WORKING TOGETHER TO ACHIEVE ECONOMIC AND ENVIRONMENTAL RESULTS

2012 CASE SUMMARIES

POLLUTION PREVENTION INTERN PROGRAM

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2012 POLLUTION PREVENTION INTERNS

The Pollution Prevention Intern program is an extension of DNR's Pollution Prevention Services, which offers no-cost, non-regulatory, confidential technical assistance through assessments, internships and other services to Iowa businesses, industries and institutions.

The intern program places upper-level students from Iowa colleges and universities at host companies to analyze the facilities' waste streams and to research and recommend process improvements that will lower operating costs while reducing negative environmental impacts. After a one-week training period, the students serve on-site at the host facilities for 12- or 24-week internships.

STUDENT PERSPECTIVES

"This internship is rewarding because you are not just making or testing a product; you are using your engineering skills to make a difference. At the end of the internship, you are able to see exactly what you have accomplished both economically and environmentally for the company."

— LISA GARRETT

"Interns receive a real, significant project that they completely own throughout the whole experience. There is an excellent balance of independence and the ability to tackle the project in ways you feel best, but at the same time there is just enough guidance to keep you moving."

— JOHN DONAHOE

"As a student the Pollution Prevention Internship gives a unique opportunity to lead and develop an industry based project from beginning to end. This fosters the skills required for one's professional discipline and can often lead to other opportunities."

— DAN NEWKIRK

COMPANY TESTIMONIALS

"The progress of the project has exceeded our expectations and we will easily meet our goals and objectives. "

— KATY VENARD, HY-LINE INTERNATIONAL

"Hy-Vee Distribution Center has hosted three interns through the Pollution Prevention Intern Program and each time we have had success stories that have went on to help in the reduction of expenditures for us and energy savings or reduced waste for the environment. "

— JOHN LAING, HY-VEE DISTRIBUTION CENTER

DIRECTOR'S NOTE

I present to you the results of the 2012 Pollution Prevention Intern Program. I applaud each of the companies, institutions and interns that have made the program such a remarkable success.

This program is an exceptional partnership of Iowa colleges and universities, business 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.

Since 2001, more than 155 dedicated companies have saved more than $69 million by implementing the solutions provided by the Pollution Prevention Interns. These environmental efficiency improvements save more than water, electricity and materials going to the landfill, they save jobs and often create opportunities to hire additional staff. These strong and efficient Iowa companies give the entire state an advantage in the competitive global marketplace.

Students in this program are provided the opportunity to demonstrate their professional abilities at their host companies. Students also may establish and build professional networks through host company staff and contact with vendors and suppliers. Approximately 25% of the interns are introduced to an employment opportunity as a result of their Pollution Prevention Internship.

As you read the testimonials and project summaries that follow, I encourage you to consider joining our team of professionals for the summer of 2013 Pollution Prevention Intern Program.

CHUCK GIPP

Chuck Gipp

CONVENTIONAL AIR POLLUTANTS DIVERTED IN STANDARD TONS

Total for all sectors							
CO_2	SO_2	CH_4	N_20	CFC	NOX	VOC	PM_{10}
151,090.05	1,942.41	37,815.60	9,972.91	1,525.01	730.19	173.52	490.57

TOTAL IMPLEMENTED ACTUAL SAVINGS 2001-2011

CATEGORY	REDUCTION	COST SAVINGS
WATER CONSERVATION	1,236,979,617 GALLONS	$5,745,016
SPECIAL WASTE	75,146 TONS	$837,912
SOLID WASTE	127,260 TONS	$13,639,360
HAZARDOUS WASTE	1,532,075 GALLONS 729 TONS	$10,223,725 $415, 835
MERCURY ABATED	42,817 GRAMS	
ENERGY	327,787,272 KWH 1,879,104 *MMBTU 7,603,657 THERMS	$18,580,976 $6, 517,738
OTHER		$13,042,689
BOD	104	$26,640
		TOTAL: $69,029,891

*MMBTUS ARE CALCULATED FROM KWH AND THERMS FOR SPECIAL REPORTING ONLY. ALL DOLLARS AND ACTUAL ENERGY SAVED ARE REPORTED UNDER THERMS AND KWH.

2012 EXECUTIVE SUMMARY

Nineteen upper-level engineering students teamed with the 2012 Iowa Pollution Prevention Intern Program to help companies meet their environmental objectives.

Working on-site at top Iowa companies, interns identify strategies to reduce solid and hazardous waste, water and energy use, air emissions, and greenhouse gases. Interns research and recommend process improvements that will lower operating costs and improve the environmental performance of host companies. This year, the interns identified opportunities that could save companies more than $3.4 million annually. Of these, projects estimated to save $1,012,500 annually were implemented or are in progress.

The intern program is an extension of DNR's Pollution Prevention Services, a non-regulatory program that offers confidential technical assistance to Iowa business and industry.

In 2012, four interns committed to 24-week projects that will continue into November. These projects are outlined in a special section at the back of this booklet. Final results of this year's 24-week projects will be posted to the DNR's website in January and highlighted in the next published summary booklet. Additional time on site allows interns to conduct more in-depth research, collect data over time and evaluate systems through varying conditions.

The final results of five 24-week projects completed in November of 2011 are included in this edition.

Collectively, these case summaries show that outstanding results are possible when companies, students and the DNR work together to achieve common goals.

The following chart shows the implemented results of the summer of 2012 program, including the conventional air pollutants and greenhouse gases diverted.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors							
CO_2	SO_2	CH_4	N_20	CFC	NOX	VOC	PM_{10}
30,249.97	90.75	8,732.04	3,595.47	230.15	45.21	12.08	4.04

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.

2012 IMPLEMENTED SAVINGS

CATEGORY	REDUCTION	COST SAVINGS
WATER CONSERVATION	61,447,839 GALLONS	$144,510
SOLID WASTE	1,116 TONS	$115,651
HAZARDOUS WASTE	13,750 GALLONS	$45,000
ENERGY	4,436,907 KWH 35,764 *MMBTU 206,212 THERMS	$346,927 $122,630
OTHER		$237,795
		TOTAL: $1,012,513

*MMBTUS ARE CALCULATED FROM KWH AND THERMS FOR SPECIAL REPORTING ONLY. ALL DOLLARS AND ACTUAL ENERGY SAVED ARE REPORTED UNDER THERMS AND KWH.

3M COMPANY

BEN KLAUS
CIVIL/ENVIRONMENTAL ENGINEERING, THE UNIVERSITY OF IOWA

KNOXVILLE

COMPANY BACKGROUND

The 3M Company is a global entity with more than 84,000 employees and annual revenue of $29.6 billion. The 196 acres of the Knoxville facility were originally purchased in 1969, construction of the initial plant started in 1973, and 3M Knoxville opened in 1975. The company produces pressure sensitive tape for industrial, automotive and construction applications. The Knoxville plant currently employs approximately 550 people and operates 24 hours per day, 362 days per year.

PROJECT BACKGROUND

3M Knoxville manufactures a large variety of products coated with adhesive. During the production of these products, scrap is generated from refused rolls as well as from excess material that has been cut off for quality reasons. While the majority of the scrap from the plant is recycled, 3M's goal is to minimize the remaining waste landfilled. The intern identified waste reduction and recycling options for the waste.

INCENTIVES TO CHANGE

The goal of the waste management project at 3M Knoxville is to maximize waste reduction and recycling efforts and reduce disposal costs. Objectives include reducing the amount of waste that is generated, increasing recycling of current material, identifying additional materials that are recyclable, finding markets for these materials, and minimizing the time and manpower required to dispose of waste sustainably.

RESULTS

Solvent Recycling: Solvent is used to clean adhesive from dies in the plant's coating bay. The disposal fees for this material are fairly high, at $3.27 per gallon or $180 per drum, so a more cost effective alternative could lead to substantial savings. The intern identified a vendor that could purify the used solvent and sell the products under its name. This will keep up to 13,750 gallons of solvent in the market each year.

Sandblast Stencil Incineration: Sandblast stencils are used when making intricate designs. One can cut the stencil to any desired shape, which makes this product attractive for companies with varieties of applications. Because the stencils are primarily made of rubber with a plastic backing, limited recycling opportunities exist for this product. The intern determined that waste-to-energy incineration was another alternative to sending this waste to the landfill. It is recommended that this material be shipped to a cement manufacturer that can burn it in place of coal. By switching to this option, 3M would not only prevent the landfilling of material; it would also displace roughly 245 tons of coal annually.

Increased Plastic Recycling: Plastic waste comprises a large portion of 3M Knoxville's waste stream. Because the company produces several kinds of tape, much of this waste material is coated with adhesive, which makes recycling difficult. However, there are a number of options for recycling plastic waste that is not coated with adhesive. Two options were identified by the intern: a company in northern Wisconsin that pelletizes and resells scrap plastic and a recycling business in Iowa City. Both are viable and environmentally positive choices.

Increased Paper Recycling: Much of the tape that comes out of the 3M Knoxville plant has paper associated with it, in addition to plastic. The paper may be coated with adhesive or silicon. Any paper with adhesive must be incinerated or sent to the landfill, but most paper, including that coated with silicon, can be recycled in one form or another.

Cardboard Core Recycling: Cardboard cores are used in many of the processes in the facility and a significant number of cores are landfilled each year. Since the cores are not made of the same material as corrugated cardboard boxes, they cannot be recycled in the same stream and must be collected and shipped separately. However, the intern determined that this is feasible and if there is room to collect them, the cores can be shipped to a recycling facility in Iowa City, along with the cardboard bales.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
608.30	0.12	305.30	0.89	0.81	0.62

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
SOLVENT RECYCLING	$45,000	13,750 GALLONS	IN PROGRESS
SANDBLAST STENCIL INCINERATION	$6,000	226 TONS 51,850 THERMS	RECOMMENDED
INCREASED PLASTIC RECYCLING	$13,500	192 TONS	IN PROGRESS
INCREASED PAPER RECYCLING	$20,600	50.7 TONS	IMPLEMENTED
CARDBOARD CORE RECYCLING	$2,500	22 TONS	IMPLEMENTED

2011 24-WEEK INTERNSHIP

CNH AMERICA, LLC

BURLINGTON

MATT BONNEY
MECHANICAL ENGINEERING AND PHYSICS, THE UNIVERSITY OF IOWA

COMPANY BACKGROUND

CNH America, LLC was formed in 1999 when New Holland HV and Case Corporation merged, and is now part of the Fiat Group. Rising to be a leader in the manufacturing of construction and agricultural equipment, CNH is a global company with dealers in 170 locations and 37 manufacturing plants. The Burlington plant is one of 9 CNH manufacturing plants in the United States. Approximately 650 people are employed at the Burlington plant, which makes the tractor loader backhoe, utility tractor, rough terrain forklift and combine header.

PROJECT BACKGROUND

This is the fourth year of participation in the Pollution Prevention Intern Program for the CNH-Burlington plant. The purpose of this year's 24-week project was to create an energy profile of the Burlington plant and identify opportunities for saving energy and reducing costs. Options included reducing demand and power factor costs. Other projects will be prioritized based on a matrix of efficiency and potential cost savings. The major focus was on lighting, ventilation and proper equipment efficiencies.

INCENTIVES TO CHANGE

CNH-Burlington spends more than $100,000 per month for electricity in the production plant. Peak demand charges and power factor charges account for a significant amount of this cost. The energy profile revealed preliminary information on where and when the energy is being used, in order to guide reduction efforts. An objective of the Fiat Industrial Group is to ensure that each of its plants is a "green" plant.

RESULTS

Lighting Retrofit: The plant spends an estimated $433,000 a year for lighting alone. The main contributor to this cost is aging, inefficient lighting. Replacing old 400W metal halide lighting fixtures with new T5HO linear florescent lamps and fixtures will provide significant cost savings. The lighting upgrades are currently in progress. Installing controls to the new lighting system will further improve the efficiency of the lighting system.

Fan Replacement: The plant has an estimated 300 ⅓ hp fan motors that are over 20 years old; with power factors lower than 60 percent. These inefficient motors contribute to the plant's very low power factor. Many fans are available that can produce the same output with less power and a much higher power factor. Replacing all of the plant's ⅓ hp fans with ¼ hp fans would not be feasible due to the long return on investment. The major impact of fan replacement would be an increase in power factor. It is recommended that the fans are replaced with high-efficiency models when they malfunction.

Air Balance Study: Air balance refers to the amount of fresh air intake compared to air exhausted. This is based on design specifications. The results of an air balance study showed that the entire plant has a negative pressure of 1.1 million cfm. A negative air-pressure causes high heating costs, due to the infiltration of the open pathways such as doors and leaks. The air balance study was primarily performed to obtain information and no projects have been presented to correct the negative pressure.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
1509	7.74	49.12	0.07	17.64	0.18

Solar Water Heating: Two large bathrooms in the plant have showers that use a large amount of hot water. It is recommended that two solar water heaters be installed to reduce the natural gas used to heat the water. The cost of natural gas at the plant's locality is relatively inexpensive, but use of renewable technologies is an important part of the CNH plan to "go green".

