WORKING TOGETHER TO ACHIEVE ECONOMIC AND ENVIRONMENTAL RESULTS

CELEBRATING 10 YEARS

POLLUTION PREVENTION INTERN PROGRAM

2010 CASE SUMMARIES

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CASE SUMMARIES WRITTEN BY
2010 P2 Interns

PROGRAM TEAM
Danielle Dilks
Jeff Fiagle
Teresa Frizell
Chuck Geguzis
Heather Jacobs
Matt Millage
Jennifer Reutzel

CREATIVE
Kati Bainter
Emily Grover

CONTRIBUTING EDITOR
Gaye Wiekierak

CONTRIBUTING PHOTOGRAPHER
Clay Smith

LAND QUALITY BUREAU CHIEF
Brian Tormey

ENVIRONMENTAL SERVICES DIVISION ADMINISTRATOR
Wayne Gieselman

IOWA DNR INTERIM DIRECTOR
Patricia L. Boddy

Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319-0034
Phone: (515) 281-5353

THE IOWA DEPARTMENT OF NATURAL RESOURCES IS AN EEO/AA EMPLOYER

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CELEBRATING TEN YEARS

POLLUTION PREVENTION INTERN PROGRAM

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2010 POLLUTION PREVENTION INTERNS

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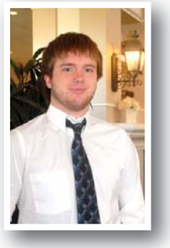


"This internship was a great opportunity to use my engineering skills to make a difference for a company and for the environment."

IAN STEWART
CARGILL INC.

"It's a great experience that helps you gain a combination of professionalism and technical experience you can't really get from most internships. You get to control your projects and see the outcome of your work."

DANJIN ZULIC
EMCO ENTERPRISE INC.

"The biggest positive for the pollution prevention program was the ability to work on a project that was completely my own work. Knowing the project had a chance to make a real impact was a motivating factor throughout the entire internship."

DAVID LOOS
GENESIS HEALTH SYSTEM

"This was a great experience! I learned more in the three months than I did in an eight month coop. I also feel like my contribution has value, and that something good will come out of the work I did."

AMBER JOHNSON
INFASTECH™

COMPANY TESTIMONIALS

The intern was able to guide the project in a direction that gave us answers and alternatives. We were shown options that could benefit our facility. The program is rewarding for us along with the students.

-KATHERINE TEETER, JBS

It's a great program and gives companies the opportunity to focus on some important issues that are difficult to fit into current staff schedules.

-DIANA LATCH, IOWA HEALTH SYSTEM

The staff support system for the interns is great and the intern selection process is a great filter to get students with good work ethics and dedication.
I would continue to support this program at our facility and would recommend it to other businesses in the area.

-VIRAL VARSHNEY, INFASTECH™

INTERIM DIRECTOR'S NOTE

I am pleased to report that 2010 marks the tenth-year anniversary of the Pollution Prevention Intern Program and I commend the program's interns, businesses and institutions for the outstanding leadership, vision and environmental stewardship they have shown throughout the decade.

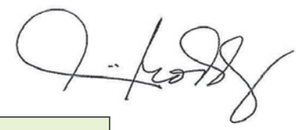
In 2001, the program began with 14 interns working with host companies to develop cost-effective options for preventing and minimizing pollution. In a very short time, businesses were documenting results that exceeded expectations and the program began to draw attention from national industry, government, academic, and environmental organizations. We knew we had launched a program with tremendous potential. In 2003, the program received honors that included the National Pollution Prevention Roundtable's Most Valuable Pollution Prevention Award.

To date, the Pollution Prevention Intern Program has saved 140 businesses and institutions more than $62.6 million. It continues to evolve as it embraces emerging technologies, economic conditions, and the expressed goals of each company. But what has always made this program outstanding is its unique partnership of Iowa colleges and universities, businesses and institutions, and government. Interns provide fresh perspectives while gaining valuable on-site job experience and companies realize the compatible benefits of reduced costs and positive environmental impacts.

The Pollution Prevention Intern Program has become even more important in these tough economic times. Faced with global competition, escalating costs of energy and natural resources, falling profits and reduced consumer spending, companies are realizing that it is no longer practical to continue to operate at the status quo. At the same time, more and more consumers are seeking out environmentally friendly products and places to do business. Companies that practice sustainable resource management can cut costs as they improve their environmental stewardship.

The 2010 intern projects summarized in this booklet represent the excellence and innovation that have become hallmarks of the Pollution Prevention Intern Program. I look forward to another decade of progress and partnership with Iowa's finest students, businesses and institutions.

PATRICIA L. BODDY



TOTAL IMPLEMENTED ACTUAL SAVINGS 2001-2010

CATEGORY	REDUCTION	COST SAVINGS
WATER CONSERVATION	1,039,285,454 GALLONS	$5,155,276
SPECIAL WASTE	75,146 TONS	$837,912
SOLID WASTE	122,793 TONS	$12,931,621
HAZARDOUS WASTE	1,399,714 GALLONS 335 TONS	$10,033,524 $269,354
MERCURY ABATED	42,817 GRAMS	-
ENERGY	286,842,430 KWH 1,597,143 MMBTU 6,181,500 THERMS	$15,937,624 $5,739,881
OTHER	---	$11,709,400
BOD	104	$26,640
		TOTAL $62,641,232

2010 EXECUTIVE SUMMARY

Nineteen upper-level engineering students from Iowa colleges and universities served as interns in the 2010 Iowa Pollution Prevention Intern Program.

The intern program is an extension of DNR's Pollution Prevention Services, a non-regulatory program that offers confidential technical assistance to Iowa businesses and industries. Interns are placed at host facilities to analyze the company's waste streams and to research and recommend process improvements that will lower operating costs while reducing negative environmental impacts.

Sixteen interns completed 12-week internships in August, implementing projects that dramatically reduced solid and hazardous waste, water and energy use, air emissions, and greenhouse gases. Implemented projects will save participating companies and institutions more than 1.38 million dollars annually. The interns also conducted analyses and provided background information for future pollution prevention opportunities. These recommended projects could save companies an additional $2.1 million per year.

This year, three interns committed to 24-week projects that will continue through November and December. Twenty-four week projects allow an intern to collect data over time and evaluate systems through varying conditions. These extended internships also allow more opportunity for the intern to implement the projects they have recommended. The host company benefits by having continuous oversight of initial stages of the implementation process, while the intern gains valuable hands-on experience and may be able to see the project through to fruition.

Pollution Prevention Services is continuing a five-year partnership with the U.S. Environmental Protection Agency, which includes an annual workshop for hospital facility managers in collaboration with the Kansas State University Pollution Prevention Institute. Interns funded through this partnership identified opportunities to reduce operating costs by improving energy efficiency and waste handling procedures at four facilities.

Companies have faced many economic and environmental challenges in the past ten years. Host companies of the Iowa Pollution Prevention Intern Program continue to demonstrate that environmental stewardship fosters economic growth.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
9,472.36	40.6	5,399.70	1,811.56	112.55	6.71

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.

2010 IMPLEMENTED SAVINGS

CATEGORY	REDUCTION	COST SAVINGS
WATER CONSERVATION	39,704,000 GALLONS	$113,882
SOLID WASTE	946 TONS	$226,992
HAZARDOUS WASTE	160 TONS	$27,000
ENERGY	34,475,289 KWH 413,380 THERMS	$245,772 $282,595
OTHER	-	$492,000
		TOTAL $1,388,181

BURKE CORPORATION

AARON ROBERTS
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

NEVADA

Burke Corporation, a subsidiary of Hormel Foods, produces and markets fully cooked meat products for businesses. Burke manufactures more than 1,500 different products and produces approximately 90 million pounds of meat annually, which it distributes internationally. Burke produces consistent, convenient and safe products with a forty-year history and commitment to service, quality and product development. Hormel Foods bought Burke in 2007 and has continued Burke's dedication to convenient and safe products.

PROJECT BACKGROUND

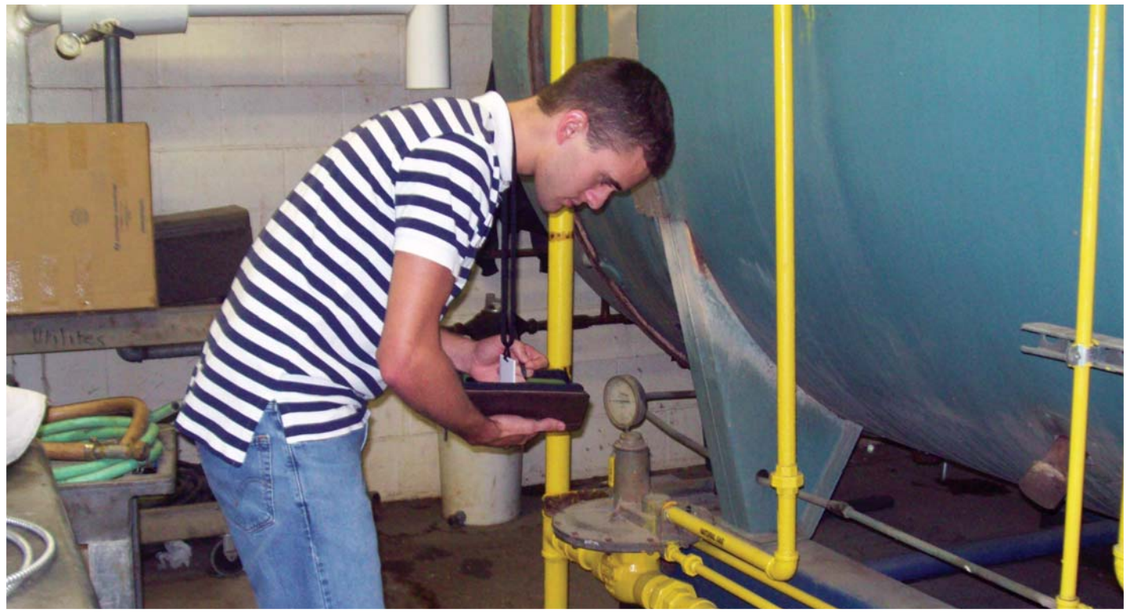
After previous success with the Pollution Prevention Intern Program, Burke hosted a 2010 intern to analyze natural gas usage and reduction. During the course of the project a natural gas baseline was created, which assisted in focusing subsequent reduction projects on the largest utility users. The intern examined boiler economizers, insulation, production line steam reduction, oven water reuse, and Light Emitting Diode (LED) lighting.

INCENTIVES TO CHANGE

Adopting sustainable practices will assist Burke with offsetting the rising cost of utilities. The company is continually exploring new and innovative ways to conserve resources and decrease fixed costs.

RESULTS

Boiler Economizer: Burke's boiler system efficiency could be dramatically improved through the installation of a condensing stack economizer. Installing a boiler economizer system on Burke's largest boiler would result in yearly savings of 174,700 therms of natural gas.

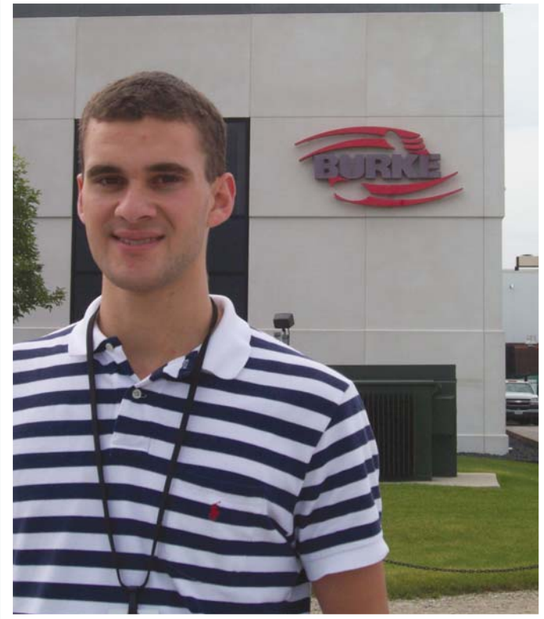


Insulation: Insulation projects in Burke's boiler room, mechanical rooms, and wastewater plant would significantly reduce natural gas usage by the plant's hot water and steam systems. Installing 600 feet of pipe insulation and 100+ removable insulation blankets, and insulating four steam tanks would result in an annual savings of 41,536 therms.

