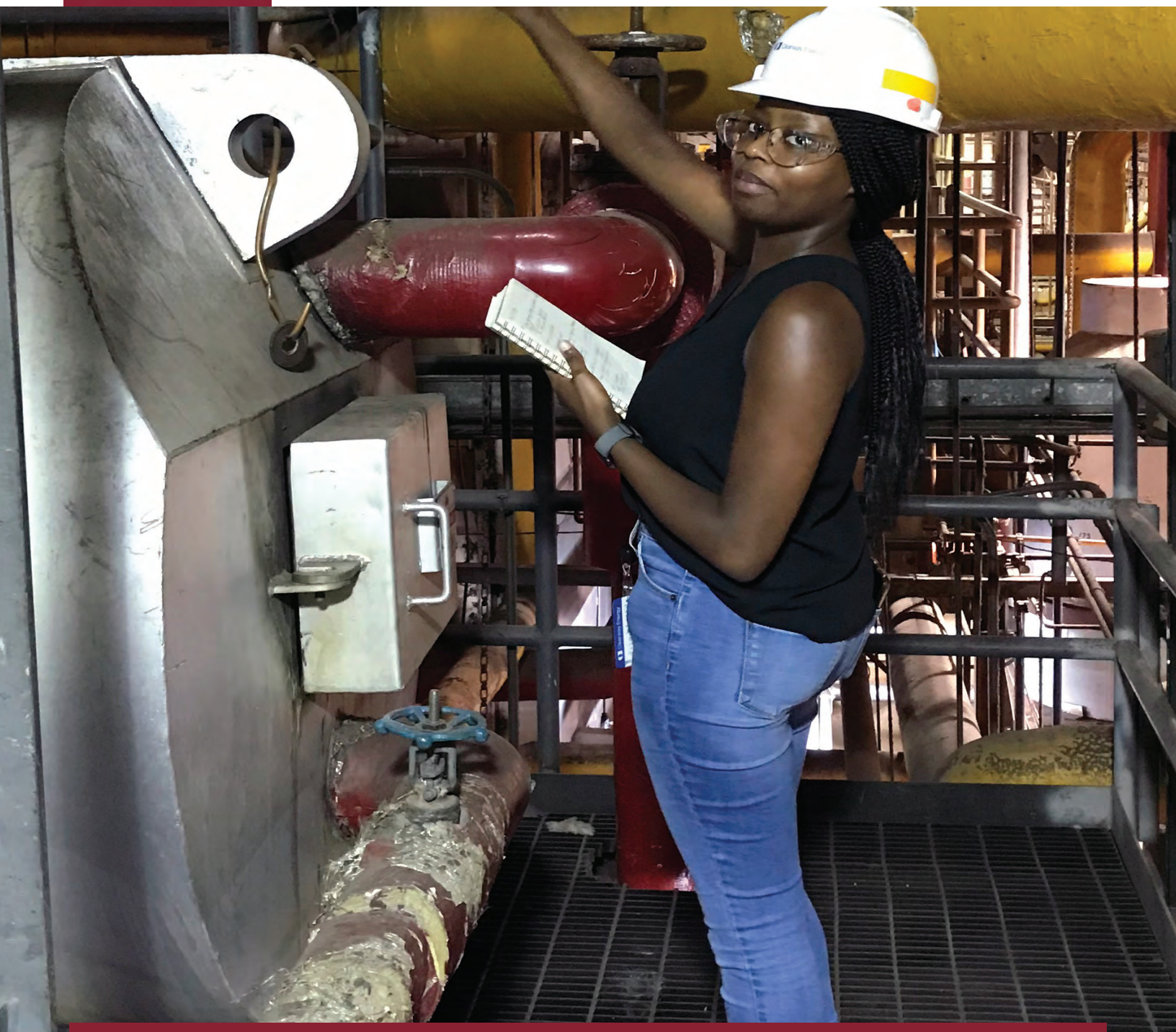
MnTAP

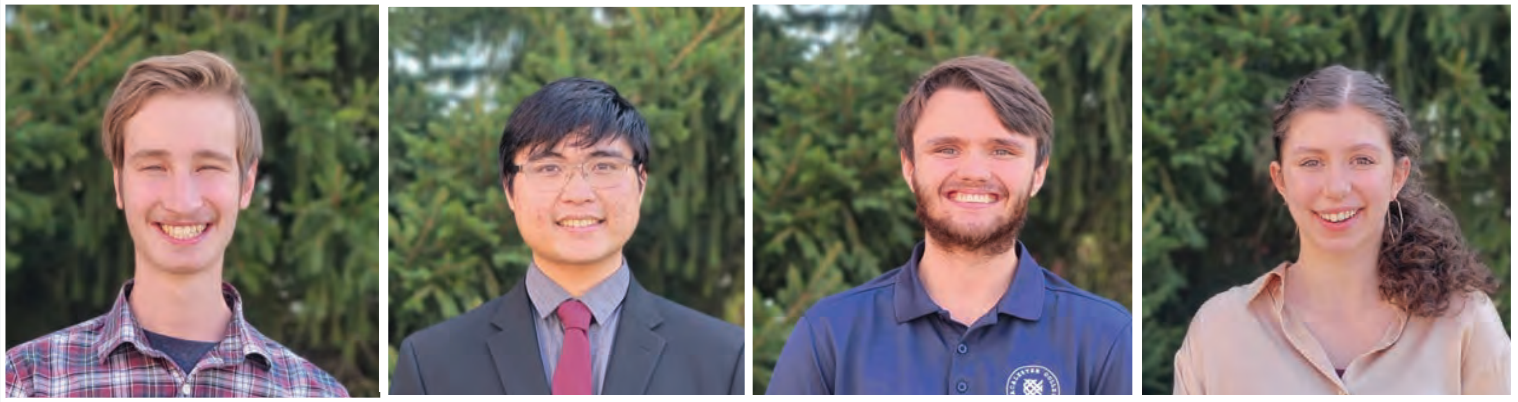
SOLUTIONS



2022 MnTAP Intern Program

"Special thanks to our partners who made the 2022 MnTAP Intern Program a great success. The students, host companies, MnTAP staff, financial sponsors and partners all play a vital role in making these business and environmental SOLUTIONS possible."

~ Laura Babcock, MnTAP Director



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Intern Projects

Project Focus Key

 Chemicals

 Electricity/ Natural Gas

 Water

 Waste

MnTAP thanks our generous partners who make this vital work possible. Each of these organizations contributed financially to the intern program in 2022. Their support helps maintain our continuing pollution prevention, energy efficiency and water conservation work.