Capacitor Banks: Capacitor banks are used to increase the power factor by reducing the inductance load. The reason for the low power factor at the plant is unknown but aging equipment in the mechanical system is believed to be a main contributor. The utility company charges a fee for having such a low power factor. Using capacitor banks will not correct the root cause but provides a quick, cost-effective solution to eliminate extra fees while investigating the cause. The use of capacitor banks could reduce utility costs by more than $70,000 annually.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
LIGHTING RETROFIT	$27,173	400,320 KWH	IN PROGRESS
FAN REPLACEMENT	$32,702	441,164 KWH	RECOMMENDED
SOLAR WATER HEATING	$378	663 THERMS	IN PROGRESS
CAPACITOR BANKS	$70,000	TBD	RECOMMENDED

2011 24-WEEK INTERNSHIP

CONAGRA FOODS

CHELSEA TOMEK
INDUSTRIAL ENGINEERING & ENVIRONMENTAL STUDIES
IOWA STATE UNIVERSITY

COUNCIL BLUFFS

COMPANY BACKGROUND

ConAgra Foods® is proud to make the food people love, manufacturing and marketing leading branded and specialty food products to retail and foodservice customers in the United States and internationally. The company's consumer foods are found in 97 percent of America's households, and 25 of them are ranked first or second in their category. The Council Bluffs plant manufactures exclusively frozen foods brands, including Marie Callender's®, Banquet®, and Healthy Choice® meals. The plant is built on a 17-acre plot of land and employs more than 850 people.

PROJECT BACKGROUND

ConAgra Foods operates a frozen meal assembly plant located in the business district of Council Bluffs, Iowa. ConAgra Foods maintains a comprehensive safety, health, and environmental management program at the plant. The program includes engineering, education, and enforcement provisions for hazard communication, spill preventions and response, hazardous waste, universal waste and oil management, wastewater, and storm water management.

INCENTIVES TO CHANGE

In 2009, ConAgra Foods outlined five long-term sustainable development goals to work toward becoming a more environmentally friendly company. One of these goals is to divert at least 75 percent of the company's solid waste from landfills. Achieving these goals will not only benefit the environment, but may also result in significant cost savings to the company as well.

RESULTS

Plant-Wide Recycling: To track the amount of recycling the plant was undertaking, the intern compiled and summarized data to create a baseline of current and historical landfill and solid waste disposal costs. The landfilled and diverted waste tonnages, as well as the associated revenue and costs, are now compiled monthly in ConAgra's Sustainable Development Reporting Tool (SDRT). An estimation was made of the types and tonnage of uncollected recyclable waste coming through the plant annually, along with total savings that could be accrued if these waste streams were recycled. If a recycling program were started, 232 tons could be diverted from the landfill, saving the plant up to $24,380 annually.

Environmental Pillar: An "Environmental Pillar" was constructed to create awareness of the plant's current status environmentally, and to lay out what needs to be done to reach the company's sustainability goals. The pillar has four subset workstreams: solid waste diversion, water use reduction, greenhouse gas emission reduction, and environmental education and awareness. Breaking down the current status of each workstream allowed the intern to pinpoint areas of highest opportunity and brainstorm projects to target areas with the highest potential for improvement.

Wastewater Reduction: The flooding during the summer of 2011 caused a heightened awareness concerning the company's wastewater handling, and provided the opportunity to handle the liquid waste and the solids removed from wastewater in a more economical and ecological manner. The intern researched alternative disposal methods, including dewatering the wastewater sludge, rendering the liquids for animal feed, or directly land applying the liquids. Direct land application was determined to be the best option both economically and ecologically. With no capital investment, the plant would save more than $190,000 annually by directly land applying the sludge at a nearby farm, in addition to the indirect environmental benefits of reduced vehicle emissions (due to larger load sizes and less loads transported) and elimination of the additional chemical, energy, and water usage at the municipal facility in Omaha.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
135.31	0.25	893.14	467.65	1.32	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
PLANT-WIDE RECYCLING	$24,380	232 TONS	RECOMMENDED
ENVIRONMENTAL PILLAR	$3,750	--	IN PROGRESS
WASTEWATER REDUCTION	$191,662	--	IN PROGRESS

EAGLE WINDOW AND DOOR

JOHN DONAHOE
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

DUBUQUE

COMPANY BACKGROUND

Eagle Window and Door is an Andersen Corporation company that has two locations in Dubuque, Iowa. Eagle specializes in manufacturing aluminum clad wood windows and doors for high-end residential and commercial applications. It offers a wide variety of customization options that includes 50 exterior colors, nine different wood species, and 11 interior finishes. The products manufactured at Eagle are part of the Andersen Architectural Collection, which is focused on creating the style of home the customer desires.

PROJECT BACKGROUND

The electrical costs associated with the compressed air system at both of the Eagle locations contribute significantly to the total bill. In addition, oil present in the air lines results in considerable scrap and lost labor costs. The intern examined ways to improve the efficiency and performance of the compressed air systems, in order to reduce the company's total energy usage, cost and environmental impacts.

INCENTIVES TO CHANGE

Eagle Window and Door has always been committed to environmental responsibility through its involvement with the Window and Door Manufacturers Association, the U.S. Green Building Council, the National Fenestration Ratings Council, and the U.S Environmental Protection Agency's Energy Star program. The company emphasizes preserving nature, reducing waste, using recycled materials, and conserving energy. These principles and priorities are being applied to both of the manufacturing locations.

RESULTS

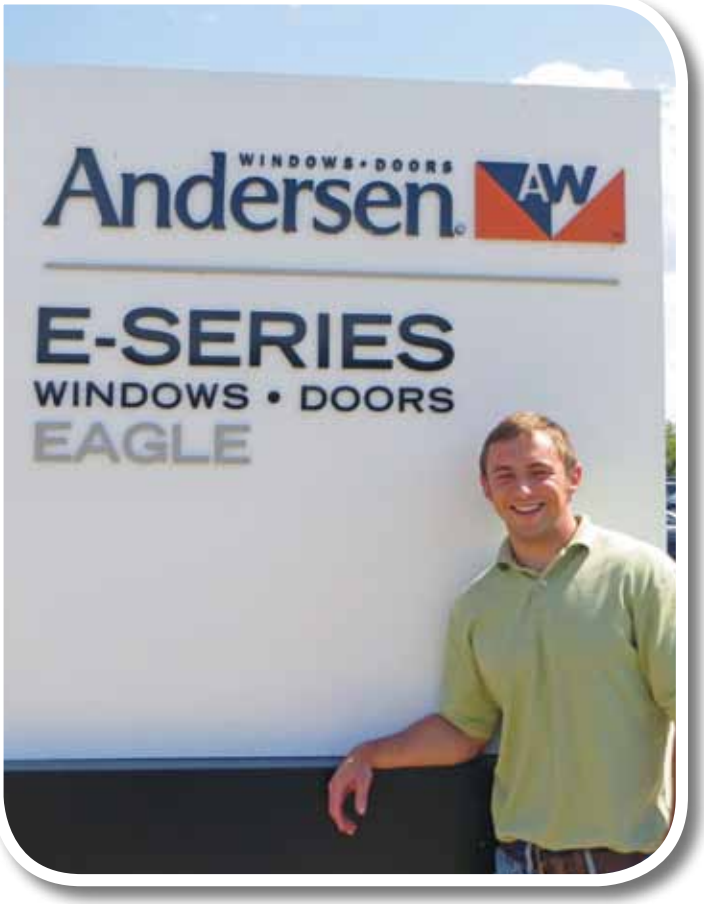
Mist Eliminator Installation: The automated paint line, located at the smaller Eagle facility, produces approximately $453,770 in scrap material and product annually. Oil in the air lines contributes to 24 percent of the scrap generated. Ideally, 0.01 PPM of oil should be present in the lines; currently, the oil exceeds 1.37 PPM. The installation of a mist eliminating filter will help to filter out this oil and could save Eagle $64,511 annually in scrap reduction and lost labor.

Air Dryer Replacement: The air dryer is an important component in providing high quality end-use air. The current dryer specifications indicate it is a 50° F dew point dryer, while the ideal temperature for the painting application is approximately 37° F. In addition, new technology dryer units have significantly less pressure drop across their inlets and outlets compared to the current model. A two pound per square inch drop of exit pressure could improve the compressor's efficiency by one percent. Replacement would result in approximately $600 in savings annually.

Air Compressor Replacement: The current air compressor is approaching the end of its service life and is the main source of oil in the system's air lines. If the facility upgraded to a newer variable speed drive technology, considerable electrical savings could be realized. In addition, the amount of scrap and lost labor would be reduced, which would provide a total savings of $99,663 annually.

Air Leak Repair: A system air leak analysis was performed at each Eagle location. Leaks in the air lines have a direct impact on electrical costs and wasted energy. Over $5,209 worth of annual leaks were located in the facilities. Implementing a compressed air system maintenance program and repairing leaks would reduce electrical costs as well as decrease the environmental impact.

Demand Side Storage: Portions of the main facility experience a highly variable demand for compressed air depending on the time of day and production schedule. This range in demand can cause the compressor to fall behind on supplying air. Installing air receiver tanks for storing air near the high demand areas of the facility would help eliminate large demand spikes and allow the compressor to run smoother and at a lower operating pressure, ultimately reducing energy costs by approximately $2,810 per year.



CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
371.50	1.93	12.11	0.02	4.34	0.05

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MIST ELIMINATOR INSTALLATION	$64,511	133 TONS 47,048 KWH	IN PROGRESS
AIR DRYER REPLACEMENT	$600	7,143 KWH	RECOMMENDED
AIR COMPRESSOR REPLACEMENT	$99,663	320 TONS 190,836 KWH	RECOMMENDED
AIR LEAK REPAIR	$5,209	62,012 KWH	RECOMMENDED
DEMAND SIDE STORAGE	$2,810	33,440 KWH	RECOMMENDED

GOLDEN CRISP PREMIUM FOODS, INC.

WESLEY HUTTER
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

SIOUX CENTER

COMPANY BACKGROUND

Golden Crisp Premium Foods, Inc. in Sioux Center, Iowa, is a branch of Patrick Cudahy, and is a producer of pre-cooked bacon. The plant in Sioux Center is about 107,000 square feet and employs approximately 420 workers. The plant receives shipments of frozen pig bellies, and then flavors, slices, heats and packages the bacon to be ready for consumption. Various slicers and slicer settings allow for the production of many different shapes and sizes of bacon. On average, the company produces over 60,000 pounds of bacon every day.

PROJECT BACKGROUND

Golden Crisp Foods uses five industrial microwave ovens to heat the bacon. Analysis showed that the ovens account for approximately 65 percent of the plant's utility bill. Other large consumers include the refrigeration system, lighting, and large water heaters needed for sanitation. The company teamed with the Pollution Prevention intern program to identify opportunities to improve the efficiency of its processing systems and reduce utility costs.

INCENTIVES TO CHANGE

In 2011, Golden Crisp Premium Foods, Inc. received an Environmental Recognition Award from the American Meat Institute. The company continues to seek opportunities to employ pollution prevention strategies and improve environmental performance. One of their environmental priorities is to decrease overall energy consumption at the plant by 10 percent by the end of 2013. The outcome of the 2012 Pollution Prevention intern project could have a substantial impact in achieving this goal.

RESULTS

Microwave Oven Operational Consistency: When seeking energy reduction opportunities in the bacon cooking process, many variables must be taken into consideration. Variables include the quality of the pig bellies, adjustments for microwave transmitters and the amount of space between each slice of product on the conveyor belt. For this reason, quantifying potential changes to increase energy efficiency can be a challenge. More research is recommended, which could include an in-depth assessment to achieve a more consistent oven operating plan and a review of opportunities to improve the operational accuracy of the vision system on each production line.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
843.15	4.34	27.45	0.04	9.86	0.10

Reduce Heat Load in RTE Rooms: Hot bacon and hot conveyor belts roll directly out of the ovens and into the Ready-To-Eat (RTE) rooms in the plant, generating an increased heat load for these areas. Addressing this issue could reduce refrigeration energy usage as well as costs. One option would be constructing a wall in the RTE rooms to create an additional unrefrigerated room where the bacon could first be cooled with outside ambient air. Not only could this allow the bacon time to cool before it enters the refrigerated rooms; it could also decrease the mass of bacon and conveyor belts that occupy the RTE rooms at one time. Implementing this change could be cost-prohibitive, so researching other options is recommended.

Advance Lighting Retrofit: Most of the lights on the plant floor are sodium halide lights, which lose their efficiency after a short period of time. In addition, the heat generated by these bulbs can be significant enough to affect the amount of refrigeration required to cool the plant's freezers and coolers. Golden Crisp has already begun a LED retrofit to reduce energy usage and eliminate any additional head load generated by the facility's lighting. Although the initial investment is costly, doing a full scale change-out as opposed to a phased-in approach can save additional money and energy in the long run.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MICROWAVE OVEN OPERATIONAL CONSISTENCY	$46,000	663,000 KWH	RECOMMENDED
REDUCE HEAT LOAD IN RTE ROOMS	$185,000	2,643,000 KWH	MORE RESEARCH NEEDED
ADVANCE LIGHTING RETROFIT	$73,000	843,000 KWH	RECOMMENDED

GREEN PLAINS HOLDINGS II, LLC.

NICHOLAS JAEGERS
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

LAKOTA

COMPANY BACKGROUND

Located two miles west of Lakota, Iowa, Green Plains has been producing ethanol since it opened in 2002. Initially under Global Ethanol, Green Plains has retained the capacity to produce approximately 50 million gallons of ethanol per year. The plant expanded in 2006, which enabled it to generate twice the initial amount of ethanol. In addition to ethanol, the facility markets dry, wet and modified distillers grains, corn oil and syrup. The facility occupies 230 acres of land and employs 55 people.