Oven Water Reuse: Water used in an oven cooling system can be reused through a process change. The process change could save the company 575,000 gallons of water and 4,350 therms per year.

Production Line Steam Reduction: Regulating steam flow between production batches could reduce 1.8 million pounds of steam per year. Decreased steam usage would result in the reduction of natural gas by 24,000 therms, water by 225,000 gallons, and an additional reduction in water treatment chemicals used in the wastewater plant.

LED Lighting: Ten LED lamps were installed in one section of the cold storage area, as a test to observe the performance and light value of LEDs in cold conditions. If the test shows the LEDs provide satisfactory light, the remaining lamps in the cold storage area will be converted. The goals of the LED project are to reduce electric usage, improve lighting quality, and reduce cooling demand. Another advantage of using LED technology is that it would allow Burke to turn off the freezer lights, due to the instant on/off capability of LED.



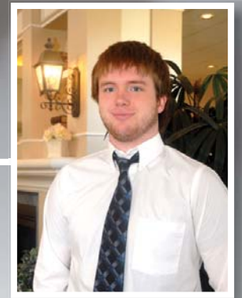
CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
169.76	0.49	312.66	37.63	2.10	0.04

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
BOILER ECONOMIZER	$113,000	174,700 THERMS	RECOMMENDED
INSULATION	$27,580	41,536 THERMS	RECOMMENDED
OVEN WATER REUSE	$11,900	575,000 GALLONS 4,350 THERMS	RECOMMENDED
STEAM CHAMBER STEAM REDUCTION	$20,400	225,000 GALLONS 24,130 THERMS	RECOMMENDED
LED LIGHTING	$1,159	14,067 KWH	RECOMMENDED

CARGILL INC.

IAN STEWART
ENVIRONMENTAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

SIOUX CITY

Cargill Inc. is an international producer and marketer of food, agricultural, financial, and industrial products and services. Globally, the company employs 138,000 people in 67 countries. Cargill's operations at its Sioux City, Iowa location include crushing soybeans, creating meal products, and extracting and refining oil into many products. This facility employs 95 individuals in the crush plant, administration office and refinery. Its main products are soy meal, bean hulls, and different blends of vegetable oil. Products are transported by truck or rail cars.

PROJECT BACKGROUND

Cargill generates solid waste at several locations in its operations. The intern investigated opportunities to reduce the amount of solid waste sent to the landfill and to maximize the facility's material reuse and recycling efforts.

INCENTIVES TO CHANGE

Since resource efficiency is a company goal and the costs of handling and disposing of waste are rising, increased recycling and beneficial reuse of materials is advantageous. Several recycling and reuse opportunities at the plant can save Cargill money while reducing its environmental footprint.

RESULTS

New Bean Dumpster: An on-site dumpster collects soybean meal and other grain products that do not meet Cargill's food safety requirements. This dumpster is managed by a company that purchases salvage grain material. After proper separating, cleaning and disinfecting, the salvage grain company produces animal feed products.

Currently, a second on-site dumpster that is also commonly filled with grain products and soybeans that do not meet Cargill's food safety requirements is taken to the landfill. The grain product waste is the result of rock sifting, ground contamination and equipment cleaning. Installing another salvage grain dumpster at this second location would result in landfill diversion and cost savings.

Soybean Reintroduction Door: In one location, soybeans occasionally spill into an outdoor area. The area has an overhead cover to protect the spilled product from rain damage and other contamination. Investigation revealed that by fabricating a reintroduction door in a designated production area, these soybeans could be fed back in to the production process. This process change would provide landfill diversion and increase revenue from the recovered product.

Secondary Foreign Material Screening: Most of the discarded soybeans are from the foreign material screening process. One way to increase revenue and yields while reducing landfill costs would be to implement a secondary screening process. The secondary screening could be small in scale, yet could more efficiently remove foreign material, ensuring that the maximum amounts of soybeans are processed.

Cardboard Dumpster: After performing a waste audit, the intern determined that the crush plant sent a significant amount of cardboard to the landfill. A dumpster for cardboard was placed at a convenient location for optimal usage. Use of this dumpster will reduce hauling of other dumpsters, recycle more material and save on costs.

Steel Drum Liner: The refinery uses steel drums for trash collection. The drums are used at locations where material needing disposal may be of temperatures exceeding 100°F. Once it is cooled, this material also often sticks to the container so it cannot be emptied, causing the entire drum to be landfilled.

A solution to this problem is to use a high-density polyethylene bag that can handle material from -40°F to 212 °F and is designed to not stick to containers. This would allow for the drums to be emptied and reused. On-site reuse of the drums would reduce landfill costs and recycling excess drums could generate revenue.

Spent Bleaching Clay: The refinery produces spent bleaching clay daily. This material, under certain conditions, can be spontaneously-combustible. It also is the largest volume of waste generated at the plant. The clay contains between 20 percent and 30 percent oil, which gives it some beneficial reuse potential. Due to the properties of the material, finding a solution will require additional research.

One company expressed interest in receiving this material from Cargill and reusing it in producing animal feed. The clay is beneficial for this purpose because it boosts fat levels, makes the material flowable and is a mycotoxin binder. However, the cost of hauling the material to the company detracts from the appeal of this option.

Other options include composting and energy capture. A composting facility has expressed interest in the oil, as well as the conditioning nature of the clay itself. Systems set up for high-ash fuels can benefit from the high thermal value of the oil from the clay to produce energy.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
5.81	0.02	0.25	0.02	---	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
NEW BEAN DUMPSTER	$4,720	91 TONS	IMPLEMENTED
SOYBEAN REINTRODUCTION DOOR	$8,132	20 TONS	IMPLEMENTED
SECONDARY FOREIGN MATERIAL SCREENING	$85,547	200 TONS	RECOMMENDED
NEW CARDBOARD DUMPSTER	$340	4 TONS	IMPLEMENTED
STEEL DRUM LINERS	$800	1 TON	IMPLEMENTED
SPENT BLEACHING CLAY	$200,000	2,339 TONS	RECOMMENDED

CITY OF DUBUQUE

PETE KATARAS
CONSTRUCTION ENGINEERING – MECHANICAL EMPHASIS, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

DUBUQUE

Dubuque, Iowa is a city led by environmentally aware leaders that strive to create a sustainable community by managing resources and increasing energy efficiency. Sustainable Dubuque is a program that focuses efforts on three main aspects of community development: environmental and ecological integrity, economic prosperity, and social and cultural vibrancy.

Located on the Mississippi River in northeast Iowa, the city of Dubuque employs more than 900 people throughout the year. Citizens of Dubuque take pride in the city's slogan: Masterpiece on the Mississippi.

PROJECT BACKGROUND

The Historic Federal Building, City Hall, and City Hall-Annex were all constructed more than a half-century ago. Through the years, renovations have been made that increase energy efficiency and reduce the carbon footprint of the buildings. The project identified new opportunities that could produce environmental and utility cost savings.

INCENTIVES TO CHANGE

The model for Sustainable Dubuque consists of 11 principles that identify and address community values that citizens want to preserve for future generations. The intern project addressed two of these key values, community design and smart energy use, by identifying opportunities to improve the efficiency of municipal buildings, while preserving the historic integrity of the older structures. Increasing the efficiency of municipal buildings and minimizing the use of energy and resources will position the city as a model of sustainability.

RESULTS

Electricity Savings: Reducing the daily electricity use in the Historic Federal Building will produce noticeable annual savings. Opportunities to reduce energy consumption include reducing the number of lights used in unoccupied and naturally lit areas, powering down computers and monitors when not in use, reducing the quantity of multi-function office equipment in common areas, eliminating space heaters, and installing variable frequency drives (VFD) on the chiller system pumps. Implementing these recommendations would save 120,730 kWh and reduce energy costs by $10,130 a year.

Window Upgrades: The Historic Federal Building loses significant energy to the surrounding environment through its exterior windows. The windows are manufactured from steel with a single glazing that provides poor thermal resistance between the indoor and outdoor air temperatures. Further, infiltration through the steel frames result in wasted energy and increased costs.

The intern offered three options to increase the thermal efficiency of the windows and reduce infiltration around the frames with technologies that would retain the historic integrity of the building. Depending on the option selected, energy use could be reduced by up to 7,000 therms, saving $6,700 a year.

Cooling Tower: City Hall uses more than 1,000,000 gallons of water a month to cool its air handling units and heat pumps. Installing a cooling tower to convert the open loop system to a closed loop system would save millions of gallons of water and chemicals. The cooling tower would cool the water to an adequate temperature, allowing the water to be reused. While the city is not directly billed for water consumption, a commercial consumer would be charged approximately $70,200 for supply and disposal of this amount of water.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
141.20	0.54	350.26	177.14	1.55	0.02

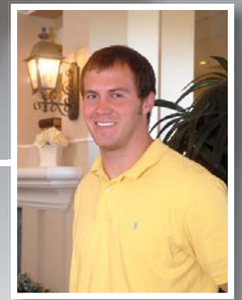
PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
ELECTRICITY SAVING PRACTICES - HISTORIC FEDERAL BUILDING	$7,153	84,244 KWH	RECOMMENDED
WINDOW UPGRADES - HISTORIC FEDERAL BUILDING	$6,700	9,550 THERMS	RECOMMENDED
CITY HALL COOLING TOWER	$8,740*	12 MILLION GALLONS OF WATER	RECOMMENDED

*Based on current city water rates, the 12 million gallons of potable water would be, if billed to a commercial user, $24,000 for water with sewer charges of $42,000 + tax. Currently these fixed and variable costs are subsidized by community rate payers.

SIX-MONTH INTERNSHIP

CNH AMERICA LLC

LOGAN SMITH
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY



COMPANY BACKGROUND

BURLINGTON

CNH is a global leader in the manufacturing of construction and agricultural equipment. The company totaled $13.8 billion of revenue in 2009. With approximately one million square feet under one roof and a workforce of more than 400 employees, the Burlington site manufactures tractor loader/backhoes, rough terrain forklifts and landscaping tractors under the Case Construction name. Through World Class Manufacturing, CNH is set to have its products meet Tier 4 emission standards by 2014.

PROJECT BACKGROUND

This is the third year that CNH has participated in the Pollution Prevention Intern Program. During the summer, the intern focused primarily on performing a compressed air audit and creating a motor survey. The intern returned to CNH-Burlington for 12 additional weeks to focus on other energy saving projects such as lighting retrofits, heat regeneration in the paint ovens, natural gas consumption in the paint ovens and hot water boiler, and an HVAC review.

INCENTIVES TO CHANGE

CNH strives to employ development tactics that are environmentally and socially sustainable. The company is not only committed to minimizing the footprint that its products have on the environment; they are devoted to decreasing the environmental impact of their production processes. By performing an energy audit of the facility and understanding which processes consume the most energy, the CNH-Burlington site is taking another step toward becoming a greener company.

RESULTS

Compressed Air Audit: The intern first conducted a compressed air audit of the facility. Because several processes in CNH use compressed air, production is directly affected by its availability. Compressed air is very expensive, accounting for more than 10 percent of electricity used at CNH. Compressed air leaks are also noisy. Tests showed that an estimated 29 percent of the system's capacity was lost to leaks. An ultrasonic leak detection survey was performed and approximately 72 percent of the leaks in the system were tagged for repair. Fixing these leaks and implementing an ongoing leak management program would allow CNH to reduce the proportion of system capacity lost to leaks to less than 10 percent.