METROPOLITAN COUNCIL

"The Metropolitan Council is pleased to partner with the MnTAP program. By connecting student interns to industries, commercial entities, and communities to identify and improve water and energy efficiency, MnTAP provides essential expertise and services to our organization and the Metropolitan Planning Region. Communities benefit, water resources and the environment benefit, business and industries benefit, and students gain essential on the job experience. This is a true win-win-win relationship, and we are proud to work with this exceptional group of professionals."

~ John Clark, Ph.D., Principal Environmental Scientist
Metropolitan Council Environmental Services

Xcel Energy® RESPONSIBLE BY NATURE®

"Xcel Energy greatly values its partnership with the MnTAP Intern Program and is proud to support it year after year. The knowledge and expertise the student interns provide for our customers enables them to implement energy efficiency projects and earn incentives through Xcel Energy's various rebate programs. The value MnTAP brings to Xcel Energy, our customers, and the next generation of energy efficiency and waste reduction specialists is immense."

~ Leah Piotraschke, Product Portfolio Manager
Xcel Energy

MINNESOTA POLLUTION CONTROL AGENCY

"The 16 projects that made up this summer's intern program led to some of the more creative and successful solutions I've seen yet. For example: One recommended operational change at Stylmark netted a $18,000 annual savings with no cost required to implement. Overall, nearly 30 percent of intern recommendations had already been implemented by the end of the summer, demonstrating the kind of effective results you can achieve by investing in a summer intern project."

~ Mark Snyder, Pollution Prevention Coordinator
Minnesota Pollution Control Agency

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

Funding for one 2022 MnTAP Intern project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources.

"The MnTAP internship program is innovative and effective. Project updates to LCCMR always show that significant conservation measures have occurred at the host facilities, and we appreciate getting to watch the development of Minnesota's future workforce unfold in real-time."

~ Legislative-Citizen Commission on Minnesota Resources

CenterPoint Energy

For several years CenterPoint Energy has been a proud sponsor of the MnTAP Intern Program. In addition to the students learning in real life scenarios, our customers benefit from getting a fresh set of eyes on a particular project or opportunity they're interested in. It's a win-win! The program prepares students for a career in energy and engineering while our customers benefit from their enthusiasm and knowledge. The MnTAP experience has been an enjoyable one and CenterPoint Energy will continue to support this great program in the years to come."

~Todd H. Berreman, Director of Energy Efficiency
CenterPoint Energy

2022 Intern-Proposed Solutions

Recommendation	Reduction	Cost Savings	Equivalents (annual)
Water Conservation	68,700,000 gallons	$627,000	Water for more than 3,000 Minnesota residents
Waste	742,000 lbs	$588,000	Annual waste from 370 Minnesota residents
Chemicals	70,000 lbs	$26,000	Over 140 55-gallon drums
Electricity	5,980,000 kWh	$486,000	Electricity for over 630 Minnesota homes
Natural Gas	556,000 therms	$627,000	CO_2 emissions from 625 passenger vehicles
Production Impacts	---	$684,000	---
Total Potential Cost Savings	**---**	**$3,038,000**	**---**

For more information and applications, contact Intern Program Manager Matt Domski at 612-624-5119, mdomski@umn.edu or at www.mntap.umn.edu/interns/business/howtoapply/

Be Part of the 2023 Intern Program

A History of Success

For over 35 years, MnTAP has been coordinating an intern program that places highly qualified students in facilities for three months to focus on pollution prevention, energy efficiency and water conservation solutions. The goal of the program is to provide benefits to companies and students while extending MnTAP services to businesses around the state.

Interns Have Far-Reaching Impact

The interns' impact reaches far beyond the walls of the facilities; many solutions identified during projects have been applied to other companies, increasing the impact of the program.

Companies Reap Rewards

More than 380 companies have been served by the program. Interns have worked with industries such as hospitality, healthcare, manufacturing, and food processing. The bottom line is MnTAP intern projects result in solutions that positively impact a business and reduce its environmental footprint.

Sign Up Now

Do you have a pollution prevention or energy efficiency project that you'd like to tackle, but are pressed for time? Would you like to help a science or engineering student advance their technical skills while providing them with a real-world opportunity to use their classroom knowledge?

Now is the time to start thinking about developing a project for next summer. Applications are accepted **through February 2023 or until spots are filled**.

Advance Corporation

Madeline Danforth
Chemical Engineering
University of Minnesota Duluth

Company Background

Located in Cottage Grove, Advance Corporation is a braille signage and custom awards company that employs 60 people. Founded in 1941, Advance Corp began as a flexographic products manufacturer, which led the company to develop a wide variety of engraving and etching capabilities closely aligned with the printing industry. In 1990, the company formed its Braille-Tac™ division and began producing wayfinding sign systems and ADA-compliant signage. Both the Award line and the Braille-Tac™ divisions feature products fashioned in an impressive array of materials, styles, and design specifications. While Advance Corp's processes and products have evolved, its commitment to quality and customer satisfaction has remained the same since its establishment over 80 years ago.

ADVANCE CORPORATION

"Over the summer, I gained an abundance of knowledge and was able to explore projects that allowed me to think creatively. The most rewarding part is the impact that my projects will have, and I am thankful for the opportunity that I was given." ~MD

Project Background

A major part of Advance Corp's longstanding success is the company's ability to maintain a high standard for its products despite changes in the industry. As part of its new green initiative to combat wastes of all forms, the company made the decision in 2022 to discontinue its magnesium die product line. In addition, the company began working with Environmental Initiative to explore the opportunity for reducing air emissions from its painting and finishing operations. These changes led to interest in a MnTAP intern to determine the waste saving potential of discontinuing the magnesium etching process as well as switching to a lower emission paint system.

Incentives to Change

Although nitric etching had long been a core operation at Advance Corp, it became clear that eliminating this process would offer substantial benefits from both business and environmental standpoints. The process generated significant amounts of wastewater, resulting in high labor and chemical expenses and elevated regulatory compliance requirements. Removing production from this line would help the company reduce its non-value added processes and waste profile, saving labor, material costs, waste disposal fees, and productivity.

Volatile organic compounds (VOCs) contained within the paints applied to signage are a risk to worker health. Advance Corp had made efforts in the past to explore lower VOC options but had not found satisfactory products available from their paint supplier. Another challenge was the additional equipment costs for spray equipment compatible with water-based finishes. Grant funding available through Ramsey/Washington Recycling & Energy meant that Advance Corp had the opportunity to offset costs.

