMMENDED

MERCY HOSPITAL– IOWA CITY

FACILITY BACKGROUND

Mercy Hospital in Iowa City started out in 1873 as a small 20-bed hospital. Since then, Mercy has grown tremendously and now has 234 licensed patient beds and employs more than 1,000 staff. Mercy Iowa City has branched out to provide services in other areas of eastern Iowa, but the main in-patient building remains the heart of the hospital.

IOWA CITY

ANDREW PATZ
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

An Environmental Management System (EMS) is already in place to monitor and control several aspects of energy use around the hospital, such as HVAC and outdoor lighting. Mercy Iowa City is no stranger to green practices and uses them frequently. Many of the standard pollution prevention practices from the IDNR have already been researched and implemented in the hospital.

INCENTIVES TO CHANGE

Despite excellent practices, Mercy's natural gas and electric bills each exceed $600,000 per year. Two new boilers will be installed by October 2008 to replace an older, inefficient boiler. The new boilers should alleviate much of the strain on the natural gas usage, though options to reduce the need for steam are also sought. To reduce electrical consumption, lighting was identified as a key area for research and improvement.

RESULTS

Lighting Upgrades: According to the U.S. Energy Information Administration, healthcare facilities use about 44 percent of their electricity for lighting. While efficient T8 fluorescent lights are the most common type of fixture in the hospital, hundreds of T12 fluorescent, incandescent, halogen, and sodium vapor lamps can be upgraded for significant cost savings and improved lighting quality.

Lighting Management: The main contributor to the large amount of lighting use is not inefficient fixtures, but lights that are continuously lit. While some lights must be on continuously due to code, the majority can be managed through occupancy sensors or policies for when lighting should be turned off.

Standby Energy: Numerous equipment from office hardware such as computers, printers and fax machines, to vending machines use significant amounts of electricity even when not in use. Electrical management hardware, software and new policies can reduce this unnecessary use of electricity.

9V Rechargeable Batteries: Over 5,700 alkaline 9V batteries are used and thrown away every year, mainly from transmitters that monitor heart conditions. High capacity lithium-ion rechargeable batteries can replace the alkaline 9V battery one-for-one, with a payback of less than four months.

Hand Dryers: Mercy currently uses 32 tons of single-fold paper towels every year. New high-airflow hand dryers have a similar drying time to paper towels, while providing better germicidal conditions and enormous cost savings due to decreased material, waste and labor. Industrial roll paper towels also provide substantial savings over single-fold paper towels and allow users to choose between paper and a hand dryer.

Mechanical Insulation: Many pipe fittings, controls, and attachments have little or no insulation. More efficient insulation, new manufacturing techniques, and sky-high gas prices make insulation very cost-effective. Most of the insulation would have a payback of less than one year, but would provide benefits for decades.

Peak Reduction/Ice Chiller: Over 30 percent of Mercy's electricity bill is generated from peak charges. Cutting or moving energy usage during peak times will cut costs as well as produce cleaner and more efficient energy. Replacing two older chillers with two new chillers and an ice storage system can alleviate the expensive peaks during the summer by as much as 20 percent. The replacement chillers can also incorporate new technologies such as an integrated VFD and no-oil operation for much more efficient starting, partial loads, and full loads.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	3.33
CO	0.341
NOX	1.58
VOC	0.0549
PM	0.0824

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	613.9
CH4	23.12
N2O	0.308
CFCS	7.564

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
LIGHTING UPGRADES	$28,502	399,660 KWH	IN PROGRESS
LIGHTING MANAGEMENT	$7,195	104,000 KWH	IN PROGRESS
STANDBY ENERGY	$5,641	109,000 KWH	IN PROGRESS
9V RECHARGEABLE BATTERIES	$3,424	0.32 TONS DIVERTED	TESTING
HAND DRYERS	$10,567	11 TONS DIVERTED	IN PROGRESS
MECHANICAL INSULATION	$6,163	7,627 THERMS	RECOMMENDED
PEAK REDUCTION/ICE CHILLER	$71,681	NOT DIRECTLY QUANTIFIABLE	RECOMMENDED

SIEGWERK USA CO.