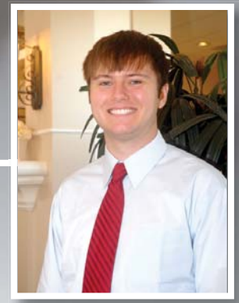
The intern then examined applications of compressed air and determined that modifications to equipment used in the paint system could produce considerable savings. The paint must be continuously agitated or else it will coagulate. Compressed air pumps and agitators are much less efficient than their electrical counterparts. If CNH were to switch from pneumatic agitation to electric agitation, the company could save more than 80,000 kWh per year.

Air compressors are operating at a pressure much higher than what is required to run production. If the pressure of the system were lowered to what is necessary, CNH could save 18 percent on the electricity consumption of its compressors.

Synchronous Drive Retrofit: Electric motors are a common source of power transmission. CNH utilizes several hundred motors for various processes. The intern took an inventory of the electric motors and their applications in the facility. Although there are many direct drive applications, numerous motors transmit their power through v-belt drive systems. These v-belt drives lose substantial efficiency due to friction and excessive bending in the belts. New technology in synchronous drive systems eliminates many of these losses and allows for an increase in power transmission efficiency of between 5 percent and 9 percent. The addition of these drives would save CNH more than 300,000 kWh of electricity annually.

EMCO ENTERPRISE INC.

DANJIN ZULIC
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY



COMPANY BACKGROUND

EMCO Enterprise Inc. is a fully owned subsidiary of Andersen Corporation. The company is the leading manufacturer of storm doors in the Unites States and employs more than 500 people at its two locations: Des Moines, Iowa and Luray, Virginia. EMCO produces 15 different types of storm doors with features that provide energy efficiency, security and durability.

PROJECT BACKGROUND

This is the second consecutive year that EMCO has participated in the Pollution Prevention Intern Program. Several areas of operation have potential energy and environmental savings. The intern focused on reducing compressed air leaks and demand, setting up a sustainable recycling program and exploring lighting options.

INCENTIVES TO CHANGE

EMCO is committed to making a positive impact on the environment. The company has initiated an ECO 3 system that emphasizes reusing materials, recycling and reducing waste. The facility's compressed air system accounts for a large portion of the monthly electric bill and is not monitored as effectively as other utilities. Reducing and eliminating inefficiencies and associated costs are major incentives to change.

RESULTS

Compressed Air Leaks: The intern found 177 air leaks after conducting a compressed air audit using an ultrasonic leak detector. These leaks account for approximately 40 percent of the total compressed air demand of the plant. The leaks were fixed and a continuous leak detection program was set up through preventative maintenance personnel. By following the program, maintenance should be able to detect and fix approximately 400 cubic feet per minute of air leak volumetric flow each year. Fixing the leaks is a straightforward process that may involve replacing common fittings, adding pipe thread sealant or tightening fittings. The return on investment is usually one to two weeks.

Compressed Air Component Shut Down: The compressors had been started three hours before production began every day. By starting the compressors two and one-half hours before production, 130,000 kWh will be saved each year. The 50 horsepower compressor is on for testing continuously, outside of production hours. If this usage were decreased by 50 percent, almost 100,000 kWh could be saved annually.

Heat Recovery: Most of the compressors have a heat recovery system that provides space heating for the plant. However, one of the most frequently used compressors does not have a system to recover heat. If such a system were put in place, up to 80 percent of the energy used to power the compressor could be recoverable heat.

Pressure Reduction: A pressure reduction of 1 pound per square inch is equivalent to 0.5 percent of total energy reduction. With the leak detection program and several other measures in place, EMCO could handle a reduction of 10 pounds per square inch.

Lighting: Currently, the plant uses T12 bulbs in most of its 1,500 fixtures. The best options to switch to are LEDs or T8 bulbs. The plan with the best return on investment is to replace every T12 bulb in the plant with a T8 bulb.

Recycling: The Dixon facility supports the main Walnut location by warehousing raw materials and distributing small parts. Before this project, there was no recycling at the Dixon facility except for office recycling. After the intern established a method to separate recyclable materials and trash, cardboard started to be recycled. About 109 tons of waste will be diverted from the landfill annually through increased recycling.

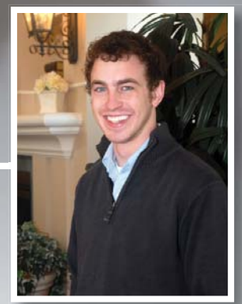
CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
979.11	4.64	55.60	2.22	10.63	1.14

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
AIR LEAKS	$30,456	507,595 KWH	IMPLEMENTED
LEAK DETECTION PROGRAM	$19,188	319,800 KWH	IMPLEMENTED
END EARLY START UP	$7,800	130,000 KWH	IMPLEMENTED
TURN OFF 50 HP COMPRESSOR	$5,755	95,924 KWH	RECOMMENDED
HEAT RECOVERY	$7,192	10,562 THERMS	RECOMMENDED
PRESSURE REDUCTION	$4,000	66,667 KWH	RECOMMENDED
LIGHTING	$10,021	273,727 KWH	RECOMMENDED
RECYCLING	$10,638	109 TONS	IMPLEMENTED

FARLEY'S AND SATHERS CANDY COMPANY, INC.

ETHAN GUIO
CHEMICAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

CRESTON

Farley's and Sathers Candy Company, Inc. is headquartered in Round Lake, Minnesota. The company produces a variety of non-chocolate candies and distributes its products throughout North America. The Creston, Iowa facility's main products are Trolli® brand Gummi Candies and other gelatin- and starch-based confections, such as the Jujyfruit. The facility runs continuously five or six days a week and has a target production of 100 million pounds this year.

PROJECT BACKGROUND

Continued growth in production over recent years has increased pressure on the company's on-site wastewater treatment plant. The resulting increases in water usage and carbon loading could potentially cause the effluent to exceed the concentration limits imposed by the municipal wastewater treatment plant, which could lead to surcharges. This project sought to proactively decrease production water usage and loading to improve on-site wastewater treatment plant operations and reduce costs.

INCENTIVES TO CHANGE

Due to the rising costs of water and wastewater treatment, Farley's is committed to identifying opportunities for decreasing water usage and improving wastewater treatment plant operations. Excess loading received at the on-site wastewater treatment plant from the production facility could potentially cause Farley's to pay for tanker trucks to transport loads of wastewater to a third party for treatment at a cost of $1,600/day.

RESULTS

Tanker Avoidance: Changes in cleaning procedures have reduced both the amount of sugar and starch going down the drain and overall water use. Procedural changes were also intended to increase the percentage of waste that is swept into totes for use as animal feed, rather than being washed down the drain. Temperature probes have been inserted in several drains to enable the company to gauge water use at different times. High temperature readings show extended use of hot water hoses. Samples have been drawn from drains throughout the plant to determine which production areas pose the largest problems in terms of loading. Additional monitoring is planned after the completion of this project. The changes have limited loading leaving the plant, eliminating the need for external water treatment and an estimated $490,000 in related costs.

Water Reduction: The plant has already seen an 8 percent reduction in water use due to the changes in cleaning procedure and monitoring throughout the facility. This reduction has been realized despite an extra four production days in the month. Metering the water lines flowing to each process unit will show which work areas are using the most water and will help to minimize water use.

Caustic Reduction: The plant has seen a loading reduction similar to its water reduction. The reduction in loading directly contributes to a reduction in the use of caustic soda, used at the plant's wastewater treatment facility to control pH. Caustic soda is a large expenditure for the company and a very corrosive chemical. Reducing its use cuts costs and reduces overall chemical use.

Natural Gas Reduction: Natural gas consumption in the plant is down 4 percent. This change can be attributed to a reduction in hot water demand due to changes in clean up procedures.

Biogas Use: The on-site wastewater treatment plant uses anaerobic digestion to treat the waste stream from the confection manufacturing facility. This process produces a biogas byproduct that is primarily methane. This gas is currently being flared off as a waste stream, although it could be used for practical applications. At one time, the gas was burned in one of the on-site boilers, but because of changes in gas production that process was halted. An outside contractor assessed the feasibility of using a set of 65 kW microturbines to consume the biogas and determined the capital cost would be prohibitive. Alternatives to the existing biogas control train are now being investigated to once again generate process steam for the manufacturing facility.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

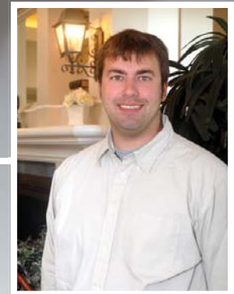
Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
875.97	1.00	1,555.90	746.45	5.95	0.17

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
TANKER AVOIDANCE	$492,000		IN PROGRESS
WATER REDUCTION	$26,000	3.9 MILLION GALLONS	IN PROGRESS
CAUSTIC REDUCTION	$27,000	160 TONS	IN PROGRESS
NATURAL GAS REDUCTION	$48,000*	105,960 THERMS	IN PROGRESS
BIOGAS USE	$40,430	89,250 THERMS	INVESTIGATING ALTERNATIVES

*Does not include savings in trasport charges and other associated fees.

GENESIS HEALTH SYSTEM

DAVID LOOS
ENVIRONMENTAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

DAVENPORT

Genesis Health System comprises four hospitals and numerous office buildings. Two main campuses are in Davenport, Iowa. Each location houses approximately 250 beds and employs 800 first shift employees and physicians. Both locations offer complete general hospital services. A specialized cancer center at Genesis West offers some of the most advanced methods of treatment in the area. The Heart Institute at Genesis East offers state-of-the art diagnosis techniques dedicated to improving heart health.

PROJECT BACKGROUND

This project focused on the conditions of the boiler systems at both east and west campuses. The facilities serve the hospitals with a constant supply of steam for sterilization, humidification, dietary, and heating purposes. A survey was done in order to establish boiler efficiency at these locations and to analyze the steam distribution system throughout both facilities. The analysis included a steam trap inspection and research into possible boiler upgrades that could raise the system's efficiency.

INCENTIVES TO CHANGE

Genesis Medical Center (GMC) Davenport uses natural gas boilers for steam production. The life expectancy of these types of boilers is typically 30 years. The boilers at Genesis East are currently 35 years old. Although considerable preventative maintenance has kept these boilers in very good condition, there are concerns that they will need to be replaced in order to minimize maintenance costs and maximize efficiency. There is also concern that rising energy costs could drastically affect utility costs if preventative measures are not taken.

RESULTS

Steam Trap Audit: An audit of almost 250 steam traps was conducted throughout both campuses. Steam traps are used in order to remove condensate from the distribution system without allowing steam to leave the system. More than 20 percent of the audited steam traps were found to be malfunctioning, allowing steam to pass into the return condensate line.

To address this problem, an annual steam trap audit should be conducted by maintenance on site, using an ultrasonic probe. This should lower the number of faulty traps each year to less than 10 percent facility wide. In order to aid with the audit, a steam trap database and floor maps with locations of each trap were created. This will allow for proper recordkeeping and thorough steam trap inspections.

Boiler Insulation: Researching past performance of GMC Davenport's boilers showed typical combustion efficiencies, close to the maximum allowable of 85 percent. However, the boilers were often producing steam at much lower levels, from 65 percent to 70 percent. This shows a loss of energy within the boilers themselves. In order to help address this problem, insulation was recommended on the bare surface at the ends of each boiler. The insulation would raise the efficiency by approximately 1 percent and would require little up-front capital.

Waste Heat Economizers: The intern analyzed the feasibility of installing economizers on the boilers. Economizers take heat leaving the system in the exhaust (flue gas) from the boiler and use the heat to preheat incoming boiler makeup water. Current flue gas temperatures at the facilities range from 300°F to 360°F. Prior to use in a boiler, makeup water must be heated to 212°F. Economizers were not feasible for this project because most of the water (86 percent) is kept in the system in the form of condensate at a much higher temperature than domestic cold water. This made the capital investment considerably high for the potential return.