PROJECT BACKGROUND

Ethanol production requires large quantities of water throughout the process for both cooling and production. Green Plains' commitment to low-impact production has placed the company well within the industry standard for water utilization. This is accomplished largely through water reuse throughout various processes in the facility. To help reduce Green Plains' water usage further, the intern's focus was on performing a water balance. Identification of water allocation throughout the plant preceded an assessment of water conservation techniques.

INCENTIVES TO CHANGE

Green Plains pumps its own water for use on the facility's site. The water is extracted from the Silurian-Devonian and Prairie du Chien-Jordan aquifers to the water tower at the plant. The high volume of water required to run the plant puts strain on pumping systems, driving up electrical and maintenance costs. Since the water comes from a well, chemical costs associated with purifying the water also provide incentive to conserve. By decreasing water consumption, operating costs will decrease and the stress on systems will also diminish, all while preserving natural resources, reducing greenhouse gas emissions and stimulating profit.

RESULTS

Water Softener Regeneration: Two water softeners treat water for use in the boiler. They regenerate about once every day and a half and the resulting water shows no sign of hardness. Reducing the frequency of regeneration could save on salt, water, pumping cost and the chemicals that treat the water used in regeneration. It was found that the softeners could sustain regeneration less frequently and still produce boiler-quality water.

Green Sand Filter Discharge: While conducting the water balance, calculations showed a significant variance from the amount of water treated for use and the amount used in production. This water was traced to two filters in CO_2 scrubber equipment. Both filters had valve leaks that were intended to be closed except during regeneration. One leak was reduced from an average flow of 102 gallons per minute to three gallons per minute, saving 140,000 gallons of water per day. Further savings through reuse of green sand backwash is being investigated.

Cooling Water Chemical Treatment: Sulfuric acid is used in the cooling towers for pH control. Sulfuric acid is costly and can pose a health risk to workers. The intern investigated the feasibility of using carbonic acid, which is naturally generated in the CO_2 scrubbers, for pH control. While carbonic acid would appear to be an economical and safe replacement for sulfuric acid, further research is needed to determine the practicality of this application and other opportunities for using the carbonic acid.

Leak Repair: Repairing leaks in steam pipes and pump seals could reduce make-up water required to each system. Leak repair would also contribute to savings on chemical treatment costs, discharge volumes and electricity required to pump the fluid.

Reverse Osmosis (RO) Optimization: Two RO units treat filtered well-water on site. It was determined that worn membranes were preventing one unit from operating efficiently. Replacing the membranes and implementing a preventative maintenance plan would keep both RO units and associated components operating consistently at optimum efficiency. These measures could increase recovery and promote water, chemical and electrical savings.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
332.07	1.67	16.78	0.03	0.80	0.04

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WATER SOFTENER REGENERATION	$1,906	74,543 GALLONS	IMPLEMENTED
GREEN SAND FILTER DISCHARGE	$17,715	51,254,456 GALLONS	IMPLEMENTED
COOLING WATER CHEMICAL TREATMENT	--	SULFURIC ACID SAVINGS	INVESTIGATING
LEAK REPAIR	$21,809	6,786,507 GALLONS 81,784 KWH	RECOMMENDED
REVERSE OSMOSIS OPTIMIZATION	$14,537	21,159,384 GALLONS 54,510 KWH	RECOMMENDED

GREEN PLAINS SUPERIOR, LLC.

DARREN YOUNGS
CHEMICAL ENGINEERING, THE UNIVERSITY OF IOWA

COMPANY BACKGROUND

Green Plains Superior, LLC. is a 50 million gallon per year dry-grind ethanol plant located in Superior, Iowa. In addition to producing ethanol, the facility refines and sells fermentation co-products as distillers grains, syrup, and corn oil. Green Plains Superior, LLC is a subsidiary of Green Plains Renewable Energy Inc., a vertically integrated bio-ethanol company consisting of three primary segments: ethanol production, agribusiness, and marketing and distribution. The ethanol production segment consists of nine ethanol plants with an annual production capacity of 740 million gallons.

PROJECT BACKGROUND

The ethanol industry has made significant strides over the last decade to reduce water consumption, but water availability may inhibit continued industry growth if additional water reduction methodologies are not developed and implemented. Green Plains Superior, LLC has been continually working on increasing water efficiency and aims to reduce total water usage by 10 percent in 2012.

INCENTIVES TO CHANGE

Average water usage at Green Plains Superior, LLC is 4.10 gallons of water per gallon of ethanol produced. A unique challenge is that the well influent contains high concentrations of calcium, sulfate, and iron. This requires the facility to have an extensive water treatment process that produces large volumes of wastewater, discharged to the Des Moines River. The remainder of the water leaves the plant through evaporation or is contained in the co-products. Any reduction in water use during water treatment or production processes would significantly reduce the environmental impact of the facility.

RESULTS

Sulfate Precipitation: The reverse osmosis retentate stream contains sulfate concentrations exceeding 2,800 ppm and must be diluted to below 1,360 ppm to meet discharge permit specifications. Sulfate precipitation of gypsum through addition of hydrated lime could theoretically reduce sulfate concentration to 1,300 ppm in an additional water treatment process. Precipitation of ettringite, a calcium hydrosulphoaluminate mineral, through the addition of aluminum trihydroxide could further reduce the sulfate concentration below 150 ppm. Implementation of a sulfate precipitation process would eliminate the need for dilution and create the opportunity to investigate becoming a zero liquid discharge facility.

Well Water Dilution: The facility currently dilutes the reverse osmosis retentate stream with softened water. Significant water treatment chemical use could be avoided by diluting the retentate steam with a mixture of untreated well water and soft water. An appropriate ratio of dilution water must be used to ensure iron concentrations are within permit specifications because well influent iron concentrations exceed the discharge concentration limit. Active control of dilution requirements avoids excessive dilution and reduces chemical use in an environmentally friendly and economical manner.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
1969.08	0.45	368.57	165.36	18.26	0.09

Filter Backwash Recycle: Well influent passes through a cold lime softening process to remove hardness and heavy metals. The softened water passes through sand filters to remove suspended solids carried over from the clarifier. Accumulation of suspended solids in the media results in flow reduction through the filter. A mixture of water and air is backwashed through the filter to fluidize the media, releasing the solids into the backwash water. Installation of a settling tank to separate the suspended solids from the backwash water would allow soft water to be recovered and reused.

Thin Stillage Clarification: Removal of additional suspended solids from thin stillage increases evaporator efficiency, allows for wetcake moisture optimization to reduce natural gas usage, and increases production capacity by removing non-fermentable solids in the backset. Disk nozzle centrifugation and microfiltration were investigated to determine efficacy of solids removal. A disk nozzle centrifuge produces a more concentrated retentate stream allowing for further processing, but operates at a lower suspended solids recovery than a microfiltration unit. Installing a disk nozzle centrifuge is recommended, to provide the greatest operational advantages while minimizing expenses.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
SULFATE PRECIPITATION	$65,410	77.8 MILLION GALLONS OF WATER	RECOMMENDED
WELL WATER DILUTION	$54,506	7.85 MILLION GALLONS OF WATER	IN PROGRESS
FILTER BACKWASH RECYCLE	$2,762	3.28 MILLION GALLONS OF WATER	IN PROGRESS
THIN STILLAGE CLARIFICATION	$145,000	780,000 GALLONS OF WATER 114,700 THERMS	RECOMMENDED

GRINNELL COLLEGE

LISA GARRETT
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

GRINNELL

COMPANY BACKGROUND

Grinnell College is a private liberal arts college located in Grinnell, Iowa. Approximately 1,600 students from all states and about 50 countries are enrolled at Grinnell College, and the college employs approximately 600 faculty and staff. The campus covers 120 acres with 64 buildings and a 365-acre environmental research area. Since its founding in 1846, the college has pursued its mission to educate its students "for the different professions and for the honorable discharge of the duties of life."

PROJECT BACKGROUND

The Pollution Prevention intern at Grinnell College worked on two main projects: boiler retrofits and rainwater harvesting. The boiler plant consumes over 90 percent of the natural gas used by the college and presents opportunities for changes that will save money and reduce emissions. The intern also examined rainwater harvesting as a possible water supply for the chiller plant cooling towers.

INCENTIVES TO CHANGE

Grinnell College is very dedicated to environmental stewardship. Two buildings on campus are LEED Silver Certified and the Environmental Education Center at the Conrad Environmental Research Area is LEED Gold Certified. The president of the college recently signed the American College and University Presidents Climate Commitment. This signifies Grinnell College's commitment to reduce emissions as the college works towards climate neutrality. The college has also formed a committee that is writing a comprehensive sustainability plan for the campus.

RESULTS

Boiler Economizers: The boiler plant at Grinnell College consists of three 500 hp and two 600 hp fire-tube boilers. The plant provides steam throughout campus for heating, dehumidification, and domestic hot water use. Economizers use the heat from the exhaust stack to pre-heat the boiler feedwater, reducing the amount of natural gas needed for combustion. Adding economizers to all five boilers would reduce the college's total natural gas consumption by 5.7 percent and save $57,132 annually. The emissions reductions would help the college as it works towards climate neutrality.

Variable Frequency Drives for Blowers: Variable frequency drives (VFD) control the speed of the motor to match the required load under varying conditions. The savings potential associated with VFDs is greatest when the load on the motor is less than the maximum continuous rating for long time periods and when the burner must operate at low- or mid-fire. These conditions are common for the boiler plant at the college. Adding VFDs would reduce the facility's electricity consumption by 117,000 kWh each year.

Rainwater Harvesting: Grinnell receives an average of 36.59 inches of precipitation each year. Rainwater collection from the chiller plant and Noyce Science Center roofs could provide 1,480,250 gallons of water for chiller plant make-up water annually. However, with an initial cost of over $100,000 and annual savings of $9,770, the project is not recommended at this time.

Solar Water Heating System: In 2011, a solar water heating system was installed on the EcoHouse, a project house owned by Grinnell College. The system was added as a testing opportunity for the students who lived in the EcoHouse, so payback was not calculated before purchasing the system. Since its installation, the system has collected 380.94 therms, resulting in a payback of 26 years. More research is needed to determine if solar water heating systems would be feasible for other housing on campus.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
230.28	0.61	89.66	0.22	1.71	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
BOILER ECONOMIZERS	$57,132	90,686 THERMS	RECOMMENDED
VARIABLE FREQUENCY DRIVES FOR BLOWERS	$7,804	117,000 KWH	RECOMMENDED
RAINWATER HARVESTING	$9,770	1,480,250 GALLONS	NOT FEASIBLE AT THIS TIME
SOLAR WATER HEATING SYSTEM	$348	344 THERMS	MORE RESEARCH NEEDED

HY-VEE DISTRIBUTION CENTER

CHRISTOPHER BONDI
MECHANICAL ENGINEERING, THE UNIVERSITY OF IOWA

CHARITON

COMPANY BACKGROUND

Hy-Vee is a supermarket chain with more than 235 stores in eight states and more than 56,000 employees. Its annual sales exceed $7.3 billion. The main distribution center is in Chariton, Iowa. The 1.5 million-square-foot facility includes three warehouses, a dry goods warehouse, a refrigerated warehouse and a health and beauty care warehouse (HBC), as well as office space, a print shop, a truck maintenance shop and a fuel island for the trucks.

PROJECT BACKGROUND

The project focused on reducing electricity and natural gas use for the dry goods warehouse, HBC, truck shop, offices and print shop. The major areas of energy consumption include the lighting and HVAC systems as well as the battery chargers for the warehouse forklifts and other vehicles. These areas were targeted for their potential to yield the highest savings.

INCENTIVES TO CHANGE

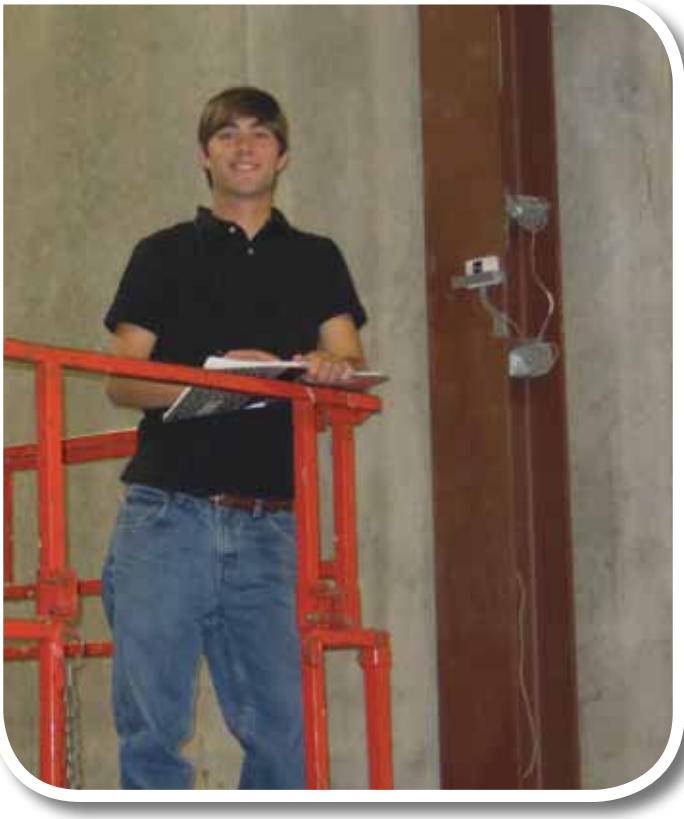
The cost of utilities and the environmental impacts of energy consumption encourage many companies to reduce utility use. Managing energy consumption allows companies to keep costs low and stay competitive. Hy-Vee's sustainability mission is "To promote the well-being of our customers, employees, communities and the global environment."