COMPANY BACKGROUND

Siegwerk is a privately owned, independent printing ink manufacturer founded in 1830. Through the years, Siegwerk has grown internationally and has become the third largest ink producer in the world. Siegwerk's primary market is the packaging industry, and the company is the second largest packaging ink manufacturer worldwide.

Siegwerk NAFTA's Center of Competence is located in Des Moines, Iowa and has approximately 700 employees throughout the NAFTA region.

ADAM BERANEK-COLLINS,
CHEMICAL ENGINEERING
UNIVERSITY OF IOWA

PROJECT BACKGROUND

Siegwerk has an ongoing commitment to the environmental stewardship of its products and processes. As part of its commitment, Siegwerk partnered with a Pollution Prevention Program intern to review sustainability at its Des Moines facilities. Projects focused on process improvements that will reduce waste.

INCENTIVES TO CHANGE

Siegwerk has two driving incentives for change. With the cost of raw materials and the associated transportation expense, any waste is a direct impact to the company's profitability. In addition, Siegwerk's commitment to environmental stewardship and their customers' focus on sustainability is a strong influence.

RESULTS

Solvent Reduction: Siegwerk's generation of hazardous waste is from cleaning processes. The purpose of the cleaning process is to reduce the risk of color and chemical contamination. Siegwerk has an automated program that determines the quantity of solvent used for cleaning in between chemically incompatible systems. However, operators have the option to run additional cleaning cycles to ensure cleanliness. The computer program is not taking into account the scheduling of identical inks being produced back-to-back.

The addition of this parameter will result in savings potential of approximately 8,000 gallons of hazardous waste generation per year at the Des Moines South facility. Similar recommendations have been made for the Des Moines East facility, which would potentially save 50,000 gallons of hazardous waste generation per year.

Solvent Reuse: In Siegwerk's production process, there are parameters that allow for the reuse of solvents that had been used in cleaning operations without compromising the quality standards of their product. With the modification of some of the parameters, Siegwerk can better reuse solvent in their processes.

At the Des Moines South facility, a total of 14 parameter changes were implemented leading to potential hazardous waste generation savings of over 15,000 gallons per year.

At the Des Moines East facility, a similar process change can be implemented and has the potential to save 13,000 gallons of hazardous waste generation per year.

Solvent Adjustments: Siegwerk had multiple cleaning solvent blends that were used throughout their processes. After review of the solvent blends and their chemical properties, modifications were made to optimize the reuse of these materials.

The implementation of this project resulted in reducing approximately 37,000 gallons of hazardous waste generation at the Des Moines South facility.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	2.60
CO	9.49
NOX	1.88
VOC	2.13
PM	0.52

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1,074
CH4	116
N2O	28
CFCS	25

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DSM SOUTH FACILITY SOLVENT REDUCTION	$61,833	8,000 GALLONS HAZARDOUS WASTE	IN PROGRESS
DSM EAST FACILITY SOLVENT REDUCTION	$384,327	50,000 GALLONS HAZARDOUS WASTE	PROPOSED
DSM SOUTH FACILITY SOLVENT ADJUSTMENTS	$293,594	37,000 GALLONS HAZARDOUS WASTE	IMPLEMENTED
DSM SOUTH FACILITY SOLVENT REUSE	$121,194	15,000 GALLONS HAZARDOUS WASTE	IMPLEMENTED
DSM EAST FACILITY SOLVENT REUSE	$102,282	13,000 GALLONS HAZARDOUS WASTE	PROPOSED

HOSPITALS FOR A HEALTHY ENVIRONMENT (H2E) CIRCUIT RIDER

COMPANY BACKGROUND

H2E (now part of Practice Green Health) was originally founded as a joint venture of the American Hospital Association, Environmental Protection Agency (EPA), Health Care Without Harm, and the American Nurses Association. H2E aims to create sustainable healthcare facilities by reducing the quantity and toxicity of waste; virtually eliminating mercury; minimizing the use of persistent, bioaccumulative, and toxic (PBT) chemicals; and reducing the environmental footprint through source reduction and recycling.