Boiler Replacement: Replacing GMC Davenport's boilers could raise the efficiency of the system by as much as 20 percent. However, due to the current condition of the boilers, the low volume of steam production at these facilities and the relatively high capital investment that would be required, boiler replacement is not feasible at this time. The high capital investment would be needed, in part, due to the nature of the boiler locations and the large installation costs that would be incurred.

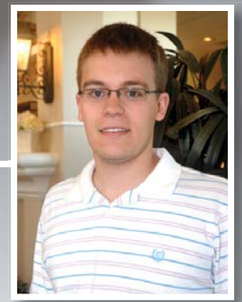
CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
26.29	0.07	43.41	0.11	0.33	0.01

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
STEAM TRAP AUDIT	$23,000	33,000 THERM	IMPLEMENTING
BOILER INSULATION	$5,600	8,000 THERM	RECOMMENDED
WASTE HEAT ECONOMIZERS	$29,000	41,000 THERM	NOT FEASIBLE UNDER CURRENT CONDITIONS
BOILER REPLACEMENT	$131,000	187,500 THERM	NOT FEASIBLE UNDER CURRENT CONDITIONS

GREEN PLAINS SUPERIOR, LLC

GABE MCNUNN
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY



COMPANY BACKGROUND

SUPERIOR

Green Plains Superior, LLC is an ethanol production facility based in Superior, Iowa. The company is a subsidiary of Green Plains Renewable Energy Inc., and currently employs 43 individuals. The employees are split between two daily shifts to maintain constant operations for ethanol production in the facility. The plant consumes more than18 million bushels of corn in order to produce over 50 million gallons of ethanol annually. Along with ethanol, the company produces and sells dried distillers grains, distillers wet grains, and a syrup, all of which are byproducts of the ethanol production process and sources for animal feed.

PROJECT BACKGROUND

An audit of the compressed air system was performed in order to identify areas of the system in which efficiency could be increased, resulting in energy, environmental, and cost savings.

An insulation audit was also performed to identify opportunities to reduce the amount of heat loss found primarily in the steam, return condensate and ring dryer systems. Reducing heat loss leads to direct savings in natural gas consumption, with associated cost savings and the diversion of pollutants and greenhouse gasses.

INCENTIVES TO CHANGE

Responsible for almost 10 percent of the electrical usage at the plant, the compressed air system is a large potential source of energy savings. Any increase in the efficiency of the compressed air system would lead directly to a reduction in energy consumption and cost.

Aside from the cost of corn, natural gas is the largest cost of ethanol production at Green Plains Superior. Any reduction in natural gas consumption by means of insulation would result in direct environmental and cost savings.

RESULTS

Compressed Air System: The compressed air analysis revealed potential savings obtainable through several strategies including repairing air leaks, decreasing supplemental compressor operation, reducing compressor discharge pressure, decreasing dryer regenerative air purge rate, maximizing compressor cycle time, and installing compressor cold air intake systems. Overall, the environmental impact of the recommended actions can save up to 769,000 kWh of annual energy consumption. The cost savings due to reduced energy consumption could exceed $29,000 on an annual basis. In some cases the benefit of reduced maintenance and wear, along with extended compressor life, would provide additional savings.

Deaerator Tank Insulation: The insulation audit revealed the greatest source of heat loss to be the deaerator tank. Insulating the tank would have the greatest possible return of all intern recommendations. Annual savings could exceed $38,000, with a potential return on investment of less than six months. The audit also found more than 460 feet of bare steam and condensate lines accounting for upwards of 15,000 therms of annual heat loss. Bare valve and flanges are estimated to account for an additional yearly heat loss of nearly 3,660 therms. With the appropriate insulation, up to 90 percent of the heat loss could be prevented, saving the company $11,000 each year.

Ring Dryer Insulation: The ring dryer is responsible for almost one-third of the natural gas consumption at Green Plains Superior. Noted areas of the ring dryer include large air duct flanges, access hatches, and areas where insulation has been damaged or removed. In total, an estimated bare surface area of 366 square feet is recommended for the addition of insulation. Savings would exceed $10,000 annually.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
407.67	2.05	109.76	0.42	5.03	0.06

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR COMPRESSED AIR LEAKS	$8,150	247,900 KWH	RECOMMENDED
INCREASE CYCLE TIME/AIR SYSTEM RECONFIGURATION	$6,315	191,940 KWH	RECOMMENDED
REDUCE GA 45+ COMPRESSOR OPERATION	$6,440	195,800 KWH	RECOMMENDED
UPGRADE TO DEW-POINT DEPENDENT PURGE CONTROL	$4,434	134,778 KWH	RECOMMENDED
COMPRESSOR PRESSURE REDUCTION	$3,800	115,500 KWH	RECOMMENDED
COMPRESSOR COLD AIR INTAKES	$2,600	79,000 KWH	RECOMMENDED
STEAM AND RETURN CONDENSATE PIPE INSULATION	$8,250	15,000 THERMS	RECOMMENDED
DEAERATOR TANK INSULATION	$38,000	69,000 THERMS	RECOMMENDED
VALVE AND FLANGE INSULATION	$2,010	3,660 THERMS	RECOMMENDED
RING DRYER INSULATION	$15,400	17,520 THERMS	RECOMMENDED

GRINNELL COLLEGE

ALEX NEUMANN
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

Grinnell College is a private college located in Grinnell, Iowa. The college serves approximately 1,500 undergraduate students and employs about 200 faculty members. There are more than 60 buildings on campus, including classrooms, offices, athletic facilities, and dorms. Many buildings were built in the last ten years and many others have been renovated. Most buildings use heat provided by a central boiler plant, and air conditioning provided by a central chiller plant.

PROJECT BACKGROUND

The intern focused on three main projects: Expansion and renovation of the chiller plant, including installation of reheat chillers; renovation of the air handling units (AHUs) in Norris Hall dormitory; and the installation of motion sensors in the Alumni Recitation Hall (ARH).

INCENTIVES TO CHANGE

There would be many benefits to renovating the chiller plant. Reheat chillers recover heat that is normally dissipated into the atmosphere and use the heat to provide energy for domestic hot water. This process would not only decrease the overall cost of daily energy use at the campus, but would also decrease the emissions of the heating, ventilation and air conditioning (HVAC) systems. Improving the efficiency of the AHUs in Norris Hall would also significantly decrease the daily costs of HVAC. Finally, installing motion sensors in ARH would dramatically save HVAC costs. All three projects would decrease thermal and pollutant emissions.

RESULTS

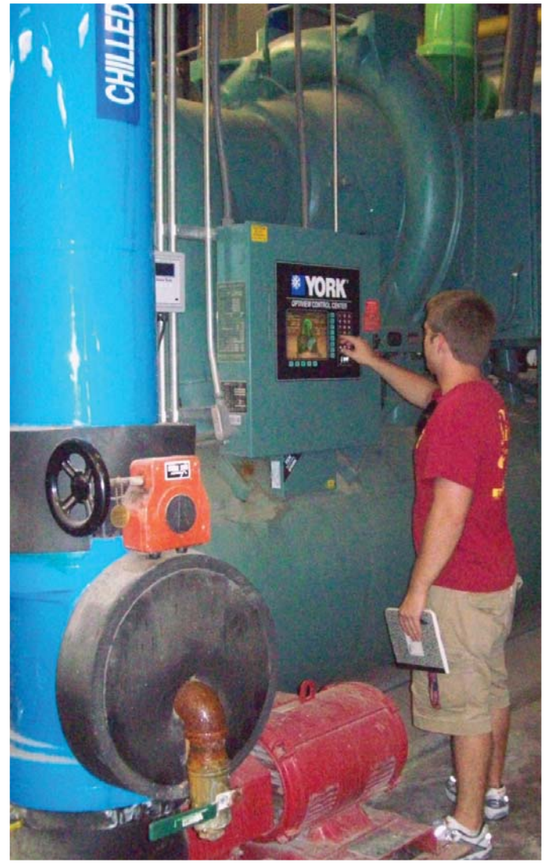
Renovation of Chiller Plant: The intern evaluated two options for upgrading the chillers. The first was to replace three outdated, but still operational, chillers. An analysis of this project concluded that this would not be economically feasible at this time. The intern also analyzed the option of installing reheat chillers. These chillers not only provide chilled water for air conditioning; they also provide hot water for any necessary load. The result would be that the summer heating load would decrease to the point where the 250 horsepower boiler is powerful enough to handle the load. Even taking into account a slight increase in electric consumption, this project would save the college more than $24,000 per year.

Air Handling Units in Norris Hall: There are two AHUs in Norris Hall. One is operational, but uses outdated technology; the other is an archaic machine that needs to be replaced for economic, environmental, and sanitation reasons. The solution would be to install a variable frequency drive (VFD) control on the newer unit, replace the old unit, and install a heat recovery wheel in the relief vent. All of these projects would assist in decreasing the demand on utilities, and would consequently decrease the emission of pollutants into the atmosphere.

Motion Sensors in Alumni Recitation Hall: Installing motion sensors on the variable air volume (VAV) boxes throughout the ARH building would greatly decrease the heating and cooling demands in the winter and summer. This decrease in demand would provide significant savings in utility costs from the boiler plant and chiller plant, and the project would pay for itself in less than one school year. The college could expect similar results if it were to install motion sensors throughout other buildings on campus.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

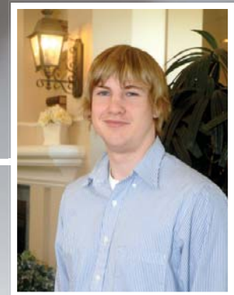
Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
39.41	0.11	65.06	0.17	0.50	0.01



PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
RENOVATION OF THE CHILLER PLANT	$24,400	78,210 THERMS	RECOMMENDED
AIR HANDLING UNITS IN NORRIS HALL	$6,060	3,555 THERMS	RECOMMENDED
MOTION SENSORS IN ARH	$12,400	15,111 THERMS	RECOMMENDED

HY-VEE DISTRIBUTION CENTER

JOHN FENSKE
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY



COMPANY BACKGROUND

CHARITON

The supermarket chain Hy-Vee, Inc. sells groceries and products to customers in Iowa and the surrounding states. In 2009, sales topped $6.4 billion and 2010 marked the company's 80th year of business. Its more than 56,000 employees operate in corporate offices in Des Moines, two distribution centers and 229 stores. Most distribution activity is based in the larger center in Chariton, Iowa. The complex consists of more than 1.5 million square feet of warehouse space and employs a fleet of 125 tractors and 270 trailers.

PROJECT BACKGROUND

The intern examined truck washing activities and compressed air leaks at the Chariton distribution center. The truck wash project included updating the aging on-site wash and determining impacts of the recently introduced off-site washing operations. Additionally, recommendations for a new wash system were made, for future remodeling of the area. The intern also explored and quantified the effects of compressed air leaks.

INCENTIVES TO CHANGE

Hy-Vee's sustainability policy addresses four key areas: store construction and design, energy and resource conservation, waste reduction and recycling, and product sourcing and packaging. This project shows customers that Hy-Vee acts on its policies. Additionally, rising utility costs and the new off-site washing costs invite changes to current practices and systems. Hy-Vee recognized the benefits that recommendations from Pollution Prevention Services could bring to the distribution center.

RESULTS

Control & Wash Cycle Updates: Most of the distribution center's truck washing needs are satisfied by an on-site wash. Cycle test results showed that utility use could be reduced through a change in process control. Replacing the fixed timer controllers with a series of simple on/off photoelectric emitters will result in water, natural gas, and electricity savings and waste reduction.

Other issues with the wash bay remain. First, additional labor is required for cleaning clogged nozzles and for adding solid detergent to the wash tank. Secondly, trucks are not being cleaned to the level desired. By replacing the current wash arch with a two-step liquid detergent application, both problems can be solved. Additionally, utility use will be further reduced and wastewater will become less hazardous.