RESULTS

Lighting: The lights in the warehouse and HBC were burning out unusually quickly because they were set up on photo eye sensors that shut the lights off when the areas were unoccupied in order to conserve electricity. Two solutions were proposed: installing LED lights or changing out the instant start ballasts originally installed for programmed start ballasts. LED lights would produce greater savings in both electricity and increasing the lamp life, while changing the ballasts would require a lower initial investment.

Office HVAC Night Time Shut Down: In studying the HVAC system for each building, it was discovered that the system in the office ran continuously throughout the day and night. Shutting down this system during the night hours would greatly reduce the electrical consumption in the office.

Hot Water Piping Insulation: Two hot water boilers provide most of the heat for the warehouse. The pipes that carry the hot water to the air handlers are not insulated in most areas of the building. Some of these areas do not need heat and the heat lost from the pipes is wasted. Insulating the pipes in these areas would save a significant amount of natural gas, as well as electricity that is used to air condition the break room due to heat from two pipes in the ceiling.



Warehouse Ceiling Fans: Five industrial ceiling fans have been installed in the dry goods warehouse. These fans are designed to blow the heat down from the ceiling, reducing the amount of energy used in heating. In the warehouse, however, much heat is lost due to infiltration of cold air through dock doors, which decreases the effectiveness of the fans. Temperature readings should be gathered over the next twelve months to determine the savings potential for continued purchase and installation.

Conveyor Sensors: The HBC uses a conveyor system to load totes for shipping. The conveyor that takes empty cardboard boxes to the recycling baler runs continuously during the day and sometimes for extended periods when no boxes are being emptied. Putting sensors on these conveyors to start them only when needed would reduce the electricity used by the motors.

Vacuum Message System: A vacuum tube system is used to send messages between offices. As an alternative, it is recommended that messages be sent electronically, via email. This would allow the vacuum system to be shut off completely and would save electricity and maintenance costs associated with the system.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
743.28	3.81	27.55	0.04	8.65	0.09

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
LED LIGHTING	$65,110	839,956 KWH	RECOMMENDED
PROGRAMMED START BALLASTS	$20,070	216,971 KWH	RECOMMENDED (ONLY IF LED LIGHTS NOT IMPLEMENTED)
OFFICE HVAC NIGHT TIME SHUT DOWN	$4,732	67,600 KWH	RECOMMENDED
HOT WATER PIPING INSULATION	$2,507	3,882 THERMS 2,540 KWH	RECOMMENDED
WAREHOUSE CEILING FANS	--	--	ON-GOING DATA GATHERING REQUIRED
CONVEYOR SENSORS	$109	1,552 KWH	RECOMMENDED
VACUUM MESSAGE SYSTEM	$45+	613 KWH	RECOMMENDED

INFASTECH DECORAH LLC

PETER ERNZEN
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DECORAH

COMPANY BACKGROUND

Infastech Decorah LLC has been making fasteners since 1969. The facility produces fasteners of all size and types, from miniature fasteners used in cell phones, to large fasteners used in construction equipment. Consumers of Infastech fasteners include automotive, construction and electronics industries. Manufacturing processes at the facility include cold forming, heading, threading, heat treating, electroplating, and packaging. Fasteners are produced from beginning to end without leaving the plant.

PROJECT BACKGROUND

The Decorah facility houses three heat treatment furnaces that strengthen the fasteners. Exhaust from the furnaces is vented to the atmosphere through several stacks. This exhaust is at an elevated temperature and results in energy that is lost to the environment. This energy can be recovered before it is vented and reused instead of being wasted. The furnaces operate 24 hours a day, seven days a week.

INCENTIVES TO CHANGE

Infastech Decorah has participated in the Pollution Prevention Intern Program for the past 8 years with much success. In the past, heat recovery from the heat treatment furnaces had been examined, but this is the first year that it is a primary focus. The facility renewed its ISO 14001 certification in 2011. The environmental policy at Infastech includes pollution prevention, continual improvement and ongoing compliance with regulations.

RESULTS

Analysis of Amount of Recoverable Power: A detailed analysis of the temperature and velocity of the exhaust gas was conducted. Based on the analysis, the amount of recoverable power was calculated to be approximately 50 kW per furnace. Subsequently, a heat exchanger able to recover this power was designed and quoted by an outside company. Methods of heat exchanger installation that would not affect the furnace operation were then determined.

Heat Recovery Methods: Various heat recovery methods for the heat treatment furnaces were investigated. Options included hot water, steam, or electricity production. Electricity production was determined to be the most economical option.

Several different methods of producing electricity from waste heat were then analyzed. The Organic Rankine Cycle (ORC) was determined to be the best fit for the heat treatment furnaces at the Decorah Operations plant. The intern compared the option of purchasing a prebuilt ORC system versus designing a new system. Designing a new system was determined to be the best option, as it allowed for a cycle that could be tailored to fit the specific situation and would reduce the overall cost of the system.

Design of Organic Rankine Cycle: The main components of Organic Rankine Cycle systems are very similar to conventional steam Rankine Cycle systems. The only difference is that the working fluid is organic instead of water.

Thermodynamic analysis of the Organic Rankine Cycle was conducted in order to optimize the system. From the optimum conditions, an ORC system was designed. This system recovers energy from the natural gas burner exhaust from one furnace and produces approximately 6 kW of electricity. If the system were installed on only one furnace, annual savings would be $3,391. If the ORC system were installed on all three furnaces, the annual savings would be $10,173, with a payback period of 4.08 years.

Insulation: The temperature of the furnace walls exceeds 100 °C, due to energy lost through them. This energy loss was estimated at approximately 0.6 therms per hour for each furnace. Extra insulation could be added to reduce this loss, but the insulation could cause the temperature of the existing furnace walls to increase, which may affect the structure of the walls. More research must be conducted to determine if the addition of insulation would have any negative effects on the walls.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
137.00	0.65	12.37	0.03	1.51	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DESIGN OF ORGANIC RANKINE CYCLE	$10,173	147,420 KWH	RECOMMENDED
INSULATION	$5,500	15,768 THERMS	ADDITIONAL RESEARCH NEEDED

IOWA HEALTH - DES MOINES

EBENEZER CHELLIAH
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

DES MOINES

COMPANY BACKGROUND

Iowa Health – Des Moines (IHDM) in Des Moines, Iowa, is the largest affiliate of the Iowa Health System. IHDM has a staff of nearly 7,000 employees, houses 779 beds, and is the parent of four hospitals: Iowa Methodist Medical Center, Iowa Lutheran Hospital, Blank Children's Hospital and Methodist West Hospital. Iowa Health - Des Moines provides a variety of services including treatment and education resources for cancer, cardiac, diabetes, maternity/OB, and rehabilitation. IHDM is committed to "improving the health of our communities through healing, caring and teaching."

PROJECT BACKGROUND

IHDM produced approximately 1,400 tons of solid waste in 2011 and spent close to $100,000 for disposal. Projected solid waste tonnage for 2012 is 1,600 tons and projected expenses exceed $100,000 for disposal. The intern identified waste reduction, composting and recycling projects after performing a waste audit at the facility. As a result of the intern's recommendations, IHDM will save thousands of dollars and make a significant impact on the environment by diverting a substantial amount of solid waste from the landfill.

INCENTIVES TO CHANGE

IHDM is constantly searching for ways to be a more eco-friendly health care provider. This year's project is the third year IHDM has participated in the Pollution Prevention Intern Program, with the previous two projects focusing on medical waste reduction and water conservation. This year's project was to conduct a waste stream analysis and develop strategies to reduce waste generation and optimize the efficiency of waste management practices.

RESULTS

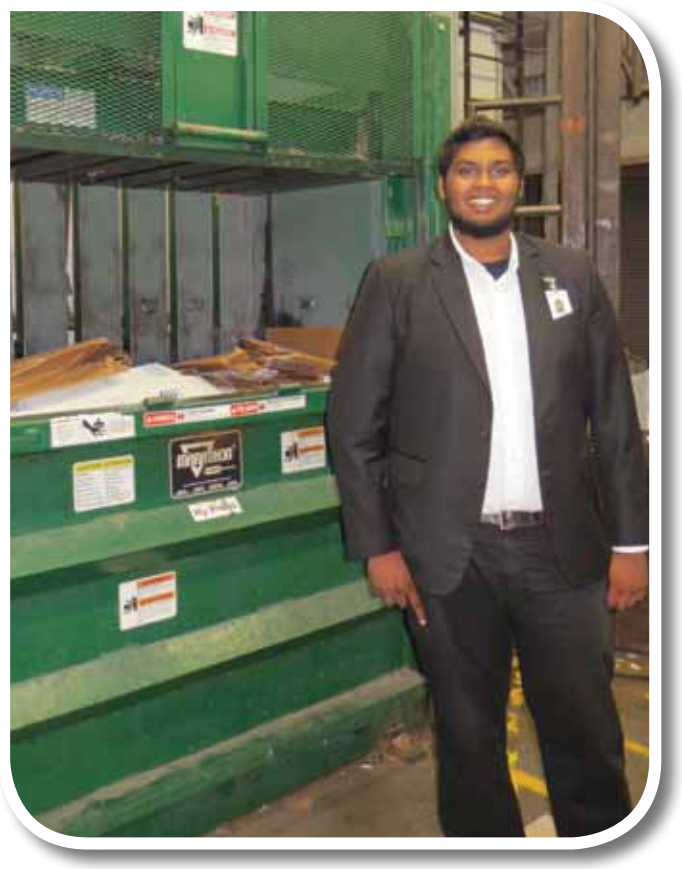
The intern conducted an audit and developed a profile of waste generated at IHDM. The results were then used to identify areas of opportunity to reduce the waste generated and evaluate alternative disposal options.

Food Waste Composting: Composting food waste would divert a substantial portion of organic waste from the landfill. The food waste could be collected at the kitchens (pre-consumer) and cafeterias (post-consumer) by kitchen and Environmental Services (EVS) staff using bins provided by the vendor. Training and educational materials are being developed to educate staff and visitors on procedures for disposing of food waste. Capturing 50 percent of the food waste could result in a diversion of nearly 278 tons from the landfill each year.

Single Stream Recycling: The existing recycling program at IHDM was good, but was unable to capture all of the "traditional" recyclable materials. Employing a single stream recycling program will ensure that all potentially recyclable materials (cans, bottles, paper, cardboard, etc.) can be collected. Comprehensive training and educational efforts are currently underway to prepare staff and visitors for this new program. A conservative 50 percent capture of this stream would yield a 96 ton diversion from the landfill each year.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
1282.85	0.15	1.29	0.14	0.35	0.07



Confidential Paper Contracting: Previously, confidential paper was collected by EVS staff, shredded and disposed of along with the medical waste. Contracting the shredding to a document destruction company will save money and ensure that the paper is recycled, diverting 200 tons of paper from being disposed of each year. It will also allow the facility's shredder to be removed, saving a considerable amount of energy and time for EVS staff.

Compactor Monitors: Trash at IHDM is picked up on a set schedule regardless of whether or not the compactors are full. Compactor monitors sense when the units are reaching capacity and will notify staff to request a pick-up. Compactor monitors could significantly reduce the number of trash pickups, saving hauling costs and preventing emissions caused by transportation.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
FOOD WASTE COMPOSTING	$6,183	278 TONS	IN PROGRESS
SINGLE STREAM RECYCLING	$4,158	96 TONS	IN PROGRESS
CONFIDENTIAL PAPER CONTRACTING	$30,086	200 TONS 31,200 KWH	IN PROGRESS
COMPACTOR MONITORS	$5,017	N/A	IN PROGRESS

JBS USA

CODY BURBACH
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

MARSHALLTOWN

COMPANY BACKGROUND

JBS is an international animal protein processing company headquartered in San Paulo, Brazil. The company has more than 120,000 employees in 140 different facilities and is the largest protein processing company in the world. JBS operates a pork processing plant located in Marshalltown, Iowa. The Marshalltown plant is the third largest pork processing facility in the United States, with more than 2,400 employees. The plant produces and distributes a wide variety of high quality pork products.

PROJECT BACKGROUND

In recent years, JBS made changes to the facility that required updated mapping of its refrigeration components and piping lines to aid in future system improvements, efficiencies and maintenance. An increase in system efficiencies can result in a reduction in the company's energy usage and associated costs. A full system assessment will take longer than this year's project term, so the intern's goal was to lay the groundwork for future work efforts.

INCENTIVES TO CHANGE

The JBS facility is refrigerated 24 hours a day to keep the product sanitary and safe. The piping and instrumental diagram (P & ID) for the plant's refrigeration system was outdated and needed to be updated to enable maintenance and contractors to work on the system and to facilitate future assessment work. Refrigeration is also the largest use of electricity in the plant, accounting for almost 70 percent of the electric bill. An increase in the efficiency of the refrigeration system would cause a significant reduction in electrical usage and provide significant cost savings.

RESULTS

Piping and Instrument Diagrams (P & IDs): Piping and instrument diagrams are required to map the layout of all the components and pipes in a system. The refrigeration system has been changed over the last few years as the facility has expanded, and new evaporative units have been added to the system. JBS will benefit from an updated P & ID of the refrigeration system so that maintenance can make repairs quickly and safely. The intern tracked all new areas and changes and used a CAD mapping program to update the P & IDs for the refrigeration system.