SOLUTIONS

Switch to Low VOC Paints

A majority of the VOCs emitted come from the paints used for metallic substrates. The intern assessed performance of several alternative paints containing fewer VOCs to identify an optimal paint system and determined that making the switch would save 1,570 lbs of VOC emissions. A significant benefit was that the paint supplier provides color-matching software to reduce time spent matching colors manually. VOC emissions can be reduced by 1,570 lbs from this change, enabling a savings of $18,000 in labor costs.

Solutions

Switch to a Water-based Wood Finishing System

An analysis of the VOC outputs by product found that Advance Corp's wood finish was the highest generator of emissions. An alternative wood finish was identified that would result in an overall decrease of 20%—840 pounds—in VOC emissions, with a cost savings of $1,800.

Optimize Sprinkler System

Irrigation consumes over 60% of Advance Corp's water usage. It was found that a 5-minute reduction of each irrigation cycle could save 97,000 gallons of water and $640. Additional improvements to the system included replacement or repair of several damaged or leaking rotors, adjustment of rotor positioning to increase watering coverage, and shutoff of a native prairie grass zone that did not require irrigation.

"Madeline was given several goals to examine and recommend changes to our operation. Goals were met and, due to her outstanding performance and dedication, her efforts have far exceeded expectations. She established processes to reduce our exposures by hundreds of thousands of dollars per year and above all caused a reduction of VOCs, wastewater and hazardous waste in our company."

~Glen Lorenz, CEO
Advance Corporation

Reduce Wastewater by Removing Nitric Etching Process

Advance Corporation is transitioning to CNC machining as a means of replacing production from their legacy nitric etch line. The shutdown of the nitric etch line means a significant portion of wastewater will be eliminated, allowing Advance Corp to haul the remainder for off-site treatment. Anticipated wastewater generation from the remaining process equipment was estimated at under 10% of the current waste volume, helping to save $132,000 in combined labor, chemical, and hazardous waste costs.

Recommendation	Annual Reduction	Annual Savings	Status
Switch to Low VOC Paints	1,570 lbs VOC emissions	$18,000	Recommended
Switch to Water-based Wood Finishing System	840 lbs VOC emissions	$1,800	Needs Further Investigation
Optimize Sprinkler System	97,000 gal water	$640	Implemented
Reduce Wastewater by Removing Nitric Etching Process	96,000 gal water 107,000 lbs of hazardous waste	$132,000	Planned

MnTAP Advisor: Daniel Chang, Associate Engineer

Ball Corporation

Michael Fleming
Mechanical Engineering
University of Minnesota Twin Cities

Organization Background

Ball Corporation is a world leading producer of recyclable aluminum packaging headquartered in Westminster, Colorado. Although the company was founded in 1880, the Global Beverage Packaging department was not formed until 1969, when Ball Corporation acquired the Jeffco Manufacturing Company in Golden, Colorado. Ball Corporation acquired an existing Rexam plant in Saint Paul, Minnesota in 2016. Ball Corporation - Saint Paul is just over 160,000 square feet and employs roughly 110 personnel full-time. The facility's only manufactured product is the 12 oz aluminum can and it produces roughly 5 million cans per day.

"My role as a MnTAP intern gave me hands-on experience in a dynamic manufacturing setting. I had the opportunity to network with industry professionals and improve my project management skills. I am very grateful to Ball Corporation for hosting me, and I value the connections I have made with both the MnTAP and Ball Corporation team members. This project has also shown me the importance of combining my career in mechanical engineering with my passion for environmental stewardship." ~ MF

Project Background

Ball Corporation is continuously making investments towards improving the can manufacturing process from start to finish. Water is a critical component of many manufacturing steps at Ball. This project specifically focused on reducing the facility's water consumption and improving various processes within the wastewater treatment protocol. Opportunities were identified to save water through reuse of treated wastewater and improve discharged water quality by making a more robust monitoring and control system for chemical use in treatment of wastewater.

Incentives to Change

Ball is focused on sustainability and as a leader in producing recyclable aluminum packaging, they are committed to reducing waste, energy and water consumption. Not only does a greener industry support the company's overarching mission, but it also aligns with Ball customers' desire for a responsibly sourced and produced product. Ball has made a commitment to being carbon neutral prior to 2050 and is currently working towards a 55% reduction in greenhouse gas emissions by 2030. Ball Corporation also places a large focus on using recycled materials for production. It is estimated that 75% of all aluminum ever produced is still in use today and Ball has its sights set on developing an infinitely recyclable product.

SOLUTIONS

Reclaimed Water Use for Polymer System

Anionic polymer is added to a tank and mixed with wastewater before entering a series of two lamella clarifiers. The activated polymer binds with any metals or particles in the wastewater and eventually forms a flocculant that can be precipitated out of solution. Currently, a chemical feeder uses a freshwater feed to inject polymer into the flash tank. A system has been proposed to utilize recycled water in place of the freshwater feed. The recommended solution would result in 1,100,000 gallons per year (GPY) of water savings and $10,800/yr in cost reduction.

Automation of pH Control for Wastewater Holding Tank

A volumetric feeder injects a lime slurry into a wastewater holding pit to maintain a desired pH. The current pH correction system often needs manual pH adjustments. A system has been proposed that would monitor and correct pH with caustic soda and would use a chemical dosing pump and automatic pH controller. The recommended solution would remove the need for manual pH adjustment and eliminate 6,000 lbs/yr of waste.

Solutions

Automatic Flow Control Valve for Can Washer

The nine-stage can washer at the facility accounts for almost 60% of the facility's daily water usage. A manually operated valve with an upstream flowmeter controls the flow of water and requires adjustments as facility water demands fluctuate. To keep the flow at a constant rate, a hydraulic actuated automatic flow control valve has been recommended to replace the manual control valve currently in use. The recommended solution would result in 1,500,000 GPY in water savings and $13,800/yr in cost reduction.

Deionized Water Recharge Frequency

Deionized (DI) water is used in the last two stages of the can washer for a spot-free rinse. During the internship, the service life of the DI systems was monitored, and it was found that an increase in the recharge set point of the DI columns from 3.5 uS/cm to 4.5 uS/cm would result in substantive chemical and water savings. Increasing the system recharge set point by 1 uS/cm would result in 230,000 GPY and $2,800/yr in water savings. The recommended solution would also decrease chemical use due to fewer system recharges, resulting in savings of an additional $4,300/yr in cost reduction.

"Having a MnTAP intern this summer was a great experience. Water conservation opportunities were quickly found at our plant in St. Paul, and detailed plans were prepared on how to reuse water, save capital, and in one case, run our equipment more consistently. These plans and ideas were also shared and implemented in other manufacturing plants across North America."