Off-Site Wash Reduction: Off-site washing began because of two key issues with the on-site wash: it was used to wash out trailers in the winter, making it unavailable for truck washing, and vehicles were not being cleaned as well as desired. Since the inadequate cleaning will be addressed by the wash cycle upgrade, the off-site washing period can be reduced to winter months only.

On-Site Wash with Water Reclaim: Present plans are to construct a new fuel island, truck shop and truck wash structures in the near future. The company intends to install a modern wash system during the remodeling. The intern recommended a specific system and defined useful features to consider in alternate applications if the suggested system were not implemented.

Compressed Air Leaks: Using an ultrasonic leak detector, the intern located, tagged and logged leaks found in the various compressed air systems in the center. Although only a small portion of the total circulation system was examined, results show that significant savings could be achieved by repairing the discovered leaks. A comprehensive study of compressed air distribution should be completed to discover all areas of air escape.

Ongoing Leak Detection Program: Without a leak detection program, significant losses from leaks will continue to plague the distribution system. Investing in one or more leak detectors and developing a formal program would aid the center's employees in locating and repairing costly leaks.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

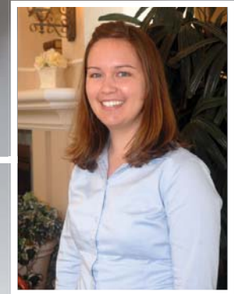
Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
140.81	0.63	184.97	78.50	1.68	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
CONTROL & WASH CYCLE UPDATES	$22,000	2 MILLION GALLONS WATER 9,000 THERMS 9,000 KWH	IMPLEMENTING
OFF-SITE WASH REDUCTION	$30,000	2.7 MILLION GALLONS WATER* 12,240 THERMS* 12,240 KWH*	RECOMMENDED
NEW ON-SITE WASH WITH WATER RECLAIM	$32,412**	3.1 MILLION GALLONS WATER*** 12,670 THERMS*** 8,240 KWH***	RECOMMENDED WITH FUTURE REMODELING
REPAIR COMPRESSED AIR LEAKS	$6,000+	84,000+ KWH	RECOMMENDED
ONGOING LEAK DETECTION PROGRAM	$1,500+	21,000+ KWH	RECOMMENDED

*Estimated emission reductions from off-site facility
**Assumption that Control & Wash Cycle Updates and Off-Site Wash Reduction recommendations have been implemented
***Includes environmental and cost savings from off-site wash reduction and estimated emission reductions from off-site facility

INFASTECH™

AMBER JOHNSON
CHEMICAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

DECORAH

Infastech™ Decorah Operations is in its 41st year of operation. The 40-acre campus houses a manufacturing facility capable of producing a wide range of products for the commercial, industrial, distribution, construction and automotive industries. Capabilities include heading, threading, shaving, grinding, heat treating, painting, stripping, passivating and class 100 clean room cleaning and packaging. In the next year, a plating system will begin production, allowing Infastech™ Decorah Operations to produce zinc plated products for the first time in its history.

PROJECT BACKGROUND

Reducing water dependency with closed-loop processes and minimizing or eliminating flow were Infastech's™ goals for this year's Pollution Prevention intern. Several wash areas were considered, as well as cooling water for two of the facility's heat treat furnaces. In addition to water conservation, smaller energy-saving projects were evaluated, including compressed air and electropolish electricity use.

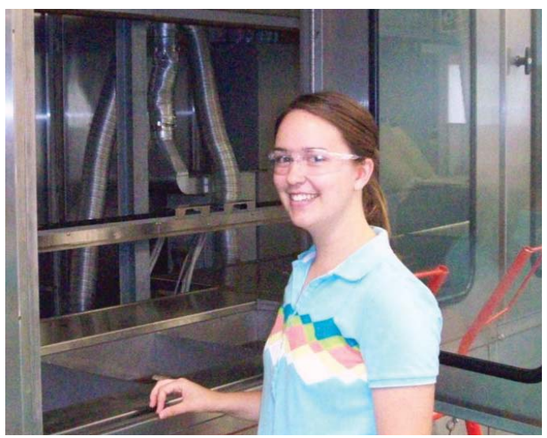
INCENTIVES TO CHANGE

Infastech™ Decorah Operations is an ISO 14001:2004 certified facility and the company maintains its certification through continuous improvement and pollution prevention. Water conservation has become increasingly important due to the implementation of new processes that consume large amounts of water. Water use and discharge regulations will only become more stringent, leading companies to decrease water consumption through process improvements. Reducing consumption has shown to result in cost savings, further proving that sustainability is necessary for growth.

RESULTS

Passivate Rinse Water Use: The current passivate system utilizes four rinse stations consisting of two soft water rinses and a two-stage deionized (DI) water rinse. The rinse water flows during all shifts, using 540,000 gallons annually. Water use could be reduced to one-third of the current usage by implementing reactive rinsing. Using DI water in a four-stage counterflow cascade would eliminate the two soft water rinses and save $10,800 annually. Using the neutralizer rinse as the acid rinse would provide the additional benefit of reactive rinsing, or initializing neutralization before reaching the neutralizer tank. With reactive rinsing, an additional $184 each year in extended neutralizer life could be realized.

Neutralizer Substitution: The neutralizer for nitric acid currently used in the passivate line acid is an expensive detergent meant for ultrasonic cleaning. Since the process no longer utilizes ultrasonics, alternative chemicals were investigated, taking cost, water use, disposal and annual usage into account. The two products analyzed will save more than $1,260 annually if used at 1 percent to 3 percent concentration. Testing was performed to ensure the new products maintained product quality. Testing is currently underway to determine if the new chemicals will negatively affect wastewater treatment. Implementation will show if the chemicals have a longer lifetime, which would save both water and chemical costs.



Heat Treat Bearings: As parts are carried through the heat treat furnaces on a belt, the bearings that support the belt need cooling. Currently, a total of 18 gallons per minute are used to cool these bearings and the belt itself. Heat treat operates 24 hours a day, seven days a week, consuming 9,072,000 gallons of water annually with an associated cost of more than $27,000 in water and sewer fees. Eliminating this water stream by converting the water-cooled bearings to air-cooled bearings is both environmentally and economically sound.

Blackstone Water Recycle: Ultrasonic cleaning in the Blackstone unit requires 8 gallons per minute of water for rinsing. Removing the contaminants from the rinse water and reusing it would decrease fresh DI water demand. For a 40-hour work week, the annual savings would be $21,838 and 864,000 gallons of water.

Electropolish Air Use: After parts have completed the electropolish cycle, they are rinsed in soft water that is agitated with compressed air spargers. Although the electropolish units are not utilized at all times, the compressed air is wide open 24 hours a day. A solenoid and a timer could be installed to ensure the air flows only when the electropolish unit is turned on. The timer would turn off the compressed air flow 30 minutes after the electropolish unit is turned off. Savings of 15,225 kWh and $762 would be realized each year by installing solenoids on the seven electropolish units.

Electropolish Maintenance: A material analysis was performed using an infrared camera to identify hot spots. Hot spots indicate difficulty carrying electrical current. By making changes to a material to improve conductivity, less power is required to send an electrical current through that material. Although no material changes were identified, a thorough cleaning would reduce the energy use by 20 percent. Including this cleaning in the maintenance procedure would save $24 and 396 kWh of electricity annually, while improving the function of the electropolish units.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
53.38	0.97	328.13	171.60	0.59	0.01

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
PASSIVATE RINSE WATER REUSE	$10,984	360,000 GALLONS WATER	RECOMMENDED
NEUTRALIZER SUBSTITUTION	$1,260+	UNKNOWN	IN TESTING
HEAT TREAT BEARINGS RETROFIT	$27,216	9,072,000 GALLONS WATER	RECOMMENDED
BLACKSTONE WATER RECYCLE*	$21,838	864,000 GALLONS WATER	RECOMMENDED
RESTRICT ELECTROPOLISH AIR USE	$762	15,225 KWH	RECOMMENDED
ELECTROPOLISH MAINTENANCE	$24	396 KWH	RECOMMENDED

*Savings and results based on 40 hours of use each week.

IOWA HEALTH - DES MOINES

HANNAH FLECK
ENVIRONMENTAL ENGINEERING, UNIVERSITY OF IOWA

COMPANY BACKGROUND

Iowa Health System is a statewide health provider that encompasses 25 hospitals in metropolitan and rural communities throughout Iowa and in western Illinois. Iowa Health System includes Iowa Health - Des Moines (IHDM), which is where this internship took place. IHDM employs nearly 6,000 people and houses 779 beds. Its four main branches are Iowa Methodist Medical Center, Iowa Lutheran Hospital, Blank Children's Hospital and Iowa Methodist West Hospital. IHDM prides itself on its compassionate care and its customer service-orientated staff training.

PROJECT BACKGROUND

Medical waste is composed of specialized waste streams that require careful handling and treatment. Medical waste can cost hospitals considerable time, energy and money to process. The goal of this project is to reduce medical waste and regular trash, in order to minimize IHDM's costs and promote environmental responsibility throughout the hospital.

INCENTIVES TO CHANGE

Red bag waste costs IHDM significantly more to process than regular trash, yet more than one-half of what is thrown in the red bag waste is regular trash. By educating staff about what belongs in the red bag waste, IHDM will benefit financially and employees will "think before they throw". As hospitals maintain more rigorous compliance standards it is important to teach environmental responsibility to every IHDM member.

RESULTS

Educational Campaign: While touring the facility the intern observed that employees tended to handle anything with blood on it as hazardous waste. However, only a small portion should be classified as red bag waste. The intern developed an educational campaign, "Think Before You Throw", which included staff meetings, posters and a net learning module. It is estimated that an effective educational campaign can cut annual costs by an average of $37,808.

Conversion of red bag waste to regular trash bags (Radiology and OB departments): The intern identified large-volume producers of red bag waste by speaking with patient care floor managers and shadowing environmental service workers on their pick-up routes. Two areas that were identified as large-volume producers were the Radiology and OB departments. The intern attended staff meetings and spoke with them about the importance of putting the appropriate items with the red bag waste. After these meetings, the floor managers took the initiative to convert some or all of their red bag waste to regular trash. Conversion of the red bag waste to regular trash by these two departments will reduce the red bag waste stream by an estimated 6 percent and save IHDM $8,972 per year.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
192.80	0.80	8.40	0.70	---	0.80

Shredded Paper Waste: Eliminating confidential paper waste from the red bag waste stream was a priority for the intern. In 2009 IHDM shredded 205 tons of red bag waste and 166 tons of confidential paper waste. All 166 tons of the shredded confidential paper waste was landfilled. The intern and IHDM's integrated services management team explored options for removing the confidential paper waste from the medical waste stream. These options included purchasing another on-site paper shredder and converting the current shredder to a two-stream process. If IHDM found a way to recycle the shredded confidential paper, it could save up to $39,560 per year and divert 166 tons of paper from the landfill.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
EDUCATIONAL CAMPAIGN	$35,788	46.1 TONS	IMPLEMENTING
CONVERSION FROM RED BAG WASTE TO REGULAR TRASH BAGS (OB)	$1,302	1.59 TONS	IMPLEMENTING
CONVERSION FROM RED BAG WASTE TO REGULAR TRASH BAGS (RADIOLOGY)	$7,672	9.36 TONS	IMPLEMENTING
SHREDDED PAPER WASTE	$39,560	166 TONS	RECOMMENDED

JBS

BRETT FRITZE
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

MARSHALLTOWN

In 2007 JBS S.A. bought Swift Co. and is now the world's largest beef processing company and third largest pork processor in the United States. JBS is headquartered in San Paulo, Brazil and employs more than 54,000 people, 2,400 of which are located in its Marshalltown, Iowa facility. JBS in Marshalltown is one of three JBS pork facilities in the United States; the others are located in Worthington, Minnesota and Louisville, Kentucky. The Marshalltown facility processes hogs for a variety of products sold around the world.