Fix Water Leaks: The intern identified a number of large water leaks while collecting data around the facility. Some of the leaks contained hot water, which is heated by the boilers. This increases the cost of the leak because gas is used to first heat the water. The intern quantified the leaks and found that, if the leaks were repaired, significant water and energy savings would result.

Heat Recovery: A considerable amount of energy used by a refrigeration system is lost as heat during condensation of ammonia gas. Much of this heat could be captured and used instead of being wasted to the atmosphere. A heat exchanger could be used to heat incoming city water for sanitation purposes, reducing the amount of fuel used by the boilers. This type of system could be used with both refrigeration systems at JBS, lowering natural gas demand greatly.

Reduce Discharge Pressure: The blast chill refrigeration system has a higher discharge pressure than recommended by industry professionals. The discharge pressure is set by the minimum approach temperature for the condensers to generate effective heat loss. The amount of surface area in the condensers is currently too low to decrease the discharge pressure. Although the cost of purchasing an additional condenser to reduce discharge pressure would be high, the cost could be offset by the savings resulting from decreased compressor energy usage. It is recommended that JBS continue research to determine if it is cost effective to purchase an additional condenser in order to reduce the discharge pressure.

Reduce Infiltration: Warm air entering the building through infiltration can cause a considerable increase in demand on a refrigeration system. The warm air can bring moisture into the building, which can reduce product quality and further increase refrigeration load. Using a thermographic imaging camera, the intern identified several areas of inadequate insulation and air leaks around the facility. Adding insulation and sealing the inefficient areas would eliminate future energy losses and reduce costs. Due to time constraints, the savings have not been fully calculated for this recommendation. However, since savings can be achieved with minimal capital investment, the return on investment would be almost instant, and this project is recommended.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
172.13	0.15	105.68	11.63	0.96	0.02

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
P & ID (REFRIGERATION SYSTEM)	$14,000	-	IMPLEMENTED
FIX WATER LEAKS	$59,505	1,312,000 GALLONS 110,500 THERMS	RECOMMENDED
HEAT RECOVERY	-	-	ADDITIONAL RESEARCH NEEDED
REDUCE DISCHARGE PRESSURE	-	-	ADDITIONAL RESEARCH NEEDED
REDUCE INFILTRATION	-	-	RECOMMENDED

JELD-WEN

PARKER WELLS
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GRINNELL

COMPANY BACKGROUND

JELD-WEN Door Systems is a manufacturer of interior and exterior doors. The plant is located in Grinnell, Iowa, and operates 16 hours a day, 5 days per week, with first and third shifts. The first shift consists of about 15 office employees and 180 floor employees and the third shift has about 100 employees. The facility is roughly 280,000 square feet in area and the plant is divided into three sections for interior doors, pre-hung doors, and exterior doors.

PROJECT BACKGROUND

The goal of the main project at JELD-WEN was to increase the efficiency of the compressed air system. It was known beforehand that leaks were an ongoing issue in the plant; and other factors, such as blow-off operations and low available air storage, also affected the system's efficiency and performance. The intern also examined peak demand loading. Lack of major spikes in demand led to investigation of motor efficiencies and other possible large power demanders.

INCENTIVES TO CHANGE

At JELD-WEN, management understands the importance of reducing waste and pollution, as previous programs and projects have demonstrated. High utility costs and demand charges provide additional incentive to make changes, as reductions in usage can result in significant savings for the company. Safety is the highest priority at JELD-WEN, so maintaining a workplace with minimal hazards is imperative.

RESULTS

Repair Compressed Air Leaks: A survey of leaks was performed to quantify current leak rates in the plant. Using an ultrasonic leak detector, 102 leaks were found, which accounted for approximately 32 percent of compressed air costs. Repairing these leaks could save the company approximately $17,621 per year in operating costs.

Leak Detection/Repair Maintenance Plan: Plans have been made for a more formal leak detection and repair program at the plant. The plan involves the purchase of an ultrasonic leak detector and a quarterly detection procedure for tagging and repairing leaks. It is also recommended that maintenance staff switch from using thread seal tape to a liquid sealant that will withstand vibrations for a longer period of time, provide a better seal, and possibly reduce the frequency of leak occurrences. An Excel file was created to record leak levels with an automatic output for air consumption and annual costs. Employing a plan such as this could save the company $11,750 per year. The payback for the recommended leak detector would be approximately 0.25 years.

Blow-Off Operation Changes: Blow-off operations can create a large amount of air demand, similar to leaks in the system. Significant savings can arise from replacing open pipes and drilled holes with engineered, low-consumption nozzles that draw in surrounding air to create a forceful airstream while using less costly, compressed air. By changing eight different operations in the plant, JELD-WEN could reduce annual operating costs by an estimated $13,997.

Storage/Pressure: Proper storage in a compressed air system is the key to performance and efficiency. Demand-side storage would help to even out the pressure change in the system by providing extra air for short periods of high demand. Once this has been implemented, maintenance could begin to reduce pressure in the system, which would lead to less waste from leaks and lower operating and maintenance costs. If additional storage reduced line pressure were implemented, the plant could save approximately $10,339 per year, with estimated payback at 1.4 years.

Replace Battery Chargers: Peak demand charges account for the majority of electrical utility costs at JELD-WEN, so reducing demand during operations could result in considerable savings. In the forklift battery charging station, 18 of the current chargers could be replaced by more efficient, high-frequency chargers, which would produce a 64 kW reduction in demand. Replacing the chargers could save $12,746 annually in demand charges alone, and $22,979 in energy costs, for a total annual savings of $35,725. The simple payback for the chargers would be approximately 1.4 years.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
896.37	4.62	29.18	0.04	10.48	0.11

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR COMPRESSED AIR LEAKS	$17,621	195,592 KWH	IN PROGRESS
LEAK DETECTION/REPAIR MAINTENANCE PLAN	$11,750	130,395 KWH	RECOMMENDED
BLOW-OFF OPERATION CHANGES	$13,997	155,366 KWH	RECOMMENDED
STORAGE / PRESSURE	$10,339	114,766 KWH	RECOMMENDED
REPLACE BATTERY CHARGERS	$35,725	255,068 KWH	RECOMMENDED

2011 24-WEEK INTERNSHIP

KRAFT FOODS

TYLER J. PLATT
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

MASON CITY

COMPANY BACKGROUND

Kraft Foods was founded in 1903 and is the largest food and beverage company headquartered in North America and the second largest worldwide. The company had revenue of $54.4 billion in 2011. Kraft Foods produces many leading food and beverage brands, including Cadbury®, Philadelphia®, Nabisco®, Trident®, Jell-O®, Oscar Mayer® and many more. The company employs approximately 127,000 people worldwide. Kraft Foods' Mason City, Iowa plant is a producer of Jell-O ready-to-eat puddings and gelatins in North America and employs approximately 275 people.

PROJECT BACKGROUND

Kraft Foods is committed to sustainable practices to reduce the environmental impact of its production facilities and to preserve our natural resources. Environmental priorities coupled with increasing costs associated with water and wastewater treatment prompted an examination into the feasibility of implementing a microfiltration system for treating the facility's wastewater.

INCENTIVES TO CHANGE

As water and wastewater treatment costs continue to rise, curbing these expenses becomes more attractive and can result in measureable, sustainable benefits. Kraft Foods plans to continue to reduce its water use and look for ways to improve its wastewater processing systems and decrease its natural gas and electrical consumption.

RESULTS

Microfiltration Wastewater Treatment: Currently, the Mason City plant treats wastewater using a dissolved air flotation (DAF) process before it enters the city sewer system. The plant pays the city wastewater fees and also pays to land-apply a by-product of the process. If the plant used a microfiltration system with alternative treatment chemicals, it would be possible to clean water to within direct discharge limits and to dry sludge for use as animal feed. This could divert approximately 20,000 tons of sludge from land application and the sludge could be dewatered and used for animal feed or combustible fuel. This project could save as much as $770,000 per year through a reduction of water sent to the water treatment plant, land application charges and chemical treatment costs. It would also be possible to reuse the cleaner wastewater for a variety of applications.

Cooling Tower Controls: Cooling towers use evaporative cooling to exhaust unwanted heat from process equipment in the plant. As water in the cooling towers evaporates, minerals within that water are left behind and can create scaling problems if some water is not removed from the tower and replaced with clean makeup water. Currently, valves for the facility's cooling towers are manually controlled, resulting in excess water use. Automatic controls use conductivity to measure mineral content and trigger valves to keep mineral concentrations at acceptable levels. Use of conductivity controls could save up to 17.4 million gallons of water per year and cut associated costs by up to $148,000 annually.

Low Flow Hose Nozzles: Throughout the plant, hoses are used for general cleaning purposes. Currently, these hoses utilize 7.5 gpm nozzles, which could easily be replaced by 4.5 gpm nozzles without compromising cleaning ability. This would save approximately 2.9 million gallons of water per year.

Additional Flow Metering: To identify opportunities to save water, it is important to know how water is being used. The plant currently tracks much of its water use. However, installing several additional meters in the plant would help to further pinpoint future opportunities to minimize water use.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
7,700.50	1.50	4,585.60	2,329.00	7.60	0.90

Boiler Economizers: The plant has a total of three boilers, with two operating at any given time. When the plant was built, each of these boilers used feed water economizers that utilized waste heat from boiler exhaust gases to preheat boiler feed water. Today, the economizers are no longer operational. Replacing these units would save an estimated 170,000 therms of natural gas per year.

Odor Scrubber Use Reduction: The plant's environmental control facility is equipped with an odor control scrubber to keep sludge odors to an acceptable level. It was found that in lower temperatures where microbial activity is minimal, an odor control scrubber is not needed and can easily be shut off, resulting in reduced water, wastewater and electrical consumption.

Vending Machine Misers: Vending machines typically use between eight and ten kilowatt hours of electricity each day. Vending misers operate with the use of motion detectors to cut off electricity to the machine while still maintaining appropriate temperatures. Installing vending misers on one vending machine could save 1,046 kWhs annually.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MICROFILTRATION	$770,000	119,789,780 GALLONS 1,198,856 LBS. BOD 20,000 TONS SLUDGE	FURTHER INVESTIGATION NEEDED
COOLING TOWER CONTROLS	$148,000	17,400,000 GALLONS	RECOMMENDED
LOW-FLOW HOSE NOZZLES	$36,000	2,913,840 GALLONS	IN PROGRESS
ADDITIONAL FLOW METERING	-	-	RECOMMENDED
BOILER ECONOMIZERS	$88,000	170,000 THERMS	RECOMMENDED
ODOR SCRUBBER USE REDUCTION	$12,000	869,760 GALLONS 6,824 KWH 4,730 THERMS	RECOMMENDED
VENDING MACHINE MISERS	$70	1,036 KWH	RECOMMENDED

KUM & GO

CHELSEA TOMEK
INDUSTRIAL ENGINEERING & ENVIRONMENTAL STUDIES
IOWA STATE UNIVERSITY

WEST DES MOINES

COMPANY BACKGROUND

Kum & Go is the fifth largest privately held, company-operated convenience store chain in the United States, with more than 430 stores in 11 states. Kum & Go distinguishes itself from its competitors with a few remarkable features. It has maintained more than 50 years of dedicated community commitment by sharing 10 percent of its profits with charitable and educational causes each year. Most notably, Kum & Go continues to lead the industry in customer service and convenience.

PROJECT BACKGROUND

Kum & Go is a champion of environmental sustainability. With their participation in the 2010 intern program, the company spearheaded numerous energy reduction initiatives transferable to both new and existing stores. The goal of this year's project is to pinpoint opportunities to divert waste from Iowa landfills and optimize the company's waste management practices.

INCENTIVES TO CHANGE

Kum & Go is striving to become the top convenience retailer in the country by 2021. In recent years, a strong emphasis has been placed on sustainability, which has resulted in a new store design and improved construction and operational practices. As the company continues to grow, Kum & Go will distinguish itself by taking innovative steps forward in the field of sustainability.

RESULTS

Because Kum & Go operates a variety of different store types in a variety of different locations, the first step was planning a strategy for conducting numerous waste audits in locations that could represent an accurate cross-section of stores. The intern then conducted audits at 12 different stores in partnership with the Iowa Waste Exchange, and analyzed the resulting data to develop areas of opportunity.

Single-Stream Education: Approximately 25 percent of all Kum & Go stores have single-stream recycling systems, which accept assorted mixed recyclables in addition to cardboard. However after waste audits were conducted, the intern found that single-stream recycling is being underutilized. Upon further investigation, it became clear that many associates are not aware of what they can recycle and do not have a convenient place to collect recyclables internally. To address these issues the intern worked with store associates to identify all recyclable materials and then worked to develop a "Recyclable Materials" reference sheet, designed to be hung on the wall or placed next to a recycling container so that associates can quickly decide if an item is recyclable. This sheet, combined with additional employee training, will increase associate utilization of the single-stream recycling containers.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
1,035.00	-	-	-	-	-

Food Waste Composting Pilot: As Kum & Go moves to become a more food-oriented convenience store chain, the amount of food waste the stores produce will increase. Food waste was in the top three waste categories based on weight (but not volume) at every store audited. The intern examined the option of collecting and composting the food and other compostable waste. There are few composting options in the state and limited options when trying to serve stores statewide. The intern recommends evaluating store kitchens for future bin placement, associate training, and signage. When an affordable option is available, a pilot test of compostable waste collection could be done in Des Moines where the service is available, and those results could be used to determine the most feasible method of expanding this program throughout the chain.