~Scott Lang, Quality Manager
Ball St. Paul

Recommendation	Annual Reduction	Annual Savings	Status
Recycled Water Use in Anionic Polymer System	1,100,000 gal water	$10,800	Recommended
pH Automation	26,000 lbs lime 6,000 lbs sludge	NA	Tentatively recommended
Automatic Flow Control Valve	1,500,000 gal water	$13,800	Recommended
DI System Recharge Adjustment	230,000 gal water 40,000 lbs chemical	$7,100	Recommended

MnTAP Advisor: Kelsey Klucas, Engineer

Beckman Coulter

Nicole Thompson
Sustainable Systems Management
University of Minnesota Twin Cities

Company Background

Beckman Coulter was founded in 1935 in Pasadena, California. It is headquarted in Brea, California with facilities all over the globe. Beckman Coulter Diagnostics in Chaska, Minnesota, has around 1,000 employees. They manufacture diagnostic systems consisting of chemical test kits and equipment for biomedical testing in various settings such as hospitals, physician offices and reference laboratories.

"This summer, my internship provided me with the opportunity to pull knowledge from all of my different skill sets and put them together to really make a difference. I have learned so much about what it means to be in a professional setting, but more than that, this internship has confirmed that I am on the right career path. I am forever grateful." ~ NT

Project Background

Beckman Coulter Diagnostics wanted to improve their resource use in relation to other Beckman Coulter facilities. Initial data indicated they were generating around 400 tons of solid waste per year and consuming almost 6 million gallons of water and 3 million kWh of electricity. With this in mind, Beckman Coulter reached out to MnTAP for assistance to make the company more environmentally friendly through water conservation, energy efficiency, and waste reduction.

Incentives To Change

Beckman Coulter Diagnostics has a goal to become a zero waste to landfill facility. They are committed to minimizing their waste streams and diverting any remaining waste from the landfill to compost or recycling. In 2021, Beckman Coulter Diagnostics formed a sustainability team with an initial goal of reducing the waste sent to landfill by 15% by the year 2024.

SOLUTIONS

Increase Recycling

The medical industry uses plastic extensively for packaging, bubble wrap, and to preserve sterility. Surveys of waste bins identified twenty two distinct items, accounting for 65,000 lbs/yr of plastic that can be diverted from the landfill and sent to Trex, where it will be recycled into decking. Expanded polystyrene foam (EPS or styrofoam), used for lightweight coolers and protection of items during shipping, is difficult to recycle because of its low density and high volume. Beckman Coulter purchased a shipping container to collect the estimated 10,000 lbs per year of EPS generated, and arranged for monthly collection by Healthy People Healthy Planet Limited Alliance, a local non-profit startup that densifies it so it can be recycled into new products.

Switch to Reusables

Bottles of substrate solution for use with diagnostic machines are currently packaged and shipped to the distribution center using conventional disposable pallet packaging. Switching to returnable, reusable plastic pallet packaging will eliminate 59,000 lbs of wood pallets, cardboard, and plastic wrap annually. Working with the bottle supplier to provide empty bottles directly in the reusable plastic totes used on the filling line may be able to reduce an additional 5,600 lbs, while providing labor savings and avoiding ergonomic risks from unpacking the boxes and loading the totes.

Additional reuse opportunities are to upgrade tableware and culture bottles from disposable to reusable, and to reuse ice packs received with incoming shipments. Many of these waste reduction opportunities, as well as some recycling and composting projects, are eligible for grants from Carver County through their partnership with Waste Wise, which will make the payback times even faster.

Solutions

Composting Organics

Paper towels, napkins, food waste, and BPI certified compostable items generated in cafeterias and bathrooms adds up to 125,000 lbs of compostable waste per year. By eliminating individual trash cans and implementing a 3-bin system including recycling, compost, and trash, Beckman Coulter will be able to compost these materials and divert around 18% of their annual waste from the landfill.

Optimize Lawn Irrigation

With five buildings on the campus, Beckman Coulter uses 6 million gallons of water a year, about half from lawn irrigation. By adjusting watering schedules and installing a moisture sensor into the soil at a cost of around $1,100, the use of the sprinklers can be diminished by at least 30%, saving 1.1 million gallons of water and $11,000 annually.

"In her supporting role, Nicole readily acted on challenges, identified and seized new opportunities, and always displayed a can-do attitude. She asked the right questions to accurately analyze solutions, acquired data from multiple sources when solving problems, and weighed the risks and benefits of different solution options. We were thrilled with Nicole's contributions to help us accomplish our program goals."

~ Bryndon Lembke
Senior Manager, Environmental Health & Safety

Install Strip Door

A chilled room in the warehouse has a large well insulated door, but during the loading and unloading process, the door must remain open, allowing cooled air to escape. A PVC strip curtain installed behind the existing door would reduce heat exchange by 80-90%, while still allowing forklifts to pass. This would save 6,300 therms, and $6,000 per year.

Recommendation	Annual Reduction	Annual Savings	Status
Increase Recycling	75,000 lbs	$7,400	Partially implemented
Switch to Reusables	146,000 lbs	$170,000	Recommended
Compost	125,000 lbs	$1,850	Implementing
Optimize Irrigation	1.1 million gal water	$11,000	Implementing
Install Strip Curtain	6,300 therms	$6,000	Implementing

MnTAP Advisor: Jane Paulson, Senior Engineer

Clearway Energy

Olajumobi Akeeb
Chemcial Engineering
University of Minnesota Duluth

Company Background

The Minneapolis Energy Center (MEC), a part of Clearway Community Energy, has been serving downtown Minneapolis for nearly 50 years. It is one of Clearway Community Energy's largest and longest-running district energy systems, employing 50 people. The MEC has been operating since 1972, while maintaining a 99.99% reliability rating. The MEC serves commercial and industrial customers, higher education, hotels, residential developments, municipal, county, state, and federal government buildings, and ballparks.

Clearway Community Energy

"It has been a privilege to be a part of the MnTAP program for the second time! I had the opportunity to gain more experience in the field of sustainability and efficiency. Starting this internship at the Minneapolis Energy Center, I got a lot of support from the managers, supervisors, and other staff members at the plant, and I am thankful for all their help. The MnTAP staff also served as great resources during the completion of my projects. This experience has prepared me for my career in energy efficiency and I am excited to see what comes next!" ~ OA

Project Background

The MEC has made great strides over the decades to improve the environmental performance of its nine plants in the downtown area. Various projects and studies involving water conservation and energy efficiency have been previously carried out in the facility. The goal for the main plant was to continue this work by completing a facility wide evaluation of water use and identifying opportunities for conservation and improvement.