STATEWIDE

BRETT EDWARDS
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

The circuit rider internship is provided by the Pollution Prevention Intern Program and is funded through a grant from the EPA Region VII. The EPA grant covers the costs of an intern working with hospitals in Iowa and Nebraska to identify mercury and ways to reduce energy consumption. A similar program offered through the Kansas State University Pollution Prevention Institute provides the same services to hospitals throughout Kansas and Missouri.

INCENTIVES TO CHANGE

Healthcare is the fourth largest source of mercury emissions to the environment. In some communities, hospitals are a source of 4 percent to 5 percent of the total mercury-contaminated wastewater. Making hospitals virtually mercury free will help reduce negative environmental impacts and prevent future mercury-related occurrences.

Healthcare facilities spend a considerable amount of money on utilities. The EPA reports that each dollar a healthcare facility saves from spending on energy is the equivalent of twenty dollars in additional revenue. Energy reductions provide both financial and environmental incentives for the hospitals.

RESULTS

Mercury Reduction: A mercury audit was performed at nine hospitals throughout Iowa and Nebraska. The assessment revealed a total of 55.97 pounds of mercury remained in these facilities in patient care areas and the physical plants.

Mercury was identified in a wide array of places in the patient care areas. Items identified include thermometers used for patients and equipment, sphygmomanometers, bougie tubes (dilators), and a barometer.

In the physical plant, the most common items that contained mercury were tilt switches on the boilers. Also, some facilities had in-line mercury thermometers on the chilled water lines. There was a considerable amount of bulk mercury identified at two of the facilities. All of the facilities were lit by fluorescent lights, which also contain a small amount of mercury.

Energy Projects: Energy reduction opportunities were researched at eight of the facilities. The areas studied at each facility included Energy Star appliances, lighting, steam and condensate line insulation, therapy pool covers, computer sleep and standby modes, and Vending Misers for vending machines.

A considerable amount of energy may be saved through the use of Energy Star certified appliances. To earn the Energy Star label, an appliance must use a certain percentage less energy than a conventional unit. Due to the large quantity of televisions, ice machines, and refrigerators found in hospitals, switching to Energy Star products can yield sizable energy cost reductions.

Lighting improvements that were studied included: switching from magnetic T12 ballasts to electric T8 ballasts, replacing 32W bulbs with 25W T8 lamps, replacing fluorescent or incandescent exit signs with light emitting diode (LED) exit signs, using compact fluorescent lights (CFL) in place of incandescent lights, and using occupancy sensors and natural lighting.

Insulation/Pool Cover: Insulating steam and condensate return lines and placing a cover over a therapy pool yield two benefits: less energy is required to maintain the temperature of the fluid and less energy is required to cool the space to which the heat escapes. The heat loss from steam and condensate lines is so substantial that it is economically feasible to insulate any pipe over 120°F. Cooling requirements are reduced by over 30 kWh for each therm saved through insulation.

Installing Vending Misers would save energy used by the vending machines. A Vending Miser is a machine that uses a motion detector to turn off a beverage vending machine when no one is in the area. The Miser allows the machine to cycle on intermittently, resulting in energy reductions without any effect on the temperature of the contents.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	4.231
CO	0.463
NOX	2.019
VOC	0.123
PM	0.106

Green House Gases Diverted in Tons (CO_2 Equivalent)