PROJECT BACKGROUND

This internship focused on improving water usage and wastewater at the Marshalltown plant. The goal was to find economically friendly solutions that will conserve water and lower pollutants in waste streams, in keeping with the direction JBS has taken to become a role model in environmental responsibility.

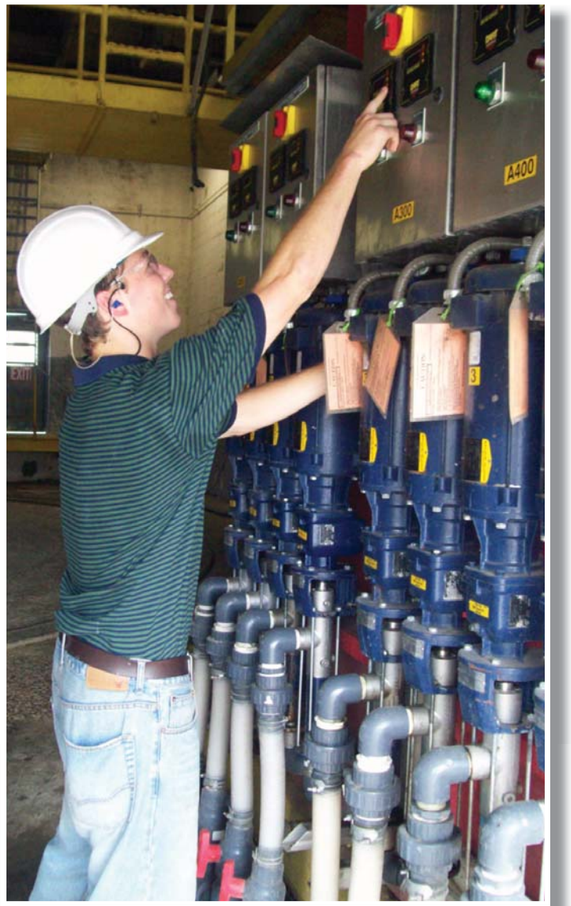
INCENTIVES TO CHANGE

Environmental accountability was the main incentive for this internship. JBS performs daily testing of its wastewater to gauge its status in order to make changes or improvements. After on-site treatment, the wastewater is sent to the city for further water treatment. JBS's efforts will help the company maintain a strong relationship with the city and will be an opportunity for them to work together for environmental sustainability.

RESULTS

Dry Pickup: Using dry pickup for cleaning is an important procedural change that could provide considerable environmental and cost savings. The intern recommended that cleaning crews remove solid waste before hosing off equipment. This would reduce the total amount of solids washed down floor drains, which would also reduce loading and save more than 37 million gallons of water annually.

Reduce Scrubber Water: Three scrubbers were analyzed, in order to quantify their makeup water usage. After taking flow rates and checking with manufacturer specifications, the makeup water was reduced by 48 GPM. These scrubbers run 24 hours a day, six days a week, so more than 30 million gallons of water will be saved annually. Since this project has no overhead costs, savings were seen immediately.



Switch to New Polymer: This project studied switching to a new polymer used for on-site wastewater treatment. By switching to the new polymer, JBS would require two-thirds less polymer by weight, which would reduce annual use by 268 tons and save $400,000 each year. This project is still under consideration because of the current improvements JBS has made in its wastewater treatment.

Nitrogen Removal: The intern analyzed the feasibility of installing a different system for nitrogen removal. The system is rated at 90 percent reduction in total nitrogen from waste streams. Although the system showed promise, it was not economically practical because of large investment costs and space requirements. However, as part of this analysis, lab testing was done to determine loading concentrations on six waste streams in the facility. Based on these results, waste streams were quantified, which set the groundwork for pinpointing future source reduction opportunities.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

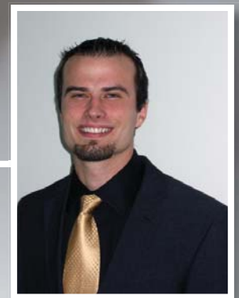
Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
729.25	1.59	975.62	588.79	24.10	0.24

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DRY PICKUP	$96,286	37,043,308 GALLONS	RECOMMENDED
REDUCE SCRUBBER WATER	$75,465	33,804,000 GALLONS	IMPLEMENTED
SWITCH TO NEW POLYMER	$407,264	268 TONS	RECOMMENDED
NITROGEN REMOVAL	$155,105	417 TONS	FURTHER RESEARCH NEEDED

SIX-MONTH INTERNSHIP

KUM & GO

ZACHARY LAWS
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY



COMPANY BACKGROUND

WEST
DES MOINES

Over the past 50 years, Kum & Go has become a highly successful organization that is respected as a convenience store pioneer and a model for quality convenience stores throughout the United States. Headquartered in West Des Moines, Iowa, Kum & Go has become the third largest private owner-operator of convenience stores in the nation, with more than 430 stores in 11 states.

PROJECT BACKGROUND

Kum & Go has a long history of environmental responsibility and has been committed to piloting new efficiencies and technologies with high potential for replication. In an effort to diversify fuels, in 1997 Kum & Go became one of the first convenience stores in the Midwest to open an E85 pump. To champion green building, Kum & Go was one of the first convenience stores to receive LEED certification. All newly constructed stores integrate Kum & Go's most up-to-date environmental measures, and it is a process of continuous improvement.

INCENTIVES TO CHANGE

With more than 430 convenience stores in 11 states, Kum & Go assets vary in age, size, and structure. Providing a large selection of fuel, cold beverages, and warm food around the clock, these stores consume a considerable amount of energy. Kum & Go constructs nearly 25 new stores every year that implement cost effective, energy efficient technologies. Retrofitting existing stores with new energy efficient technology is a company priority. Pollution Prevention Services teamed with Kum & Go to provide specific, cost effective solutions for reducing store energy consumption.

RESULTS

LED Refrigeration Lighting Retrofit: The majority of Kum & Go stores utilize fluorescent T8 and T12 lighting to illuminate beverage coolers. LED light fixtures not only consume less energy than fluorescent fixtures, but they also generate significantly less heat. When the reductions in wattage and heat generation are combined, a 61 percent energy savings could be achieved if existing coolers were retrofitted with LED lighting.

The intern applied for a $250,000 Technology Demonstration Grant through the Iowa Office of Energy Independence to assist in retrofitting 151 Iowa stores with LED cooler lighting. Kum & Go was awarded the full amount and will begin the retrofit in the fall of 2010. The project is projected to be finished in 2011 and can provide Kum & Go with more than 1 million kWh in annual energy savings.

Routine Condenser Coil Cleaning: Kum & Go provides its customers with a large selection of beverages. Each convenience store houses approximately six to eight stand-alone refrigeration units that contain internal condenser coils. The coils attract dust and frequently go unnoticed. By monitoring energy consumption prior to and after routine coil cleaning, the intern discovered a 27 percent reduction in energy consumption after the coils were cleaned. The intern will perform an energy consumption study at multiple store locations in an effort to calculate an average potential energy savings per store.

Common Compressor: Each refrigeration unit contains an internal compressor and condenser, which generate a significant amount of heat. The store's HVAC system must work harder to keep the store cool, resulting in an energy loss. The intern is exploring the possibility of retrofitting existing refrigeration units to utilize a single condensing unit. The condensing unit would be located in a back room, where a heat recovery system could be employed.

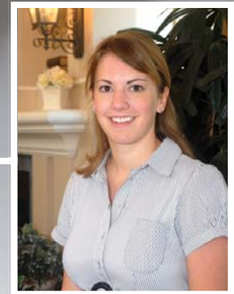
Energy Management Systems: Monitoring the energy consumption of more than 430 stores in 11 different states presents a challenge for Kum & Go. Store managers are in charge of monitoring and controlling the store temperature, lighting, and food equipment, but a manager's primary concern is meeting customer needs. With a variable influx of customers, lights and equipment can be left on unintentionally. Installing an Energy Management System (EMS) in each store to monitor energy consumption from a central hub could significantly reduce unnecessary energy consumption. In addition, an EMS can aid in diagnosing issues with an HVAC system before they become problematic. The intern will conduct an analysis to determine if the installation of an EMS would be cost effective.

Air Economizer: For several years, Kum & Go has been building new convenience stores that utilize air economizing units. However, a number of its existing stores do not contain air economizers. Installing air economizers in existing stores would greatly reduce the annual run time of existing AC units by pulling cool, outside air directly into the store, bypassing the AC units. The intern will gather data from existing stores to analyze the energy and cost savings that would be generated from installing air economizers in existing buildings.

Door Seal Preventative Maintenance: Large walk-in coolers are found in nearly every convenient store across the nation. Walk-in coolers have a number of display doors that allow the customer to reach in and grab a cold beverage. Cooler doors are opened and closed countless times throughout the day. As a result, door seals frequently become worn and ineffective. The intern will be creating a preventative maintenance plan to greatly reduce the number of ineffective seals that go unnoticed.

MERCY MEDICAL CENTER

SARA SCHMIEG
ENVIRONMENTAL ENGINEERING, IOWA STATE UNIVERSITY



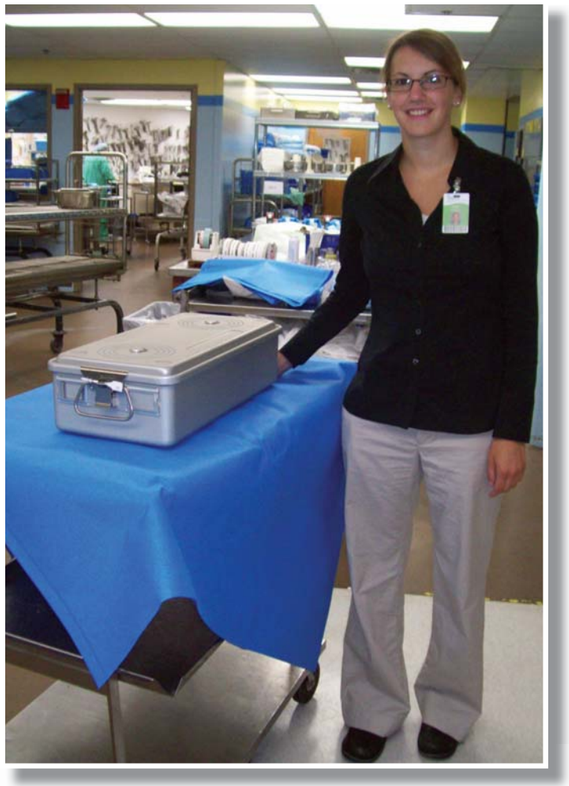
COMPANY BACKGROUND

DES MOINES

Mercy Medical Center was founded in 1893 by the Sisters of Mercy. Today it is part of Catholic Health Initiative, which encompasses 72 hospitals in 18 states. Mercy is Des Moines' longest operating hospital and one of the largest employers in the state, with more that 6,600 employees and medical staff of more than 950 physicians and health professionals. Mercy's accomplishments in sustainability include opening the first LEED certified hospital in Iowa, at Mercy West Lakes.

PROJECT BACKGROUND

Mercy Medical Center has made several advances in becoming more sustainable in the past few years. The 'Green for Mercy' motto was created, and a green committee encourages and implements sustainable projects. The Pollution Prevention Intern Program has enabled Mercy to further pursue and implement solid waste projects, and to show the impact the medical center can have as an environmental steward.



INCENTIVES TO CHANGE

The Mercy staff and green committee recognize the need for sustainability, to improve the overall quality and integrity of their services. Mercy's commitment to stewardship and its core values drive its pursuit of excellence and continual improvement. New waste reduction and recycling projects will not only provide economic savings, but could also divert more than 720 tons from the landfill each year.

RESULTS

Single Stream Recycling: Through a single stream recycling program that is in progress, more than 640 tons of solid waste is expected to be recycled each year. Iowa Department of Natural Resources' Solid Waste Alternatives Program will assist Mercy with project development and equipment purchases for the program.