Incentives To Change

As a district energy company, the MEC feels a responsibility to be a good steward of the environment. Consequently, minimizing resource use is a top priority. One way they do this is by reducing, reusing, or recycling water whenever possible. Decreasing water use is not only good for the environment but also decreases operating costs, the benefits of which can be passed along to their customers.

SOLUTIONS

Reuse Cooling Tower Water in Boiler Blowdown Quench Process

Boiler blowdown water is typically over 220°F. However, the maximum allowable sewer discharge temperature in Minneapolis is 140°F. Currently, city water is mixed with blowdown water to quench it to an appropriate temperature. The water discharged from the cooling towers could be recycled to cool the blowdown water instead. This would reduce city water use by 5,370,000 gallons per year, saving $62,400 annually.

Clean Chiller Tubes Mid-Cycle

Chillers are kept in operation for the entire cooling season before the tubes are cleaned. During this time, the well water that runs through them causes a buildup of fouling that impedes heat transfer. Mid-cycle cleaning could reduce the fouling and improve chiller efficiency. An automatic cleaning system could be trialed on two of the five chillers. The energy savings from this recommendation would be about 94,000 kWh and $21,600 per year.

Solutions

Install Air-Compressor with a VFD

The air-compressor on site functions on a load/unload cycle. When it is loaded, it operates at full capacity regardless of compressed air use, and when it is unloaded, it still uses energy while not performing any useful work. Installing an air-compressor with a VFD would allow the energy use of the compressor to match the compressed air demand and eliminate energy wasted during the unload phase. This solution would save 144,000 kWh and $10,700 annually.

Install VFD on Boiler Fan Motors

Variable inlet vanes are currently used to control the air flow into the boilers. Although they are the most efficient type of mechanical damper, installing variable frequency drives on the boiler fan motors would increase efficiency by matching the power of the motor to the amount of air flowing into the boilers. If implemented on four boilers, this could save 1,270,000 kWh and $114,500 per year.

"The MnTAP staff were well organized and had a schedule laid out for the summer that helped make the projects successful. Jumobi did a wonderful job jumping right into the projects and getting familiar with new topics. She utilized her past experience along with onsite expertise to ensure project deliverables were accurate and complete. The MnTAP staff also provided support and/or contacts whenever Jumobi needed help."

-Chris Rheineck, Production Manager
Clearway Energy

Recommendation	Annual Reduction	Annual Savings	Status
Reuse cooling tower water	5,370,000 gal water	$62,400	Recommended
Clean chiller tubes mid-cycle	94,000 kWh	$21,600	Investigating
Install air compressor with VFD	144,000 kWh	$10,700	Recommended
Install VFD on boiler fan motors	1,270,000 kWh	$114,500	Recommended

MnTAP Advisor: Gabrielle Martin, Associate Engineer

Faribault Mill

Payton Buendorf
Mechanical Engineering
University of Minnesota Twin Cities

Organization Background

Faribault Mill is located along the Cannon River in Faribault, MN, where the Mill has resided since 1892. The facility is one of the last remaining vertically integrated textile mills in the United States. Raw wool comes into the Mill and leaves as a finished blanket, throw, pillow, or bag. The many steps of processing all happen in this one location. The Mill employs around 100 people to run these processes, which range from sewing to heavy machine operation.

FARIBAULT MILL
SINCE 1865

"My experience working with MnTAP and Faribault Mill helped me to branch out of the classroom and theory into some really interesting projects. The Mill presents a unique environment, and I am glad I got to spend a summer learning as much as possible about the world of textile manufacturing." ~ PB

Project Background

Three main areas for investigation were electric motors, fluorescent lighting, and compressed air systems. With high runtime, even minor gains in these three areas can cut energy use and emissions significantly over the lifetime of the equipment. Furthermore, the Mill has been in the process of investigating a water heater upgrade to fully utilize the equipment that it feeds.

Incentives to Change

In the energy space, the Mill consumes around 2.2 million kWh of electricity per year and 110,000 therms of natural gas per year. Electricity is primarily consumed by electric motors and lighting, while natural gas is used for various heating tasks, such as boilers, water heaters, and driers. Much of the energy-consuming equipment is older than recent standard updates and government efficiency regulations, so opportunities to save energy exist almost everywhere. The price of electricity has increased by 65% from 1999 to 2018, and a further 24% rate increase over current prices is proposed by 2024. Cutting down on electricity use not only lessens the environmental impact of the Mill but can also save a significant amount of money. All three areas were investigated to find energy savings and several upgrades were recommended in lighting, compressed air, and water heating.

SOLUTIONS

Purchase Direct-Contact Water Heater

The current water heater puts out 4.5 million BTU per hour of heat, supplying 90 gallons per minute of hot water to the process. This is not enough to fully utilize the wet-dry department, which is adding a machine this year, so an upgrade is necessary for the Mill to achieve improved production capacity. In order to feed all four machines, a water heating system capacity of 8.7 million btu/h is necessary. Water can be heated via 3 methods: natural gas water heater, electric water heater, or via steam from a natural gas boiler.

Due to the high efficiency available, it is recommended that the Mill install an additional 5 million btu/h natural gas water heater using the direct-contact heating method. These units are up to 16% more efficient than a steam heating system, and cheaper to operate than an electrical system. The upfront costs are higher than the other two options, but the lifetime costs are significantly lower and the natural gas savings are significant.

Upgrade Production Lights

The Mill, like many older facilities, is equipped with fluorescent lighting in the form of tube lamps. These lamps

are not only power-hungry and put off a lot of heat, but also require ballasts in order to run, which consumes additional electricity. Production floor lights consume 144,700 kWh of electricity each year, and the storefront consumes an additional 14,300 kWh each year. The Mill is advised to replace these production floor fluorescent lights with LED tube lamps and the storefront track light bulbs with LED bulbs.

Retrofitting the current light fixtures to LEDs allows the Mill to cut energy usage by a total of 91,500 kWh each year. These lights are also drawing power during peak demand each month, and a reduction in their power draw would reduce monthly demand by 38 kW each month. Installing the lights for production requires a contractor, which would cost $37,000 after rebates. The track lights can be installed by on-site staff and would cost roughly $700.

The energy savings these improvements would create will save the Mill $12,600 each year in electricity costs using current usage and demand rates and improve light levels on the production floor. These savings provide a payback period of 3 years when both lighting projects are grouped together.

Additional Opportunities

There are many incremental changes that add up in efficiency projects like these, and each component contributes to the overall energy savings. For instance, a single compressed air leak may only cost the Mill $200 per year but repairing the overall system can save nearly 20,000 kWh per year. While little savings was found in replacing healthy, running motors, the choice to repair or replace a failed motor offers an energy savings opportunity. It is possible to recoup the incremental cost of purchasing a new motor via energy savings, and the Mill would get a new motor out of the deal.