Can and Bottle Recycling: One of the easiest ways to divert waste at Kum & Go stores is to collect recyclable cans and bottles at the pump. Currently, customers visiting the store have no convenient recycling option for their cans and bottles (besides redemption in Iowa), even if the store has single-stream recycling available. As a result, most of them end up in the trash. Cans and bottles account for 6 to 8 percent of waste at most Kum & Go stores, so installing pump-side containers to collect recyclable cans and bottles would quickly and easily divert most of this waste. If the six-week pilot test of this program is successful, it is recommended that Kum & Go expand this program to all stores that use single-stream recycling.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
SINGLE STREAM EDUCATION	$20,100	199 TONS	RECOMMENDED
FOOD WASTE COMPOSTING PILOT	--	17 TONS	RECOMMENDED
CAN & BOTTLE RECYCLING	$3,600	97 TONS	TESTING
DATA COLLECTION (VIA WASTE AUDITS)	$2,700 (ONE TIME)	--	COMPLETED

MERCY MEDICAL CENTER

DANIEL NEWKIRK
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

DES MOINES

COMPANY BACKGROUND

As part of Catholic Health Initiatives, Mercy Medical Center is a not-for-profit hospital determined to emphasize the role of human dignity and social justice in the health care system. Its four values of reverence, integrity, compassion and excellence serve as cardinal principles in the creation of healthier communities throughout the Des Moines area. Founded in 1893, Mercy Medical Center has grown to be one of the largest employers in the state, with over 6,600 employees, 950 physicians and a facility featuring more than 802 beds.

PROJECT BACKGROUND

The goal of the project is to reduce overall energy consumption at Mercy Medical Center through establishing a baseline, identifying large energy consumers and creating reduction recommendations. All recommendations feature savings potential, installation costs and simple payback estimates. The intern's area of emphasis is the facility's HVAC system, with an investigation of free cooling as a priority.

INCENTIVES TO CHANGE

As part of its mission statement to emphasize social justice, Mercy Medical Center continually searches for ways to reduce its impact on the environment. One of the company's goals is to reach 100 days of free cooling, when any wintertime air conditioning can be provided by cold outside air. More pragmatically, the company has recently faced energy price increases from their utility supplier and seeks to lower energy costs by reducing wear and tear and maintenance of its equipment.

RESULTS

Free Cooling: Currently, chillers run during the winter to meet the cooling demand of interior spaces and special applications. Many air handling units (AHUs) feature air-side economizers but cannot be used during winter weather. When the current plant was originally set up, a plate and frame heat exchanger was fitted for the demand. Since then, the wintertime cooling load has increased. A larger unit could be installed economically, which would allow Mercy to utilize free cooling for a projected 140 days per year.

Lighting Choices: The type of lamp presently in use in the facility will soon no longer be offered by Mercy's lighting supplier. It was found that the replacement T8 lamp Mercy was considering will increase the lighting system's operating cost. After further analysis, a different T8 lamp was found that could decrease the cost of energy and upkeep relative to the current lamps, thus saving money on the overall system. Both T5 and LED lamps were considered but proved uneconomical at this time.

Demand Reduction: Mercy had installed an AHU turn-off schedule with the present control system but it was abandoned due to logistical issues. The intern recommended reconsidering the use of modified AHU scheduling and installing occupancy sensors to reduce demand.

AHU Upgrades: The approximately 60 Mercy AHUs vary greatly in age and corresponding technology. It is recommended that some of the older or less advanced units be updated with the most energy efficient technology available. This would include installing premium efficiency motors, cogged V-belts, variable frequency drives (VFDs) and low pressure drop filters in the machines that do not already have these technologies.

Steam System Upgrades: Considering only natural gas consumption, providing steam and hot water to the facility represents 27 percent of Mercy's utility bill. The natural gas is fed to three boilers, two of which are over 40 years old. Since their installation, economizer technology has progressed and is now more cost-effective, so the intern recommended steam system upgrades. Replacing the feedwater tank with a deaerator, allowing for warmer feedwater and decreased chemical costs, was also recommended.

Water System Upgrades: During the internship, water system upgrades were also considered. One opportunity would be to replace an open loop, city water cooled compressor servicing the morgue condenser with its air-cooled equivalent. Currently, the pumps circulating chilled water have VFDs installed but the pumps circulating condensed water do not; installing a VFD to one of these pumps is also recommended.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
2205.10	9.89	260.02	42.92	22.97	0.25

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
FREE COOLING	$41,647	948,679 KWH	RECOMMENDED
LIGHTING CHOICES	$5,855	240,877 KWH	RECOMMENDED
DEMAND REDUCTION	$109,903	1,690,131 KWH 72,441 THERMS	RECOMMENDED
AHU UPGRADES	$30,386	692,164 KWH	RECOMMENDED
STEAM SYSTEM UPGRADES	$41,782	84,767 THERMS	RECOMMENDED
WATER SYSTEM UPGRADES	$26,421	240,877 KWH 3.0 MILLION GALLONS	RECOMMENDED

2011 24-WEEK INTERNSHIP

MONTEZUMA MANUFACTURING

DANIEL NEWKIRK
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

MONTEZUMA

COMPANY BACKGROUND

Montezuma Manufacturing, a division of Cosma International, first opened its doors in 1972. The company specializes in deep draw stamping mild and stainless steels and robotic welding lines featuring metal inert gas (MIG), spot and projection welding. Major customers include General Motors (GM), Ford and Chrysler, to whom the company provides frame rails, heat shields, panel wheelhouses, door reinforcements, inlet pipes, catalytic converter shields and floor pans.

PROJECT BACKGROUND

The goal of the 24-week project was to conduct a facility energy audit to identify opportunities to improve efficiency of the electrical, compressed air, heating and lighting systems. The focus was on compressors, make-up and infrared heating, ventilation for welding processes, and fluorescent and halide lighting. The intern began by developing a baseline and then researched options for reducing energy consumption.

INCENTIVES TO CHANGE

As part of Cosma International, Montezuma Manufacturing is joining its parent company's global initiative to cut costs and reduce energy wherever possible. To achieve these goals, the company needed to conduct a thorough energy audit, develop energy-saving strategies and adopt pollution prevention methodologies. By minimizing waste at the source, the company will reduce emissions, costs and risks, and will exceed regulatory standards.

RESULTS

Electrical: Cost saving opportunities can be achieved through upgrading control methods, purchasing energy efficient equipment and monitoring energy consumption. Specifically, presses, vending machines, personnel fans and cooling towers can all be controlled for optimum energy efficiency. Utilizing energy efficient filters in fume collectors can improve filter and collector longevity and decrease energy consumption. An energy monitoring and targeting program is recommended to find system energy inefficiencies and develop solutions. Finally, high electrical demand charges can be reduced by consistent production scheduling.

Compressed Air: Cost saving opportunities can be found through additional storage capacity, increased system maintenance, performance tracking and proper end use. Additional storage will decrease compressor cycling along with making compressor demand more consistent. As a result, the pressure level can be lowered, resulting in additional energy savings. Increased preventative maintenance is required on the system to keep compressors and piping at optimum efficiency. Using the best possible oil is also a key to maintaining an efficient compressed air system. Checking system performance through monitoring compressor conditions can also help with maintenance. Due to the inefficiency of the system it is not advisable to use compressed air unless completely necessary, as it can be up to fifty times more expensive than a blowing system, in terms of energy costs.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
ELECTRICAL			
AUTOMATE PRESS COUNTER BALANCES	$17,234	215,428 KWH	IN PROGRESS
INSTALL VENDING MACHINE OCCUPANCY SENSORS	$841	10,507 KWH	RECOMMENDED
INSTALL PERSONNEL FAN TIMERS	$8,509	106,363 KWH	RECOMMENDED
SWITCH TO ENERGY EFFICIENT FUME COLLECTOR FILTERS	$33,397	417,458 KWH	RECOMMENDED
ADJUST COOLING TOWER OPERATION	$12,913	161,413 KWH	RECOMMENDED
MANAGE POWER CONSUMPTION	$91,630	1,145,371 KWH	RECOMMENDED
UTILIZE COGGED V-BELTS	$1,995	24,938 KWH	RECOMMENDED
SCHEDULE WEEKENDS	$18,352	-	RECOMMENDED
COMPRESSED AIR			
INCREASE COMPRESSED AIR STORAGE	$10,847	135,593 KWH	RECOMMENDED
IMPLEMENT LEAK DETECTION PLAN	$11,028	137,854 KWH	RECOMMENDED
INCREASE COMPRESSOR PREVENTATIVE MAINTENANCE	$13,004	162,553 KWH	RECOMMENDED
INSTALL COMPRESSOR POWER AND FLOW METERS	$25,845	323,062 KWH	RECOMMENDED
CONVERT TO OFF-BRAND SYNTHETIC LUBRICANT	$16,799	209,990 KWH	RECOMMENDED
REPAIR AIR LEAKS	$99,255	1,240,688 KWH	IN PROGRESS
ELIMINATE COMPRESSED AIR CLEANING	$355	4,434 KWH	IN PROGRESS
HEATING			
SWITCH TO A FORCED AIR CAPTURE FILTRATION SYSTEM	$32,648	127,375 KWH 25,946 THERMS	RECOMMENDED
INSTALL VENTILATION TIMERS	$25,979	236,389 KWH 8,128 THERMS	RECOMMENDED
RECOVER COMPRESSOR HEAT	$23,821	249,823 KWH 4,410 THERMS	IN PROGRESS
INSTALL PROGRAMMABLE THERMOSTATS	$9,083	9,671 THERMS	RECOMMENDED
LIGHTING			
INSTALL SOLAR PARKING LOT LIGHTS	$7,688	96,100 KWH	RECOMMENDED
RETROFIT OVERHEAD LIGHTS	$75,177	939,707 KWH	RECOMMENDED
INSTALL ROOM LIGHT SENSORS	$5,857	73,209 KWH	RECOMMENDED
INSTALL OVERHEAD LIGHT SENSORS	$65,861	823,266 KWH	RECOMMENDED

Heating: Cost saving opportunities can be found in recovering lost heat and upgrading heat system controls. Using fume collectors to recycle plant air instead of makeup air units to exhaust plant air is a good way to conserve heat energy. Heat can also be recovered off hot compressors, leading to heated ventilation air, which is crucial to indoor air quality in the winter. Due to human error, heating equipment is sometimes left on when not in use. Installing controls will fix this problem and reduce energy costs.

Lighting: The majority of plant lighting should be retrofitted with fluorescent fixtures with LED solar outdoor lighting to achieve significant cost savings. Adding a control system would reduce unnecessary lighting time and result in additional cost savings.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
6,416.06	32.66	264.27	0.45	74.33	0.75

THE NEBRASKA MEDICAL CENTER

VISHNU BONGUNURI
M.S. MECHANICAL ENGINEERING, BRADLEY UNIVERSITY, PEORIA, IL

OMAHA, NE

COMPANY BACKGROUND

The Nebraska Medical Center in Omaha, Nebraska, is the state's largest health care facility. The center is recognized as one of the top hospitals in the world for oncology, neurology, cardiology and both organ and bone marrow transplant. As the teaching hospital for the University of Nebraska, the center is known for excellence, innovation and quality patient care. The Nebraska Medical Center has been named the National Consumer Choice Award winner as a result of a large consumer study conducted by The National Research Corporation, and is ranked by 2012 U.S. News and World Report Best Hospitals in five specialties.

PROJECT BACKGROUND

Optimizing efficiencies of the hospital's mechanical systems provides both environmental and financial benefits by reducing utility costs associated with energy usage. The Nebraska Medical Center requested an intern to conduct a steam system assessment in Clarkson and Hixson-Lied buildings to identify efficiency opportunities. The intern also researched and provided recommendations for recovering heat from the air compressors, increasing efficiencies at the central utility plant and decreasing the lighting load by installing occupancy sensors.

INCENTIVES TO CHANGE

The hospital is participating in the U.S. Department of Energy's Energy Star Portfolio system, to integrate LEED design and construction practices into its new buildings and renovations. Since steam is the major utility consumed, it was determined that by increasing the efficiency of steam distribution and boiler efficiency, significant energy and cost savings would be generated. Additionally, projects utilizing waste heat recovery and decreasing the overall electric load would also not only save money but reduce the demand load as well.

RESULTS

The intern provided information on cash incentive opportunities that may be applicable to energy efficiency improvements currently in progress at The Nebraska Medical Center. The intern used the Database of State Incentives for Renewables and Efficiency (DSIRE), supported by the U.S. Department of Energy, as a reference.

Insulation on Steam Distribution Valves: Most of the steam distribution lines are insulated in Hixson-Lied and Clarkson Tower, but the gate valves and wye strainers at pressure reducing stations and heat exchangers are not insulated. Insulating these valves would reduce radiation losses and decrease the chiller load for cooling the space.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM_{10}
501.78	0.58	300.79	0.75	2.47	0.04

Replace Failed Steam Traps: Approximately 19 steam traps in Hixson-Lied and Clarkson Tower building were failed in the open position, allowing for constant loss of steam. Replacing the failed traps could save more than 33,000 therms via recovered energy and reduce utility costs by $37,000 per year.

Heat Recovery from Air Compressors: Installing ductwork to recover the waste heat generated by three 50-hp air compressors used for medical vacuum supply would allow the hospital to recover that heat for other uses. Recovering heat from the air compressors could reduce steam used for space heating in the cooler months and reduce the chiller load in the summer months, while keeping the compressor room area cool. Roughly 55,400 therms per year of steam energy could be saved.