Operating Room Blue Wrap Reduction: By using reusable sterilization trays, blue wrapping for operating tools and equipment can be reduced by 80 percent. The trays will reduce the need for most blue wrap on equipment by providing a complete vacuum seal after sterilization. This program is projected to prevent 5 tons of plastic wrapping from going to the landfill and to save Mercy over $80,000 per year. The Solid Waste Alternatives Program will provide some start-up funds for this program.

New Confidential Document Disposal: With improved education and better management practices, Mercy could replace some confidential document shredding with paper recycling. Many paper documents that are not considered confidential could be recycled, rather than placed in confidential document shredding containers. Through this recycling change, as well as understanding quantities of shredded materials produced each week, Mercy can save more than $55,000 annually.

Cardboard Recycling at Distribution Warehouse: Mercy Medical Center's supply distribution was moved from the downtown Mercy location to a separate facility. The move made it possible for the facility to recycle more than 60 tons of cardboard and plastic wrapping annually. With the purchase of a baler or compactor, the distribution warehouse could begin to recycle this material, saving more than $7,000 every year.

Styrofoam Reduction and Recycling: Reducing or recycling styrofoam plates, cups and other items can keep more than 8 tons of styrofoam products from going to the landfill each year. This program allows for polystyrene materials to be replaced by reusable dishware or to be recycled into new materials. A densifier can be used to recycle styrofoam through compaction into 15-inch diameter cylinders.

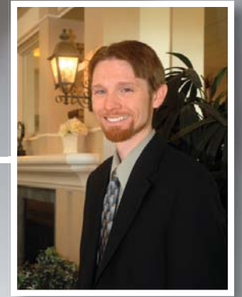
CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
841.10	3.30	36.80	3.13	----	3.45

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
SINGLE STREAM RECYCLING	$22,000	640 TONS	IN PROGRESS
OPERATING ROOM BLUE WRAP REDUCTION	$80,000	5 TONS	IN PROGRESS
NEW CONFIDENTIAL DOCUMENT DISPOSAL	$55,000	11 TONS	IN PROGRESS
CARDBOARD RECYCLING AT DISTRIBUTION WAREHOUSE	$7,300	60 TONS	RECOMMENDED
STYROFOAM REDUCTION AND RECYCLING	$600	8 TONS	IN PROGRESS

NEBRASKA MEDICAL CENTER

THOMAS FISHER
MECHANICAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

OMAHA, NE

The Nebraska Medical Center (NMC) is an acute care health facility with 689 beds and 37 operating rooms, located in Omaha, Nebraska. Known internationally as one of the top hospitals in the world for oncology, neurology, cardiology and both organ and bone marrow transplant, NMC also houses the nation's only civilian access biocontainment unit. In 2007, the center treated 26,000 inpatients and 445,000 outpatients. NMC has 9,100 employees, including nurses, staff, medical students, residents and more than 1,000 physicians practicing all major specialties and sub-specialties.

PROJECT BACKGROUND

New utility meters are being installed around the NMC campus. A building-by-building historical baseline was needed to make efficient use of the new data in evaluating future projects. The intern used archived utilities data from the new Hixson-Lied Clinical Center, billing data and national trends to extrapolate an accurate baseline for the north campus. The intern then made several recommendations to NMC for further energy saving opportunities.

INCENTIVES TO CHANGE

The hospital is participating in the Department of Energy's Energy Star Portfolio system, to integrate LEED design and construction practices into its new buildings and renovations. It has also formed a technical Energy Management Team to explore energy reduction projects and an Energy Advocate Committee to collect and disseminate information regarding new projects. Constructive change begins with analyzing and understanding current practices.

RESULTS

Dedicated Heat Recovery Chillers: Presently the Hixson-Lied Clinical Center's heating, cooling and ventilation (HVAC) system simultaneously heats and cools. Chilled water is purchased to first cool the supply air, and then steam is purchased to heat water, which in turn is used to reheat the supply air just prior to room delivery. Heat recovery chillers would reclaim the heat dumped into the chilled water lines by the north campus and use it to reheat the air in the Hixson-Lied HVAC system, thus producing savings in two areas. These chillers would reduce steam consumption for the building by 85 percent and would turn the building from a net consumer to a net producer of chilled water.

Surgery Suite HVAC Controls: In order to be in constant readiness for the intense demands of surgical procedures, devoted AHUs and electrical loads are operated non-stop at full capacity. However, the actual need for this energy varies greatly throughout the day and drops off entirely during nights and weekends. Using a controls system that can accurately dial up or dial down the energy would result in considerable savings.

Temperature Control and Energy Management Systems: In several medical office buildings, chilled water and steam appear to be running non-stop and only vary with outside air conditions rather than occupancy. Weekday usage does not vary from weekend usage. Installing systematic temperature controls and an Energy Management System for all floors and areas would enable NMC to regulate heating and cooling based on work schedules, thus reducing energy wasted during nights and weekends.

Computer Power Management Adjustments: NMC's north campus uses approximately 2,500 computers. Few of these are set up to make use of built-in power saving modes. By changing the computers' operating parameters to allow them to enter hibernation while workers are not in the building, roughly 100 watts of demand per computer could be saved during off-work hours.

Lighting Sensors in Unoccupied Spaces: Mechanical rooms, elevator control rooms, stairways and circuit breaker rooms are unoccupied most of the time, yet lighting is typically left on in these areas constantly. If occupancy sensors were installed, the lights would draw power only when necessary.

AHU Retrofit/Replace: The northernmost medical office building currently uses nearly double the amount of chilled water that it should, based on national trends for its size and purpose. Retrofitting the air handling unit with a new coil or replacing the entire unit with a more efficient system could save $31,000 annually in chilled water use. NMC would also realize secondary savings, since the unit would not need to work as hard to condition the building space.

Lighting Retrofits: While most light fixtures on campus have been replaced with newer models, more than one hundred high-wattage incandescent bulbs remain in the mechanical rooms and pipe chases. These fixtures waste more than 54,000 kWh of power each year. Switching to more efficient, longer lasting bulbs would save energy and reduce the frequency of bulb changes.

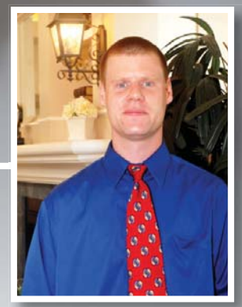
CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
3,588.90	17.82	1,103.88	4.02	44.30	0.53

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DEDICATED HEAT RECOVERY CHILLERS	$368,215	482,394 THERMS	RECOMMENDED
SURGERY SUITE HVAC CONTROLS	$135,241	67,300 THERMS 1,209,900 KWH	RECOMMENDED
TEMPERATURE CONTROL AND ENERGY MANAGEMENT SYSTEMS	$328,500	265,420 THERMS 1,173,000 KWH	IN PROGRESS
COMPUTER POWER MANAGEMENT ADJUSTMENTS	$47,000	900,000 KWH	RECOMMENDED
LIGHTING SENSORS IN UNOCCUPIED SPACES	$12,032	231,386 KWH	RECOMMENDED
AHU RETROFIT/REPLACE	$31,000	40,800 THERMS	RECOMMENDED
LIGHTING RETROFITS	$2,850	54,788 KWH	IN PROGRESS

PELLA CORPORATION

CHRISTOPHER HOLMES
MECHANICAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

Pella Corporation is a leader in designing, testing, manufacturing and installing quality windows and doors for new construction, remodeling and replacement applications. The Carroll, Iowa facility primarily manufactures wood windows and patio doors. The plant has grown to nearly 500,000 square feet and currently employs approximately 450 team members. Pella Corporation celebrates its 85th anniversary this year and continues to be committed to incorporating new technologies, increasing productivity and practicing environmental stewardship.

PROJECT BACKGROUND

A site visit from Pollution Prevention Services engineers determined that there were potential improvements that could be made to the compressed air system at Pella's Carroll operation. A Pollution Prevention intern was assigned the task of performing an energy audit on the system. Inefficiencies in the compressed air supply and demand reduction opportunities were targeted.

INCENTIVES TO CHANGE

Compressed air is a costly utility for Pella, accounting for nearly 20 percent of annual electrical costs. In a continued effort to conserve natural resources and lower operating costs, maintenance staff's goal is to reduce compressed air costs by $35,000 this year. Partnering with Pollution Prevention Services has ensured that this goal will be reached.

RESULTS

Repair Compressed Air Leaks: A compressed air leak audit was performed on all manufacturing equipment and compressor areas. An ultrasonic leak detector was used to identify 338 leaks accounting for about 30 percent of compressed air capacity. Each leak was given a numbered tag and work orders were entered into the computer system so maintenance staff can repair them when time permits. Fixing these air leaks would save nearly 648,000 kWh of electricity annually.

Ongoing Leak Detection Program: A preventative maintenance program can typically reduce compressed air leaks to 10 percent to 15 percent of compressed air capacity. Pella owns an ultrasonic leak detector that maintenance staff can use to find inaudible leaks. A plan has been developed with the help of maintenance staff to split the factory into small zones. At least one zone will be scanned for leaks every two weeks. The goal of this approach is to scan every piece of equipment at least two times each year.

Recover waste heat of Compressor 5 : Compressors generate a large amount of heat as they produce compressed air. Much of this heat can easily be recovered and used to offset natural gas heating costs during winter months. Compressor #5 is air cooled so an additional heat exchanger would be unnecessary. Heat recovery efficiencies for air-cooled compressors are typically 80 percent to 90 percent, which would reduce natural gas use by 6,577 therms annually assuming this heat were recovered for 20 weeks each year.

Modify Inlet Air Location of Compressor 5: All of the compressors used in the plant currently pull cool intake air from outside, except compressor #5. Cooler intake air allows for a better mass flow rate through the compressor and requires less energy to produce the same compressed air volume. The average temperature for Carroll, Iowa is about 20 degrees cooler than the average temperature inside the plant. Modifying compressor #5 would result in a 4 percent energy reduction for operating the compressor.

Turn Off One Compressor Second Shift: Two compressors currently operate at partial load during second shift. These compressors operate more efficiently near 100 percent load than they do at partial load. There is also auxiliary equipment that can be turned off if one of these compressors is shut down on second shift. Shutting down one compressor would still allow ample compressed air supply during second shift while reducing unnecessary energy consumption by 138,237 kWh annually.

Install Engineered Nozzles: Several blow-off applications would benefit from the installation of engineered nozzles. These nozzles are designed to amplify compressed air by pulling in ambient air. Installing these nozzles would reduce their compressed air volume use by about 40 percent and would significantly reduce noise pollution.

Use Cabinet Coolers to Cool Panels: Compressed air is currently being used to cool at least three electrical panels. This use of costly compressed air could be replaced by electric cabinet coolers. Installing cabinet coolers would reduce the electricity used for cooling these panels and would increase compressed air capacity.

Install Zero-Loss Drains: Several timed drains are currently used to remove built up condensate. Timed drains must be set to open longer than necessary to ensure all condensate is removed, which also causes valuable compressed air to be released. Zero-loss drains are considered very reliable and will remove the condensate without wasting compressed air. Replacing all timed drains with zero-loss drains would save approximately $3,100 in wasted compressed air annually.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

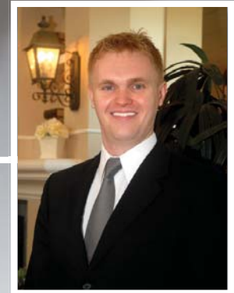
Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
761.49	4.11	37.83	0.40	9.37	0.10

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR COMPRESSED AIR LEAKS	$29,800	647,826 KWH	IN PROGRESS
ONGOING LEAK DETECTION PROGRAM	$19,668	427,565 KWH	IMPLEMENTED
COMPRESSOR 5 UPGRADES	$7,524	6,577 THERMS 28,819 KWH	RECOMMENDED
TURN OFF ONE COMPRESSOR SECOND SHIFT	$6,359	138,237 KWH	IN PROGRESS
INSTALL ENGINEERED NOZZLES	$5,879	127,795 KWH	RECOMMENDED
USE ELECTRIC FANS FOR COOLING PANELS	$2,574	55,948 KWH	RECOMMENDED
INSTALL ZERO-LOSS DRAINS	$3,103	67,478 KWH	IN PROGRESS

SIX-MONTH INTERNSHIP

PROCTER AND GAMBLE

BRANDON GOODMAN
MECHANICAL ENGINEERING, UNIVERSITY OF IOWA



IOWA CITY

COMPANY BACKGROUND

Since its founding in 1837, Procter & Gamble (P&G) has grown into the world's top manufacturer of household consumer products. Originally producing soap and candles, P&G has expanded its product base to include home care, beauty care, grooming, health care, snack, and pet care business segments. P&G's Iowa City plant is the second largest production plant in the company, employing approximately 740 people. The Iowa City facility manufactures shampoos, conditioners, and mouth and body washes that include Clairol®, Head and Shoulders®, Gillette®, Scope®, Pantene®, Aussie® and Oil of Olay® product lines.