	Total for all sectors
CO2	785.555
CH4	42.110
N2O	0.403
CFCS	9.658

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MERCURY REDUCTION	—	55.97 POUNDS IDENTIFIED	RECOMMENDED
MISCELLANEOUS ENERGY PROJECTS	$44,769	902,798 KWH	RECOMMENDED
INSULATION/POOL COVER	$23,111	253,445 KWH 9,605 THERMS	IN PROGRESS
ENERGY STAR REPLACEMENTS	$11,167	169,439 KWH 86,974 GAL OF WATER	RECOMMENDED
HAND DRYERS	$5,872	1.6 TONS WASTE DIVERTED	RECOMMENDED

POLLUTION PREVENTION SERVICES

PROGRAM BACKGROUND

The Iowa Department of Natural Resources (DNR) has offered support to Iowa companies since 2001 through its Pollution Prevention Intern Program. This program places qualified student interns with Iowa companies for 12 or 24 weeks to identify, research and implement changes that result in environmental and financial savings. In addition, DNR's Pollution Prevention Services maintains a staff of engineers and environmental specialists who regularly conduct assessments for facilities. The goal is to identify changes that reduce the company's bottom line while reducing pollution. All of these services are confidential, non-regulatory and free to Iowa industry.

STATEWIDE

JESSICA HETH
CHEMICAL ENGINEERING
THE UNIVERSITY OF IOWA

ERIC NEVERMAN
BIOMEDICAL ENGINEERING
THE UNIVERSITY OF IOWA

PROJECT BACKGROUND

Follow-up audits of 34 facilities were conducted to document project implementation and savings since 2004. Projects that were not implemented were categorized based on what barrier(s) prevented success. Examples included lack of capital, inadequate return on investment, low company priority or alterations in a company's processes. In addition, opportunities for future intern projects and P2 Services assessments were identified.

RESULTS

A total of 222 P2 recommendations were reviewed at 34 companies. Of these recommendations, nearly 50 percent had been implemented or were in progress. In addition, 11 percent of the recommendations had not yet been addressed, but are still recommended for future implementation.

ENVIRONMENTAL SAVINGS	
WATER (MILLION GALLONS)	173
SOLID WASTE (TONS)	8,270
HAZARDOUS WASTE (TONS)	4
HAZARDOUS WASTE (GALLONS)	115,500
ELECTRICITY (KWH)	31,293,000
NATURAL GAS (THERMS)	1,049,000

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	132
CO	20.8
NOX	61.6
VOC	7.9
PM	4.0

Green House Gases Diverted in Tons (CO_2 Equivalent)

	Total for all sectors
CO2	26,040
CH4	3,360
N2O	392
CFCS	316

The projects that have been implemented or are in progress have resulted in a savings of $6.3 million for the 34 Iowa companies. Environmental savings are shown in the accompanying tables.

2007 SIX-MONTH INTERNSHIP

GELITA USA INC.

COMPANY BACKGROUND

GELITA USA Inc., Sioux City manufactures gelatin, which is sold worldwide and is used in a variety of applications in the food, photographic, and pharmaceutical industries. The facility utilizes both pork skins and bone chips as raw materials. The Sergeant Bluff facility serves as the headquarters for GELITA North America Inc. and is the largest single-site gelatin producer in the world. GELITA North America has two additional facilities. The firm is a subsidiary of GELITA AG (Germany) which also has regional operations in Europe, South America, Australia, New Zealand and China.

SIOUX CITY

ANNE GRABER
CHEMICAL ENGINEERING
IOWA STATE UNIVERSITY

PROJECT BACKGROUND

GELITA currently discharges their wastewater to the Sioux City Wastewater Treatment Plant. With their current treatment system, which includes a series of five lagoons encompassing almost 115 acres, they are unable to meet the requirements to obtain permits to discharge directly to the Missouri River. The company would like to be able to improve their effluent enough to discharge to the river and reduce the land area of the lagoons. GELITA-Sioux City is the first company in Iowa to participate in the new six-month internship.