"Faribault Woolen Mill had a great summer with our MnTAP intern. Payton was very diligent and took an interest in everything we were doing at the mill and worked well with everyone. He helped troubleshoot some of our machinery issues and was there to see the installation of our new dryer. He compiled valuable information that will assist us in making informed decisions to reduce energy costs at our facility. The MnTAP program is a valuable resource, and we appreciate the dedication and work ethic the interns bring to their projects"

~ Joyce Raesner, VP of Production, Faribault Mill

Recommendation	Annual Reduction	Annual Savings	Status
Purchase Direct-Contact Water Heater	increased production	$600,000	Recommended
Upgrade Production Lights	79,308 kWh / year 33.628 kW / month	$11,000	Investigating
Upgrade Storefront Lights	14,300 kWh / year 5.03 kW / month	$1,950	Recommended
Repair Compressed Air Leaks	19,000 kWh	$1,500	In Progress

MnTAP Advisor: Jon Vanyo, Engineer

Heartland Corn Products

David Isaac
Chemical Engineering
University of Minnesota Twin Cities

Organization Background

Heartland Corn Products (HCP), an agriculture cooperative established in 1992, produces ethanol, corn oil and dried-distillers grain (DDGS). As a cooperative, farmers deliver corn proportional to shares in the company and benefit from the value of the products less the costs of operations. HCP currently has about 60 employees and produces over 140 million gallons of ethanol, 6 million gallons of corn oil, and 290,000 tons of DDGS each year.

"In two weeks, I progressed from an undergraduate student overwhelmed by the magnitude of an ethanol plant to an intern eager to solve water conservation problems. This internship expanded my understanding of concepts covered in my chemical engineering courses and allowed me to take control of my project while working alongside experienced professionals." ~ DI

Project Background

Industrial cooling at HCP uses around 214 million gallons of water and discharges around 37 million gallons of water each year. HCP had already mapped water usage and process flow in the plant and identified the cooling towers as a focus for the project. Cooling towers continuously cycle water and as some of the water evaporates the conductivity of the water reaches a set limit and the water is released as blowdown. Adjusting the number of cycles the water does in the cooling towers (cycles of concentration) will provide opportunities to optimize cooling tower water efficiency and reduce wastewater discharge. This project also identified energy conservation opportunities such as stack heat recovery and cold-adaptive enzymes for starch hydrolysis.

Incentives To Change

As HCP plans to increase ethanol production, wastewater discharge to the city has become one of the factors preventing expansion. HCP has a wastewater limit of 100,000 GPD which it currently struggles to meet. Investment in water and energy conservation will reduce the consumption of water, decrease effluent discharge, and realize cost savings.

SOLUTIONS

Increase to 9 Cycles of Concentration

Expanding ethanol production would put more pressure on the cooling towers, thereby increasing cooling tower water consumption and blowdown (wastewater discharge) to the city. The recommendation is to increase to 9 cycles of concentration by raising the ratio of low conductivity reverse osmosis (RO) permeate to well water in the cooling tower makeup. Increasing to 9 cycles of concentration would save 15,000,000 gallons of water per year and reduce blowdown by 35%. This recommendation has no capital costs associated with it, because the existing RO system has the capacity to process this additional RO water.

Reprocess RO Reject for Cooling Tower Makeup

Research was conducted on the concept of adding a closed circuit reverse osmosis (CCRO) system to process RO reject water. The concept involved feeding the permeate water from a CCRO to the cooling tower as makeup water. It was found that this change would provide no resource or cost savings and is not currently recommended for Heartland Corn Products.

Solutions

Collect Evaporated Cooling Tower Water

Collecting evaporated cooling tower water is another way to provide low conductivity makeup water to the cooling towers. This opportunity must be implemented along with increasing to 9 cycles of concentration. Five to six percent of water evaporated by the cooling towers can be captured with plume abatement technology and used as makeup to offset some of the RO water used. An additional 15,000,000 gallons of water would be saved per year if implemented. This opportunity is not recommended since it will cost HCP $13,000 per year.

Recycle Waste Heat through Stack Heat Recovery

As air emissions are treated in the regenerative thermal oxidizer, waste heat is exhausted to the environment at HCP. Recycling the heat through a stack heat recovery system would result in annual energy savings of up to 8,820,000 therms. The recycled waste heat would be used to create low pressure steam to be sent to the evaporators used in corn oil operations. This is a future opportunity that requires further investigation.

"Heartland Corn Products was pleased to participate in the MnTAP program for the first time in 2022. It was impressive to see the wide variety of projects related to water use, energy efficiency, and waste reduction. The future looks bright for this group of interns whose efforts have made a positive impact for their host organizations and for our environment."

~Terry Wendorff, Plant Manager
Heartland Corn Products

Implement Cold-Adaptive Enzymes in Starch Hydrolysis

Enzymes are used in ethanol manufacturing to breakdown starch to glucose. Implementing cold-adaptive enzymes would reduce energy use and operating costs. This is a future opportunity that requires further investigation.

Recommendation	Annual Reduction	Annual Savings	Status
Increase to 9 Cycles of Concentration	15,000,000 gal water	$17,000	Recommended
Collect Evaporated Cooling Tower Water	15,000,000 gal water	None	Not recommended
Recycle Waste Heat through Stack Heat Recovery	8,820,000 therms	$4,410,000	Future Opportunity
Implement Cold-Adaptive Enzymes in Starch Hydrolysis	TBD	TBD	Future Opportunity

MnTAP Advisor: Laura Sevcik, Pollution Prevention Specialist

Kemps LLC

Sai Ramreddy
Chemical Engineering
University of Minnesota Duluth

Organization Background

Kemps, LLC is a dairy manufacturing and supplying company that originated in Minneapolis, Minnesota. At Kemps-Farmington, they produce sour cream, cottage cheese, and yogurt, which come in a variety of flavors. Currently, 132 employees work at the facility.

"I had a wonderful opportunity to work at Kemps-Farmington and learned a lot about dairy production. I had a great time working with various employees at Kemps in understanding the water usage of the facility. I am glad I was able to apply my knowledge and skills to be able to reduce water usage. I am grateful to MnTAP for giving me this wonderful opportunity and Kemps-Farmington for their support during my project." ~ SR

Project Background

In 2021, Kemps-Farmington used about 131 million gallons of water for various processes in the facility. The objective of this project is to quantify the water usage and make recommendations to conserve water based on the water usage. Additionally, energy savings from water recommendations were considered.