PROJECT BACKGROUND

In 2007, P&G purchased two chillers with the capability to change from mechanical cooling to free cooling. In free cooling mode, the machines still supply chilled water to the system, but do so without the use of a compressor. Providing process cooling without running the compressor has the potential to supply up to half of P&G's chilled water demand at no cost. Further investigation was required, to determine if free cooling could meet the plant's chilled water requirements.

INCENTIVES TO CHANGE

As a company devoted to eliminating harmful emissions and reducing energy consumption, Procter & Gamble is continually paving the way for energy savings projects. P & G is evaluating a range of energy-saving and alternative generation projects for the Iowa City facility. Although the facility's current energy costs are low, many opportunities exist to optimize processes and to further reduce energy costs.

RESULTS

Free Cooling: Taking advantage of cool temperatures to chill plant processes is an extremely practical strategy to cut costs and reduce environmental impacts. By implementing free cooling in its current chiller setup, P&G will realize reduced winter cooling costs and many other benefits. The ability to draw approximately 600 tons of cooling from the ambient air will allow the plant to run a lag chiller sequence on pump run costs alone. On certain weekends, the plant may be able to turn off all chiller compressors, further reducing energy consumption. Additionally, the reduced compressor run times will save on long-term maintenance costs.

Chiller Optimization: While free cooling is an excellent supplemental feature, many optimization strategies can be implemented with the current chiller modes that could provide year round cost savings. Two primary optimization strategies are advanced chiller run sequencing and variable frequency compressor drive installation.

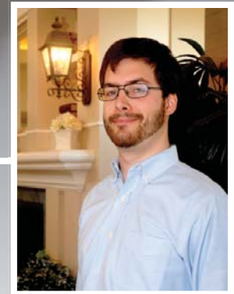
Adjustment of chiller sequencing will require an advanced understanding of the chiller system, which can be accomplished through chilled water loop modeling. The current chiller system is reactionary and functions based on temperature set points within the chilled water loop. Using algorithms that predict the rate of temperature change should allow P&G to avoid premature chiller starts, leading to additional cost and environmental savings.

P&G's current chillers use a soft-start mechanism before elevating the compressor drive shaft to a full fixed speed. Reducing chilled water output capacity is based upon internal chiller valve manipulation. Upgrading the current compressor drives to variable frequency drives will allow the compressor to control the chilled water output, thus saving energy at times of reduced chiller demand. The ability to efficiently manipulate chiller outputs also provides additional chiller sequencing options.

Water Mapping: As a manufacturer of soaps and body washes, P&G performs chemical processing daily and many of these processes require water. While developing a life cycle map of the water system at the Iowa City facility and running inlet and outlet totals, it was recognized that some water routes are not accounted for. In an effort to locate water losses, P&G has recently investigated purchasing flow meters to monitor water flow in lines without built-in meters. Enhanced efforts to install flow meters and measure unmetered pipes should provide valuable water usage information at the plant for use in evaluating future water recovery projects.

ROCKWELL COLLINS

TED KRAUSMAN
MECHANICAL ENGINEERING, UNIVERSITY OF IOWA



COMPANY BACKGROUND

CEDAR RAPIDS

Rockwell Collins is a public company that provides communication and aviation electronics solutions for commercial and government systems. Headquartered in Cedar Rapids, Iowa; the company employs 20,000 individuals worldwide. In 2009, the company's annual sales totaled approximately $4.7 billion.

PROJECT BACKGROUND

Thermal imaging was used to identify various cost savings opportunities due to escaping heat or chilled air at the Rockwell Collins C Avenue campus. Other energy conservation measures such as optimizing the compressed air system, installing a solar collector and adding economizers to primary boilers were also investigated.

INCENTIVES TO CHANGE

Currently, Rockwell Collins is implementing energy conservation measures in order to decrease its carbon footprint and increase its level of environmental responsibility. The company participated in the Pollution Prevention Intern Program to identify opportunities to reduce energy costs at the C Avenue campus.

RESULTS

Exterior Insulation Finishing System: Thermal imaging of Building 109 showed significant thermal bridging, which indicates heat transfer through the building shell dominated by heat flow through the metal components. An exterior insulation would mitigate thermal bridging and reduce air exfiltration and infiltration. Due to the significant installation cost, this option should be further researched before implementation.

Unit Heater Maintenance Program: Unit heaters of various sizes are used to heat dock and tunnel areas on the C Avenue campus. Using thermal imaging, 14 of 24 unit heaters were found to be receiving hot water and radiating significant amounts of heat during the cooling season. A maintenance plan will ensure that the heaters are kept on during the heating season and turned off during the cooling season.

Compressed Air Leak Detection and Repair: Compressed air is utilized heavily in the fabrication and plating shops. An ultrasonic leak detector was used to locate and quantify air leaks in Building 105, which is estimated to use one-third of the compressed air on the C Avenue campus. The intern recorded the location and size of each leak to prioritize and track repairs.

Compressed Air Monitoring System: Compressed air is utilized across the Rockwell Collins C Avenue campus at variable rates throughout the year. Two main air compressor units operate at variable loads, depending on the fluctuating demand. A compressed air control system that will monitor demand and adjust compressor loading accordingly will improve efficiency of the compressed air system.

Transpired Solar Collector System on B110: Building 110 houses a circuit board fabrication center that requires 100 percent outside air and a high exhaust rate. The exhaust rate creates negative air pressure in the building, which is connected to another building by an unconditioned walking tunnel. Negative air pressure caused by the high exhaust rate draws conditioned air through the tunnel into Building 110 and exhausts it outside. Using a solar collector wall system would allow Building 110 to be pressurized effectively, reducing the amount of conditioned air pulled from the adjacent building and reducing associated utility costs.

Boiler Economizers: Of the three primary boilers on the Rockwell Collins C Avenue campus, one is utilized year round while another is utilized only during the heating season. The intern recommended that exhaust stack economizers be installed on two of the boilers to recover heat from the high temperature exhaust.

Decommission Steam Boiler: A steam boiler located in the mechanical room of Building 105 was being utilized at approximately 14 percent capacity during the summer. It is recommended that the steam boiler be decommissioned and replaced with point-of-use steam units.

CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
519.41	2.46	231.17	0.26	6.42	0.09

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
EXTERIOR INSULATION FINISHING SYSTEM	$26,497	26,500 THERMS	MORE RESEARCH NEEDED
UNIT HEATER MAINTENANCE PROGRAM	$44,146	45,906 THERMS	RECOMMENDED
COMPRESSED AIR LEAK DETECTION AND REPAIR	$18,599	295,091 KWH	RECOMMENDED
COMPRESSED AIR MONITORING SYSTEM	$16,699	265,060 KWH	RECOMMENDED
TRANSPIRED SOLAR COLLECTOR SYSTEM	$28,979	30,990 THERMS	RECOMMENDED
BOILER ECONOMIZERS	$32,406	30,786 THERMS	RECOMMENDED
DECOMMISSION STEAM BOILER	$10,560	9,500 THERMS	RECOMMENDED

2010 PROJECT INDEX

POLLUTION PREVENTION INTERN PROGRAM

BOILER EFFIECIENCY
- BURKE CORPORATION
- GENESIS HEALTH SYSTEM

COMPRESSED AIR SYSTEM EFFICIENCY
- CNH AMERICA LLC
- EMCO ENTERPRISE INC.
- HY-VEE DISTRIBUTION CENTER
- GREEN PLAINS SUPERIOR, LLC
- PELLA CORPORATION
- ROCKWELL COLLINS

ENERGY SAVINGS
- BURKE CORPORATION
- CITY OF DUBUQUE
- CNH AMERICA LLC
- EMCO ENTERPRISE INC.
- FARLEY'S AND SATHERS CANDY COMPANY, INC.
- HY-VEE DISTRIBUTION CENTER
- GENESIS HEALTH SYSTEM
- GREEN PLAINS SUPERIOR, LLC
- GRINNELL COLLEGE
- INFASTECH ™
- KUM & GO
- PELLA CORPORATION
- PROCTER AND GAMBLE
- NEBRASKA MEDICAL CENTER
- ROCKWELL COLLINS

HAZARDOUS WASTE REDUCTION
- IOWA HEALTH – DES MOINES
- FARLEY'S AND SATHERS CANDY COMPANY, INC.
- JBS
- MERCY MEDICAL CENTER

HEAT RECOVERY
- BURKE CORPORATION
- EMCO ENTERPRISE INC.
- GREEN PLAINS SUPERIOR, LLC
- NEBRASKA MEDICAL CENTER
- ROCKWELL COLLINS

HVAC EFFICIENCY
- CITY OF DUBUQUE
- GRINNELL COLLEGE
- NEBRASKA MEDICAL CENTER

LIGHTING
- BURKE CORPORATION
- EMCO ENTERPRISE INC.
- KUM & GO
- NEBRASKA MEDICAL CENTER

PROCESS IMPROVEMENT
- CARGILL INC.
- FARLEY'S AND SATHERS CANDY COMPANY, INC.
- HY-VEE DISTRIBUTION CENTER
- IOWA HEALTH – DES MOINES
- JBS
- MERCY MEDICAL CENTER

SOLID WASTE REDUCTION
- CARGILL INC.
- EMCO ENTERPRISE INC.
- IOWA HEALTH – DES MOINES
- MERCY MEDICAL CENTER

WATER USE REDUCTION
- BURKE CORPORATION
- CITY OF DUBUQUE
- FARLEY'S AND SATHERS CANDY COMPANY, INC.
- HY-VEE DISTRIBUTION CENTER
- INFASTECH™
- JBS
- PROCTER AND GAMBLE

WASTE WATER TREATMENT
- FARLEY'S AND SATHERS CANDY COMPANY, INC.
- INFASTECH™
- JBS
- PROCTER AND GAMBLE

PROJECT REQUEST PROCESS

Student application and business request forms are available online at **www.iowap2services.com**. Forms may be submitted electronically, faxed or mailed.

FOR COMPANIES

Companies who are committed to implementing cost effective pollution prevention methodologies and reducing environmental impacts should submit a request 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.

Companies that would like to be considered for participation in the 2011 Pollution Prevention Intern Program should submit a project request by November 19, 2010.

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

FOR STUDENTS

Graduate and junior or senior-level undergraduate students enrolled in engineering, environmental science or physical science disciplines are encouraged to submit an application, along with a resumé, cover letter, an unofficial copy of transcripts and a list of Fall 2010 and Spring 2011 classes. The intern selection process will begin mid-November and continue into the Spring until project assignments are finalized.

Pollution Prevention Services is offering internships for 12-weeks (May 23-August 12) or for 24-weeks (May 23-November 4) in 2011.

Selected applicants will be matched to a project based on coursework performance, experience and technical skills.

SUBMIT PROJECT REQUESTS 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
Danielle.Dilks@dnr.iowa.gov

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