INCENTIVES TO CHANGE

Gelatin production results in the creation of large amounts of wastewater. The cost of water treatment at the treatment plant has risen substantially and will likely continue to rise. The stricter wastewater regulations and the growth of the company have caused the original wastewater treatment methods to become insufficient, resulting in large costs to the company. Several areas of the plant have the potential to utilize new technology to help reduce the cost of wastewater treatment while helping to prevent pollution.

RESULTS

Aeration Basin: The aeration basin is the first cell of the lagoon system. This cell currently uses coarse bubble aeration to increase the level of dissolved oxygen in the water. Several tests were conducted to determine the opportunity to improve the operation of the cell by switching to fine bubble aeration. The tests included monitoring the efficiency of the current system, pilot studies of different types of aeration, and a simulation of the cell using the new aeration. The results of these tests suggested GELITA should switch to fine bubble aeration to decrease the cost of wastewater treatment and electricity.

Aeration Pond: The aeration pond is the fourth cell of the lagoon system. This cell provides the opportunity to nitrify and denitrify the wastewater to decrease ammonia levels. Although GELITA does not currently pay for their ammonia levels in the wastewater treatment process, the charges will begin within the next few years. New aeration techniques along with other technology will be required. Ammonia is difficult to remove from wastewater so it is difficult to predict the results that will occur from the planned changes. However, the new system in conjunction with the Aeration Basin Project may allow GELITA to discharge their wastewater directly to the Missouri River. A pilot trial will be required before this project can be recommended.

Diatomaceous Earth: DE is used for filtration within the plant and currently no recovery system exists for the DE. This results in added solids to the wastewater and complicates the by-product recovery process in several ways. The opportunity to recover and reuse the DE has been researched. Approximately 25% of the DE could be reused in a year resulting in both monetary savings and non-quantifiable savings in the wastewater and by-product recovery systems. More research is needed to ensure the reused DE has no effect on product quality.

Solid Waste Recycling: Many materials used at the plant can be recycled. Bulk bags, fiber drums, combos, and cardboard were the main materials identified for beginning a recycling program. By recycling these items GELITA will save money on landfill fees and can generate revenue from the sale of the materials.

Air Pollutants Diverted in Tons

	Total for all sectors
SO2	9.745
CO	0.998
NOX	4.629
VOC	0.161
PM	0.241

Green House Gases Diverted in Tons (CO2 Equivalent)

	Total for all sectors
CO2	1801.294
CH4	67.729
N2O	0.902
CFCS	22.156

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
AERATION BASIN IMPROVEMENTS	$237,000	1,921,278 KWH	RECOMMENDED
AERATION POND IMPROVEMENTS	$630,000	—	MORE RESEARCH NEEDED
DIATOMACEOUS EARTH RECOVERY AND REUSE	$38,000	—	MORE RESEARCH NEEDED
SOLID WASTE RECYCLING	$5,500	94 TONS	RECOMMENDED

PROJECT INDEX
2008 POLLUTION PREVENTION INTERN PROGRAM

WATER USE REDUCTION
- ACUMENT GLOBAL TECHNOLOGY
- BURKE CORPORATION
- CLOW VALVE COMPANY
- GE CONSUMER AND INDUSTRIAL
- GLOBAL ETHANOL

BOILER EFFICIENCY
- AMERICAN PACKAGING CORPORATION
- KRAFT FOODS GLOBAL, INC.

COMPRESSED AIR SYSTEM EFFICIENCY
- AMERICAN PACKAGING CORPORATION
- E.I. DUPONT
- FRONTIER NATURAL PRODUCTS CO-OP
- HEARTH & HOME TECHNOLOGIES, INC.
- JOHN DEERE ENGINE WORKS

ENERGY SAVINGS
- 3M KNOXVILLE
- ACUMENT GLOBAL TECHNOLOGY
- AMERICAN PACKAGING CORPORATION
- E.I. DUPONT
- FRONTIER NATURAL PRODUCTS CO-OP
- GLOBAL ETHANOL
- HEARTH & HOME TECHNOLOGIES, INC.
- JOHN DEERE ENGINE WORKS
- KRAFT FOODS GLOBAL, INC.
- MERCY HOSPITAL, IOWA CITY
- HOSPITALS FOR A HEALTHY ENVIRONMENT, CIRCUIT RIDER