Install Occupancy Sensors: Lights are turned on and unknowingly left on for hours at a time in many of the lower traffic areas of the maintenance shop. By installing dual technology occupancy sensors in these areas, the hospital could save more than 25,000 kWh of energy annually.

Install Air Pre-heater/Economizers: Currently, four boilers in the central utility plant supply approximately 500 million pounds per year of steam to the campus. An air pre-heater or economizer in the boiler stacks could recover the waste heat and increase the efficiency of the boilers. An estimated 189,100 therms of energy per year could be saved.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
INSULATION ON STEAM DISTRIBUTION VALVES	$11,680	10,580 THERMS	RECOMMENDED
REPLACE FAILED STEAM TRAPS	$37,084	33,350 THERMS	RECOMMENDED
HEAT RECOVERY FROM AIR COMPRESSORS	$ 63,931	55,400 THERMS	IMPLEMENTED
INSTALL OCCUPANCY SENSORS	$ 1,437	25,306 KWH	RECOMMENDED
AIR PRE-HEATER / ECONOMIZERS	$ 85,095	189,100 THERMS	RECOMMENDED

2011 24-WEEK INTERNSHIP

VERMEER CORPORATION

JEFFREY GORRIE
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

Founded in 1948, Vermeer Corporation has grown from a one-man operation into an international leader in the manufacture of agriculture, construction, mining and forage equipment. At the Pella, Iowa, campus, more than 2,000 employees work across seven manufacturing plants and 1.5 million square feet to research, design, fabricate, and assemble the full line of Vermeer products.

PROJECT BACKGROUND

As an aid to its Environmental Health and Safety department, the Pollution Prevention Intern Program will help Vermeer reduce its environmental impact throughout the manufacturing process. After two successful internships with the program, Vermeer hosted a 24-week intern in 2011 to complete a campus-wide energy audit and identify projects to conserve electricity and natural gas. Vermeer will also benefit from replicating feasible recommendations at a South Dakota facility.

INCENTIVES FOR CHANGE

Vermeer strives to integrate Lean principles into every aspect of the business — quality, cost, delivery, safety and morale. The company is committed to improved production efficiency and enhanced product quality and reliability, and continually evaluates all processes to identify opportunities to improve efficiency.

Current projects at Vermeer include implementing an extensive recycling program, upgrading lighting and installing a geothermal cooling loop. Recently, Vermeer set a goal to reduce both electrical and natural gas consumption by 10 percent. Reducing waste and using energy more efficiently could significantly lower utility costs and keep the company competitive in foreign markets.

RESULTS

Destratification: During the winter months, providing heat to the buildings accounts for a large portion of Vermeer's energy use. Most of this energy is heating the upper half of the building, when the heat is needed at the work level below. Destratification fans are high-efficiency units that force a column of warm air down to the actual workspace. The redistribution of warm air would provide a more thermally equalized work environment and would reduce heating costs.

Occupancy Sensors: Lighting accounts for 10 percent to 15 percent of the electrical consumption in each building. Occupancy sensors turn lights off when the work area is not occupied. Installing occupancy sensors in lower traffic areas of the buildings could produce substantial savings.

Vending Misers: Vending misers operate as occupancy sensors for vending machines; they turn off the lights and reduce the number of refrigeration cycles when not in use. Installing vending misers could reduce the energy use of each vending machine by approximately 46 percent.

Variable Frequency Drives (VFD) on Multistage Washer Motors: A VFD adjusts the operating frequency of the motor based on demand. Currently, a throttling valve controls the flow characteristic of the multi-stage washer line. Energy can be conserved by replacing the throttling valve with a VFD that would regulate the AC motor current. A VFD could reduce the energy use of these motors up to 50 percent.

Compressed Air:

Repair Compressed Air Leaks: Compressed air is one of the most costly utilities at manufacturing facilities. The intern used an ultrasonic leak detector to identify and tag compressed air leaks. Fixing these air leaks would save 1,013,094 kWh of electricity annually.

Leak Detection Maintenance Plan: Allowing air leaks to develop decreases the amount of air available to critical applications, reducing production efficiency and increasing risk of injury to equipment operators. It is much more cost effective to adopt a scheduled leak detection plan to keep the compressed air system operating at optimum efficiency.

Heat Recovery from Air Compressors: Warm air from the compressors is expelled at approximately 144°F. Rerouting this air into the adjacent work areas could reduce the heating load in three buildings. To avoid excessive heat in the summer, a split in the air exhaust piping would allow the heat to be rerouted into the adjacent work areas in the winter and expelled into the atmosphere in the summer.

Closed-Loop Cooling Process: Vermeer is in the process of installing a cold water chilling loop to cool the distillation process in the Eco Center. A closed-loop system would allow the coolant to recirculate through the chiller and distillation process, alleviating the need for continuous feed from municipal water sources.

Heat Recovery Makeup Air Handling Units (MAUs): The heating, ventilation and air conditioning equipment on one building is not performing satisfactorily and will likely be replaced to ensure the desired five air exchanges per hour. Heat recovery MAUs transfer the heat from hot outgoing air to the cool incoming air. Installing heat recovery MAUs when replacing this equipment could reduce heating costs by up to 61 percent.

Refrigerator Replacement: The intern observed several older-model refrigerators in use throughout the plant. Replacing the aging appliances with newer energy efficient models would reduce energy consumption in the break rooms.

Lighting Retrofit: A variety of lighting fixtures are in use throughout the facility. Replacing metal halide lamps with more efficient high-bay T8 lamps and fixtures with electronic ballasts could save electricity costs and also reduce inventory of spare lamps needed.

Paper Towel Replacement: Reducing paper towel consumption by 80 percent at Vermeer could save $29,000 dollars annually and divert 7.82 tons of landfill waste. Blow dryers that provide a 12.5-second dry time are an efficient alternative to the costly paper towels.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
1374.73	19.34	318.58	18.77	44.53	0.46

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
DESTRATIFICATION	$152,128	210,754 KWH	RECOMMENDED
OCCUPANCY SENSORS	$27,424	340,940 KWH	RECOMMENDED
VENDING MISERS	$8,730	123,195 KWH	IMPLEMENTED
VFDS ON MULTISTAGE WASHER MOTORS	$2,708	38,839 KWH	RECOMMENDED
REPAIR COMPRESSED AIR LEAKS	$70,643	1,013,094 KWH	IN PROGRESS
LEAK DETECTION MAINTENANCE PLAN	$54,713	885,615 KWH	IN PROGRESS
HEAT RECOVERY (AIR COMPRESSORS)	$13,137	17,005 THERMS	RECOMMENDED
CLOSED-LOOP COOLING PROCESS	$6,776	3,153,000 GALLONS	IMPLEMENTED
HEAT RECOVERY (MAUS)	$63,201	90,639 THERMS	RECOMMENDED
REFRIGERATOR REPLACEMENT	$2,196	30,470 KWH	IN PROGRESS
LIGHTING RETROFIT	$1,791	25,691 KWH	RECOMMENDED
PAPER TOWEL REPLACEMENT	$28,655	9.77 TONS	RECOMMENDED

WEST LIBERTY FOODS

JOHN SKUBIC
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

COMPANY BACKGROUND

West Liberty Foods was founded in 1997 by the Iowa Turkey Growers Cooperative and harvested 5.5 million turkeys in 2011. The company has facilities in West Liberty, Sigourney and Mount Pleasant, Iowa, and Tremonton, Utah. The West Liberty location is also home to a research and development center and a state-of-the art quality assurance lab. In addition to harvesting and processing turkeys, West Liberty Foods processes all types of cooked, processed and ready-to-eat meat products.

PROJECT BACKGROUND

West Liberty Foods is committed to preserving natural resources. The company is ISO 14001 certified, and two of West Liberty Foods' Iowa facilities have become third party verified as landfill-free, with the third facility expected to become certified as landfill-free later this year.

West Liberty Foods has hosted interns through the Pollution Prevention Intern Program on two previous occasions. Through these projects, the company has reduced energy usage and examined opportunities to convert and reuse cooking oil. This year's intern conducted a water balance to determine where and how water was being used, then examined possible reduction and reuse opportunities.

INCENTIVES TO CHANGE

In 2011, West Liberty Foods used more than 300 million gallons of water and spent over $2 million on water-associated costs. Sending wastewater to the municipal treatment plant accounted for the majority of these costs. The facility is also experiencing a strain on its own wastewater pretreatment facility.

In addition to the environmental impacts of conserving water, this project will result in a reduction in the amount of wastewater passing through the on-site pretreatment plant and will improve the effectiveness of the pretreatment process. The reduction of wastewater going to the municipal treatment facility would result in substantial economic savings.

RESULTS

Water Leak Detection and Repair Program: West Liberty Foods was losing 2.75 million gallons of water annually to leaks. Two leaks accounted for a large portion of the loss. One of these leaks was on a condenser unit that had corroded; the other was due to a loose valve on the bird wash system. Many smaller leaks occurred off of the high pressure lines as a result of loose valves. To identify and keep future leaks to a minimum, the intern recommended a weekly audit and repair plan.

Offal Screen Wash: The screen wash on the tumble filter in the offal room has four spray heads but only one is working properly. High pressure wash hoses are being used to wash off the screen, further adding to the increased water usage. Replacing the spray heads would save one million gallons of water per year and alleviate the need for additional manual washing.

Pumps Off Nights and Weekends: Fresh water cooling pumps were found to be running continuously during idle production hours. Turning these pumps off when not needed would save 2.67 million gallons of water per year.

Picker Wash: Two pipes provide water for washing feathers into a trough. One is supplied from reuse water and the other uses potable water. The pipe coming from the potable water source, located under the first picker, could be turned off without affecting the process.

Scalder Recapture: The scalder is currently losing water to overflow at a rate of 1.8 gallons per turkey. The U.S. Department of Agriculture (USDA) regulation for the scalder is 0.5 gallons per turkey. The discrepancy is due to the turkeys pushing water out of the scalder as they leave. This can be resolved by creating a catch basin for the water and pumping the water back into the scalder.

Chiller Overflow Recapture: The chiller has a similar problem as the scalder. The USDA regulation for the chillers is 1 gallon per turkey and presently the overflow rate at West Liberty Foods is 3.2 gallons of water per bird. The water that leaves the chiller with the turkeys goes down the drain. Instead sending the water down the drain, the company could redirect the water back into the chiller and the overflow could be controlled at 1 gallon per bird.

Conductivity Reduction: The evaporative condensers that West Liberty Foods employs for cooling the plant use 80,000 gallons of water a day. By treating the makeup water, the cycles of concentration can be increased, which would increase the amount of time the water stays in the condensers before being blown down. Treatments explored were water softeners, reverse osmosis and deionizer units.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_2O	CFC	PM_{10}
1786.48	0.29	1064.58	557.42	1.56	0.21

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
WATER LEAK DETECTION AND REPAIR PROGRAM	$20,145	2.75 MILLION GALLONS OF WATER	IN PROGRESS
OFFAL SCREEN WASH	$7,340	1 MILLION GALLONS OF WATER	RECOMMENDED
PUMPS OFF NIGHTS AND WEEKENDS	$14,680	2.67 MILLION GALLONS OF WATER	RECOMMENDED
PICKER WASH	$9,762	1.33 MILLION GALLONS OF WATER	RECOMMENDED
SCALDER RECAPTURE	$41,398	5.64 MILLION GALLONS OF WATER	RECOMMENDED
CHILLER OVERFLOW RECAPTURE	$74,134	10.1 MILLION GALLONS OF WATER	RECOMMENDED
CONDUCTIVITY REDUCTION	$40,223	5.48 MILLION GALLONS OF WATER	FURTHER ACTION NEEDED

2012

24-WEEK INTERNSHIP

CASE SUMMARIES

To better assist our clients, Pollution Prevention Services now offers 24-week internships. This additional time allows interns to explore more in-depth opportunities, such as setting up prototypes for testing alternative technologies, evaluating outcomes of trial runs and spearheading implementation of feasible strategies within the timeframe of the internship.

A 24-week internship can provide benefits to both companies and students. Companies have the opportunity to pursue projects that would otherwise be too time-consuming. Students get first-hand experience in learning about a complex system, and identifying and overcoming challenges they would not encounter in a classroom or less extensive internship. Recognizing a 24-week internship is not feasible for all companies or interns; it has proven to be a viable option for addressing larger projects.

On the following pages you will see case summaries of four 24-week projects currently underway. These projects are slated to end in November 2012. The full case summaries for these projects will be posted on the Pollution Prevention Intern Program website **www.iowap2interns.com** in December and printed in the 2013 Case Summary Booklet.

DUPONT PIONEER

JAKE BRENNEMAN
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

DES MOINES

COMPANY BACKGROUND

DuPont Pioneer (www.pioneer.com), headquartered in Des Moines, Iowa, is the world's leading developer and supplier of advanced plant genetics, providing high-quality seeds to farmers in more than 90 countries. Pioneer provides agronomic support and services to help increase farmer productivity and profitability and strives to develop sustainable agricultural systems for people everywhere.

PROJECT BACKGROUND

Research and production at Pioneer generates approximately two million pounds of discard corn seed which must be incinerated in accordance with state regulations and company policy. Pioneer's discard seed is currently transported to two locations that burn Pioneer seed with other fuels in order to provide heat for their operations. Pioneer's objective is to bring the incineration process in house, utilizing its seed for fuel in a biomass boiler.

Throughout the 24-week internship the intern is also identifying opportunities, such as lighting retrofits and increased recycling, to improve sustainability practices and further reduce the company's environmental footprint.