Incentives To Change

Kemps values continuous improvement in many aspects of their facilities. Specifically, Kemps-Farmington set a goal to reduce water usage by 7% by the end of 2022. Additionally, the facility is taking precautions against the drought occurring in Minnesota.

SOLUTIONS

Install a Condensate Pump

Condensate within the steam loop is unable to reach the condensate recovery tank and is going the drain. The installation of a condensate pump will ensure that the condensate reaches the condensate recovery tank, and later heated back to steam. The pump would save 7,000,000 gallons of water, 34,000 therms, and 2,450 kWh per year, totaling an annual savings of $74,150.

Tighten Leaks

Leaks occur for various reasons such as poor condition of the hose, gasket, or pipe. Tightening the leaks would save 116,000 gallons of water and 65 kWh, summing up to $668 per year.

Improve Product Rinse

When switching between pasteurizing sour cream and yogurt, the pasteurized milk loop (PML) needs to be directed to the drain and rinsed out with softened water, which removes any product and avoids contamination. However, once the water is clear of any product, the PML is redirected to its original configuration. Currently, the redirection is accomplished by operators later than when the water is clear, sending excess water to the drain. The product rinse process can improve with the installation of a three-way valve attached with an optic sensor, which would record the clearness of water and control the direction of the flow based on the presence of product or not. The addition of the three-way valve with an optic sensor would save 365,000 gallons of water and 200 kWh, with an annual savings of $2,100.

"Our main goal for the year was to minimize water waste and increase water conservation here at Kemps. With Sai's help we were able to go above and beyond our goal. Sai was thorough, intuitive, hardworking and a true asset to Kemps. He was able to focus on our areas of biggest waste and has made a significant impact at our plant."

Peter Stollberg, Kemps Quality Assurance, Sanitation, and Compliance Supervisor

Solutions

Switch to Conductivity-based Rinses

The facility uses Clean In-Place (CIP) systems for intensive sanitation in large equipment or pipelines. Each CIP cycles goes through caustic and acid washes, which are followed up with rinses to clear out the chemicals from the wash. At the moment, nine out of 11 CIP systems operate on a preset time schedule, which causes the rinses to run for longer than needed. The recommendation is to switch to conductivity-based rinses, which would stop the rinse when the water's conductivity is at normal level. By switching from time-based rinses to conductivity-based rinses, water usage would be reduced by 5,860,000 gallons of water and 3,300 kWh per year, saving $33,600 annually.

Install Scrubber

The reverse osmosis (RO) reject water and softener regeneration water could be reused after necessary polishing, which can be accomplished by installing a scrubber. In doing so, 23,650,000 gallons of water each year could be reused, saving 7,300 kWh and $138,500 annually. Currently, the results for a water sample of the softener regeneration water is pending and the type of scrubber needs to be investigated further.

Recommendation	Annual Reduction	Annual Savings	Status
Install Condensate Pump	7,000,000 gal water 34,000 therms 2,450 kWh	$74,150	Implemented
Tighten Leaks	116,000 gal water 65 kWh	$668	Implementing
Improve Product Rinse	365,000 gal water 200 kWh	$2,100	Recommended
Switch to Conductivity-based Rinses	5,860,000 gal water 3,300 kWh	$33,600	Recommended
Install Scrubber	23,650,000 gal water 7,300 kWh	$138,500	Needs further analysis

MnTAP Advisor: Kevin Philpy, Senior Engineer

M Health Fairview

Thomas Stocking
Mechanical Engineering
University of Minnesota Twin Cities

Organization Background

M Health Fairview is a health services provider that serves the Greater Twin Cities Area. The project was located at the University of Minnesota Medical Center West Bank Campus, one of the largest and oldest of the 11 M Health Fairview hospitals. The West Bank Campus Hospital employs over 3,000 people and is 1.7 million square feet.

During my time working for M Health Fairview, I was given the opportunity to discover the mechanical background of building maintenance and conditioning. Being able to learn about and help optimize the processes that keep people safe and comfortable indoors at M Health Fairview has been the most fulfilling job I have had to date. I will happily bring forth with me the skills in both leadership and teamwork that I have honed this summer." ~ TS

Project Background

The hospital uses large amounts of resources to maintain space conditions for their employees and patients 24/7. Water and energy are in constant use. A boiler plant on campus provides steam to heat the hospital campus as well as neighboring businesses. This project was focused on mapping resource use and identifying opportunities to save steam along with other energy and water saving opportunities.

Incentives To Change

With a hospital campus that has been serving patients for over 100 years, equipment throughout the West Bank Campus may be older and less efficient compared to newer technologies. The opportunity to save resources and money while contributing to climate change prevention efforts has spurred M Health Fairview to update their systems on the West Bank Campus.

"Our MnTAP intern was an amazing addition to our team! He made so many useful recommendations for our site that we plan on doing at other M Health Fairview sites. We were very fortunate to have him as part of our team this summer."

~ Gabriella Appel, Manager Plant Operation
M Health Fairview UMMC West Bank

SOLUTIONS

Replace Failed Steam Traps

When steam traps fail, the resources that go into creating the steam are wasted. A steam trap survey was completed using an ultrasonic leak detector. Of the 138 live traps that were tested this summer, 27 had failed. By repairing or replacing the failed traps, the hospital would save 140,000 therms of natural gas, 650,000 gallons of water, and $190,000 a year.

Recommence Yearly Steam Trap Surveys

Recommencing yearly steam trap surveys will ensure failed steam traps are replaced or repaired quickly to maintain optimal steam trap performance. For the nearly 800 steam traps on the West Bank Campus, the estimated annual savings for conducting a steam trap survey are 150,000 therms of natural gas, 650,000 gallons of water, and $240,000.

Install Variable Frequency Drives to Optimize Supply Airflow/Air Changes per Hour

Installing VFDs on AHU fans that supply conditioned air at a flow rate higher than standard requirements would allow the AHUs to operate at lower speeds so they meet just the minimum requirements (provided the room cooling load does not demand higher flow rates). This recommendation would save 1,930,000 kWh and $150,000 annually.

Solutions

Optimize Water Softener Settings

Water softening on the West Bank Campus is essential for both patient care needs and processes such as sterilizing surgical instruments. The water softening system for process applications can be optimized by setting the incoming water hardness value to match the actual feed water hardness. This change would reduce annual regenerations resulting in 9,400 lbs of salt and 16,500 gallons of water saved per year.

Flash High-Pressure Condensate

High-pressure steam traps and sterilization process machines that use steam discard their high-pressure condensate to a flash tank which vents to the environment. Since this high-pressure condensate cannot be returned to the boiler without risking pipe damage, using the vented steam as a source of heat instead of releasing it was explored.