WASTE WATER TREATMENT
- GE CONSUMER AND INDUSTRIAL
- JOHN DEERE OTTUMWA WORKS
- GELITA USA (2007)

HEAT RECOVERY
- 3M KNOXVILLE
- ACUMENT GLOBAL TECHNOLOGY
- BURKE CORPORATION
- HEARTH & HOME TECHNOLOGIES, INC.

WASTE REDUCTION
- AMERICAN PACKAGING CORPORATION
- BURKE CORPORATION
- CLOW VALVE COMPANY
- HY-VEE, INC.
- JENNIE EDMUNDSON HOSPITAL
- KRAFT FOODS GLOBAL, INC.
- MERCY HOSPITAL, IOWA CITY
- SIEGWERK USA CO.
- HOSPITALS FOR A HEALTHY ENVIRONMENT, CIRCUIT RIDER
- GELITA USA (2007)

PROCESS IMPROVEMENT
- BURKE CORPORATION
- CLOW VALVE COMPANY
- FRONTIER NATURAL PRODUCTS CO-OP
- GE CONSUMER AND INDUSTRIAL
- SIEGWERK USA CO.
- POLLUTION PREVENTION SERVICES AUDIT PROJECT

STUDENTS' PERSPECTIVES

"The Pollution Prevention Program has given me a lot of real world experience in learning how business works. I have met many new people and this program has opened up many new networking opportunities."

– TIM HILL, KRAFT FOODS GLOBAL INC.

"It is a great opportunity for real-world experience in which you have a project that is all your own and you see everything from start to finish. It is a very rewarding experience seeing your ideas actually being implemented."

– STEVEN NELSON, JENNIE EDMUNDSON HOSPITAL

"I felt like my input was really valued, and I became an important member of the team. It was very satisfying to know that some of my recommendations are already in place and others will also be implemented in the near future. I felt like I made a real difference!"

– ANDREA SIEFERS, HY-VEE INC.

"The quality of the experience for the intern is very high. There was a definite, measurable progress throughout the internship with tangible results. The process was consistent with expectations and responsibilities of a professional engineer."

– SCOTT SALSBERY, HEARTH & HOME TECHNOLOGIES

APPLICATION PROCESS

Application and proposal forms for students and businesses are available online at www.iowap2services.com. Forms may be submitted electronically, faxed or mailed.

FOR COMPANIES

Companies that would like to be considered for participation in the 2009 Pollution Prevention Intern program should submit a project proposal by NOVEMBER 15, 2008.

Companies who are committed to implementing cost effective pollution prevention methodologies and reducing their environmental impact should submit a proposal that identifies a focus project and outlines the desired objectives and deliverables. Business selection criteria is based on the project's relationship to the pollution prevention hierarchy - focusing on source reduction first, then reuse and recycling, risk reduction potential and environmental impacts.

Please note: Students are not trained in or qualified to assess regulatory compliance issues.

FOR STUDENTS

Graduate and upper-level undergraduate students who wish to be considered for 2009 internship positions should submit an application, along with a resume, cover letter, an informal copy of transcripts and a list of current coursework by FEBRUARY 8, 2009.

Pollution Prevention Services is offering internships for three months during the summer or for six months in 2009. Applications are requested from students enrolled in environmental science, physical science and all engineering disciplines. Selected applicants will be matched to a project based on coursework performance, experience and technical skills.

SUBMIT PROPOSALS AND APPLICATIONS TO:

Danielle Dilks
Iowa Department of Natural Resources
Pollution Prevention Intern Program Coordinator
502 East Ninth Street
Des Moines, IA 50319-0034
Phone: (515) 281-8063
Fax: (515) 281-8895
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