INCENTIVES TO CHANGE

Transportation and incineration of corn seed costs Pioneer approximately $90,000 annually, a figure that could be greatly reduced or entirely avoided if the incineration process were kept entirely on campus. Utilizing the corn as a fuel would also help Pioneer reduce energy consumption and utility costs, providing even greater savings and environmental benefits. DuPont Pioneer considers environmental stewardship to be a Core Value and continually seeks ways to benefit the environment while simultaneously streamlining operations.

RESULTS

Corn Boiler: With two million pounds of seed at its disposal, Pioneer has the capacity to offset over three million kilowatt-hours of energy by utilizing a corn boiler to supplement the load on an existing boiler system. By bringing the entire seed disposal process in house, Pioneer would also realize significant savings in the cost of incineration, as the company has relied on outside parties to incinerate discard in the past. Because use of the corn boiler would allow Pioneer to greatly reduce its dependence on the practices and procedures of outside parties, the project mitigates risk in both the handling of regulated seed and unpredictable disposal fees.

Many obstacles must still be overcome. Because the majority of the discard must be sent for incineration in the summer and fall and a boiler would run primarily during the winter, a system for storing excess seed must be identified. A significant portion of the seed is also stored in packets, which will not be able to flow from a hopper system into a boiler. The intern has begun to look for machines that could be used to separate the seeds from their packages without reducing the seeds' integrity as a fuel. The intern has also begun to research the potential effects of burning treated seed, which makes up approximately half of the supply, and what options are available to make the process safe and environmentally friendly.

Lighting Upgrades: The intern performed a lighting audit of incandescent light bulbs located in conference rooms in the main campus. The bulbs have since been replaced with 11-watt LED bulbs with a much greater lifetime, reducing Pioneer's energy usage and maintenance costs. The 12 buildings that make up Pioneer's main campus contain several thousand other lighting fixtures. The intern will continue to perform audits around campus in order to recommend additional strategies to reduce Pioneer's energy costs and environmental impact through lighting upgrades.

Plastic Recycling: One of Pioneer's research facilities several minutes west of the main campus generates over 20 tons of waste in the form of plastic array tape and pipette tips. While both are made of recyclable materials, due to their particular geometry they cannot be accepted by Pioneer's current recycler. The intern will be working with a committee of researchers at the facility to find a solution that will allow these materials to be recycled.

HY-LINE INTERNATIONAL

DANIEL JENSEN
CIVIL/ENVIRONMENTAL ENGINEERING, IOWA STATE UNIVERSITY

DALLAS CENTER

COMPANY BACKGROUND

Hy-Line International is a poultry company that specializes in genetics. Hy-Line brand laying hens produce 44 percent of the world's eggs and 85 percent of the nation's white eggs at locations worldwide. Regionally, Hy-Line employs approximately 150 people in Dallas County and has hundreds of other locations nationally and internationally. The facilities are categorized into three main areas of production; hatchery, research farms and cooperator farms. In 2011, Hy-Line in Dallas Center shipped more than 3.6 million live female chicks, 540,000 live male chicks and millions of hatching eggs.

PROJECT BACKGROUND

Hy-Line generates a variety of wastes associated with poultry production, including hatchery waste, whole eggs, liquid eggs, spent hens, solid manure and liquid manure slurry. Current waste management procedures include rendering, field application, incineration, feed additive production, composting and landfilling. In this 24-week project, the intern is re-evaluating the current organic waste management practices in order to minimize costs and produce environmental benefits.

INCENTIVES TO CHANGE

The goal of the internship project is to cut disposal costs by 50 percent and convert wastes to value-added products that can be used locally. These products could help neighboring farmers and greatly reduce the costs associated with Hy-Line's organic waste.

RESULTS

The intern first established an organic waste baseline to analyze the volume of waste produced and how it is managed. This baseline was then used to evaluate the benefits of various alternatives.

Anaerobic Digester: The intern recommended that an anaerobic digester be installed at the facility. Anaerobic digestion is the decomposition of organic materials in the absence of oxygen. It would allow for a closed-loop disposal plan for all of the company's organic waste. In addition to reducing costs, a digester would produce biogas. The biogas could be used to power a 225 kW generator that, in turn, could significantly reduce Hy-Line's energy bills. A digester would also produce liquid fertilizer and digestate (solid soil amendment). These products are less harmful to the environment than direct application of raw manure to farmland and could be sold to provide additional economic benefit.

As required by the company, a professional third-party feasibility study will be done to confirm the project's feasibility. Other opportunities for organic waste reduction that involve less capital investment than a digester include in-house composting, third party composting and processing the organic waste into livestock feed.

Whole eggs: A recent regulation set by the U.S. Food and Drug Administration requires new standards regarding storage temperature of eggs sold for human consumption. A change in storage temperature at the facility would affect the hatchability of the eggs so millions of the company's whole eggs will now have to be disposed of. The intern identified a compost facility and a nutrient recycling company willing to take the eggs at no charge. This practice is expected to save the company $40,000 in landfill fees and divert 883 tons of special waste from the landfill annually.

Lighting: The intern is investigating the potential energy savings associated with an LED lighting retrofit. Testing is underway to determine if the use of LED lighting produces adverse affects on the birds' health or production. If test results are favorable, the project could significantly reduce energy costs for lighting in the barns housing the layer hens.

Other Projects: The intern has identified additional opportunities to reduce energy usage and divert waste from landfills. Projects include the use of an infrared camera to determine the efficiency of large egg coolers and to develop a municipal solid waste recycling and reduction plan.

PROCTER & GAMBLE

JUSTIN MCANINCH
MECHANICAL ENGINEERING, THE UNIVERSITY OF IOWA

IOWA CITY

COMPANY BACKGROUND

Procter & Gamble started in 1837 as a small soap and candle company based in Cincinnati, Ohio. It has since grown to a multi-billion dollar Fortune 500 company with facilities worldwide and products ranging from beauty and grooming to household care. The Procter & Gamble facility in Iowa City, Iowa, began operation in 1956 and manufactures shampoos and conditioners, oral rinse products, and body wash. The brands produced are Pantene®, Head & Shoulders®, Herbal Essences®, Aussie®, Gillette®, Scope®, Crest Pro Health®, Olay®, Old Spice®, and Ivory®. The plant employs approximately 630 people in its manufacturing facility.

PROJECT BACKGROUND

The Procter & Gamble Hair Care site in Iowa City has waste heat sources spread throughout the facility. The purpose of the 24-week intern project at Procter & Gamble is to assess and research technologies to recapture, transfer and store heat energy, identify inefficiencies in the steam trap program and optimize boiler efficiency. The intern will continue to collect data and research recovery options in the coming weeks.

INCENTIVES TO CHANGE

In an effort to improve the environmental profile of its operations, Procter & Gamble's goal is to reduce production of energy, waste, CO_2, and water usage by 20 percent in 2012, as compared to 2007 data. While the company has achieved a reduction per unit of production of 57 percent in waste and 22 percent in water usage, energy and CO_2 have only been reduced by 16 percent and 12 percent respectively.

Therefore, the goal of the Procter & Gamble Iowa City site is to reduce electricity and natural gas usage by 20 percent. Accomplishing this goal will not only support Procter & Gamble as a whole, but will also reduce utilities costs and emissions.

RESULTS

Waste Heat Recovery: The available waste heat energy has been quantified at several locations, but many more locations remain to be investigated. Preliminary results show that collecting energy, augmenting the quality with a heat pump or similar device, and delivering to processes is possible. This project may be divided into two subprojects focusing on different locations in the facility. Financial feasibility will be determined during the next 12 weeks.

Replace Failed Steam Traps: It is estimated that each failed steam trap at the facility costs $626 - $1,343 per year in wasted steam. Surveys have been conducted for 250 of the 600 traps at the facility and several failed traps were identified. Surveys will continue and recommendations for replacement will be made during the next 12 weeks.

Implement Steam Trap Maintenance Program: Steam energy is currently being lost to leaks, failed traps, and lack of insulation. To address this, the intern is working with

utilities personnel to implement a comprehensive steam trap maintenance program including a rotating schedule for trap surveys, established protocols for trap replacement, standards for trap installation, equipment training, and resource materials creation. As a part of this effort, the intern has promoted the creation of steam trap maps to facilitate future trap surveys and has organized training for ultrasonic measurement.

Steam System Insulation and Heat Recovery: Currently, most steam traps and some lengths of condensate return lines are not insulated. The intern is investigating savings from using removable steam trap insulation and condensate return line insulation. Additionally, some condensate from the steam lines is sent to the sewer and is not recovered for boiler feed water. Condensate recovery options are also being investigated.

Boiler Efficiency: As boiler efficiency increases, the cost of producing steam will decrease. The intern is investigating opportunities for increasing efficiency through automated controls for O_2 and CO, upgrading the burners, and installing economizers.

ROSENBOOM MACHINE AND TOOL

BRANDON HUTH
CHEMICAL ENGINEERING, IOWA STATE UNIVERSITY

SHELDON AND SPIRIT LAKE

COMPANY BACKGROUND

Rosenboom Machine & Tool manufactures custom hydraulic cylinders for a variety of markets. The Sheldon, Iowa, plant is home to the corporate headquarters and includes a 200,000-square-foot manufacturing plant. The company has added a 250,000-square-foot plant in Spirit Lake. These two plants operate 22 hours per day, six days per week. Raw material enters the plant and is turned, milled, welded, and assembled into cylinders. The cylinders are then pressure tested and painted per customer requirements.

PROJECT BACKGROUND

The intern conducted a waste audit of both Sheldon and Spirit Lake manufacturing facilities. Using this profile, the key contributors to the waste steam were identified and prioritized according to potential savings. After identifying the large contributors to the waste stream, the intern identified solutions that would reduce the amount of waste generated and increase the marketability of the scrap that is unable to be reduced.

INCENTIVES TO CHANGE

Rosenboom Machine & Tool teamed with the Pollution Prevention Intern Program for 24 weeks to strengthen its environmental stewardship and to lower operating costs at its Spirit Lake and Sheldon facilities. Raw materials represent a large percentage of the total cost of a cylinder, so reducing the waste metal associated with production would make Rosenboom a more profitable company. Solid waste going to municipal landfills represents a large expenditure that could be reduced through a recycling program. With careful planning, 90 percent of the current trash volume could be diverted from the landfill.

RESULTS

Metal Shavings Processing: Metal shavings generated in the manufacturing process at Rosenboom are currently picked up by a local scrap hauler for recycling. Generation of the shavings cannot be reduced, so developing a process to increase marketability and reduce associated handling costs of the metal shavings is the most appealing option. Processing the shavings into a marketable form could allow Rosenboom to close the loop on the raw material providers and potentially generate additional revenue.

Cut Management: A large variety of rod and tube material are cut each day. Often, the entire stock length of material cannot be used, generating an unusable short end. This short end then becomes scrap since it is too short to reuse in a different cylinder. A computer program can be used to optimize cut lengths made from each full rod or tube and minimize remaining scrap.

Cardboard Recycling: Cardboard tubing, which protects the chrome plated rods during shipping, represents over 50 percent of the waste sent to the landfill. Baling the cardboard would allow it to be recycled, diverting 350 tons per year of cardboard and other recyclables from the landfill. The baler could also recycle white office paper and brown kraft paper. These items are not large contributors to the waste stream, accounting for less than 70 tons per year, but are easily recyclable commodities.

Pallet Diversion: When materials arrive at Rosenboom on wood pallets that are either damaged or do not meet Rosenboom's specifications for reuse, they are sent to the landfill. In the next 12 weeks, the intern will identify a suitable vendor capable of repairing or otherwise diverting these pallets from the landfill. The intern will also investigate the feasibility of reusing these pallets internally for other projects. The combination of recycling and pallet diversion will substantially reduce Rosenboom's solid waste disposal fees.

Hazardous Waste: In the next 12 weeks, the intern will work with the paint line in Spirit Lake to identify improvements for its solvent recovery and recycling systems. The intern will provide Rosenboom with several options for solvent recycling and reuse. Improvements could lower Rosenboom's solvent purchasing costs, hazardous waste disposal costs and regulatory burdens.

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» Join the P2 INTERN PROGRAM in 2012!

STUDENT APPLICATION & BUSINESS REQUEST FORMS are available online at:
www.iowap2interns.com
Forms may be submitted electronically, faxed or mailed.

FOR COMPANIES

Pollution Prevention Services is currently accepting requests for 2013 intern projects. Companies must submit a project request that identifies a focus project and outlines the desired objectives and deliverables. Requests must be submitted by December 1, 2012 to be considered for 2013 intern placement.

Requests will be reviewed upon receipt and companies contacted within one week for additional project development. Final determination of acceptance will be made within 30 days after project development is completed. Intern assignments for finalized projects will begin in OCTOBER OF 2012.

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 disciplinesare encouraged to submit the following documents for consideration:

- Application Form
- Résumé
- Cover Letter
- Unofficial copy of transcripts
- List of Fall 2012 and Spring of 2013 classes

Selection of 2013 interns will begin in October and continue into the spring until project assignments are finalized.

Pollution Prevention Services is offering internships for 12-weeks (May 20-August 9) or for 24-weeks (May 20-November 8) in 2013.

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

SUBMIT PROJECT REQUESTS & APPLICATIONS TO:

DANIELLE DILKS, P2 Intern Program Coordinator
Iowa Dept. of Natural Resources
502 East Ninth Street
Des Moines, IA 50319-0034

P: 515.281.8063 | F: 515.281.8895
Danielle.Dilks@dnr.iowa.gov

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