Connect Single Pass AHUs to Chilled Water

Supply air is cooled by sending cold water through a high surface area cooling coil in the air handler units (AHUs) on the West Bank Campus. Two AHUs are cooled by single pass cooling that uses an estimated 458,000 gallons of water a year. If the chiller closest to these AHUs is replaced, connecting these AHUs to the chilled water system will save all of this water and $5,300 dollars per year.

Fix Leaks Throughout Campus

Periodic steam leaks spring up on the West Bank Campus due to the high pressures of the system. This summer, a leak causing extra expense of up to $324,000 was found. It was recommended that this leak be fixed as soon as possible to eliminate the water and energy wasted.

Recommendation	Annual Reduction	Annual Savings	Status
Replace Failed Steam Traps	140,000 therms 650,000 gal water	$190,000	Partially Implemented
Recommence Yearly Steam Trap Surveys	150,000 therms 650,000 gal water	$240,000	Recommended
Install Variable Frequency Drives to Optimize Supply Airflow/Air Changes per Hour	1,930,000 kWh	$150,000	Recommended
Optimize Water Softener Settings	9,400 lbs of salt 16,500 gal water	$1,800	Recommended
Flash High-Pressure Condensate	--	--	Needs Further Investigation
Connect Single Pass AHUs to Chilled Water	458,000 gal water	$5,300	Recommended
Fix Leaks Throughout Campus	190,000 therms 2,250,000 gal water	$324,000	Recommended

MnTAP Advisor: Laura Sevcik, Pollution Prevention Specialist

Miller Manufacturing

Devin Fleck
Mechanical Engineering
St. Cloud State University

Organization Background

Miller Manufacturing started as a family-owned business in 1941 and today is owned and operated by Frandsen Corporation of North Branch. Miller Manufacturing's catalog features over 1,000 products which are sold through a large network of farm and animal health supply distributors in the United States and over 30 countries around the world.

"I am truly grateful for this internship introducing me to the complexities of the supply chain and reinvigorating my enthusiasm for making the world a greener and cleaner place. I was always aware that our transition to sustainable technologies was hindered by the complexity of existing infrastructure, but at Miller I learned how to overcome those challenges and found the best technologies to take us into the future." ~ DF

Project Background

Miller Manufacturing has multiple facilities that share responsibility for the manufacture of various product components, as well as final product assembly. The shared responsibility between facilities leads to the shipment of parts and products internally, which Miller identified as a possible opportunity for packaging waste reduction. Miller staff have also been exploring opportunities for energy efficiency in various parts of the facility, as well as ways to increase production efficiency and reduce waste, overall.

Incentives To Change

To prepare for company growth and increasing energy demand, Miller chose to have the intern analyze current processes to identify efficiency opportunities. This is Miller Manufacturing's second year in a row hosting a MnTAP intern and continuing its commitment to process efficiency and environmental stewardship.

"The data shows we are on the right track to reduce waste and obtain substantial cost savings through the hard work of the MnTAP internship program. We appreciate the chance to help our intern gain valuable knowledge through developing relationships within our internal departments and with our suppliers."

~ Shannon Jurgens, Facilities Manager
Miller Manufacturing Company

SOLUTIONS

Reusable Pallet Wraps

It is recommended that Miller Manufacturing replace disposable plastic shrink wrap with reusable pallet wraps for internal company shipments. Plastic wrap used to secure packages on pallets shipped to and from the Glencoe and Anoka facilities produces 3,800 lbs of waste. The reusable pallet wraps would be shared between facilities to maximize savings and are currently being tested.

Compressed Air Study

A preliminary analysis of the Miller Glencoe compressed air system shows that leaks are present in the current system's infrastructure. It is recommended that Miller Manufacturing contract for a professional compressed air study to tag specific leaks and identify other system efficiency opportunities. Cost savings from repairing the leaks themselves, as well as potential rebates from repairs and system improvements should outweigh the cost of the contracted air study.

Solutions

Dock Leveler Sweeps

Dock leveler sweeps are used to maintain weather seals on loading dock doors. To increase efficiency and the effectiveness of these sweeps, it is recommended that Miller Manufacturing replace all broken or partially broken dock leveler sweeps every September. In addition, leaves and large debris should be cleaned from the sweeps at the start of the month starting in September and ending in May each year. Keeping at least one new pair of leveler sweeps on hand is advised in case any are found to be damaged.

Energy-Saving Dock Hinges

Energy-saving dock hinges, such as Green Hinges, are spring-loaded hinges for dock doors that allow for a tighter seal to the building. These hinges push the dock doors flush with the wall to close unwanted gaps, which helps minimize heat and energy loss. According to the natural gas energy audit performed during the intern project, these hinges could save Miller 3,000 therms of natural gas and $2,200 a year. The hinges are eligible for rebates and require minimal process changes or disruption for installation.

Temperature Control Settings

The Miller Glencoe distribution center has two types of heaters that operate in tandem: radiant and unit heaters. The radiant heaters are more efficient and have been noted to provide a more comfortable working environment by employees. Both heaters are currently set at 62°F, which is slightly above what is necessary for employee comfort. It is recommended that Miller set the radiant heaters to 55°F when the building is unoccupied and 60°F when it is occupied. Unit heaters should be set to 5°F below the radiant heaters, so they are only used to alleviate cold spots or support the radiant heaters on especially cold nights.

Exhaust Fans Occupancy Sensors

Adding occupancy sensors to restroom exhaust fans is recommended to reduce the amount of cooled or heated air lost from the building when restrooms are not in use. A conservative savings estimate for building heating affected by occupancy sensors suggests 300 therms of natural gas and $2,000 could be saved annually. If wiring allows, adding occupancy sensors to light switches would help reduce electrical costs, as well.

Recommendation	Annual Reduction	Annual Savings	Status
Reusable Pallet Wraps	3,000 lbs	$6,500	Testing
Compressed Air Study	18,000 kWh	$1,000	Implementing
Dock Leveler Sweeps	160 therms	$250	Recommended
Temperature Control Settings	6,500 therms	$5,000	Implemented
Exhaust Fan Occupancy Sensors	300 therms	$2,000	Recommended
Energy-Saving Dock Hinges	3,000 therms	$2,200	Recommended

MnTAP Advisor: Matt Domski, Intern Program Manager

Minnesota Grocers Assoc.

Parker Grundvig
Sustainable Systems Management
University of Minnesota Twin Cities

Organization Background

The Minnesota Grocers Association (MGA) was founded in 1897 and remains the state's only trade association for grocery and convenience stores, brokers, manufacturers, and wholesalers in the retail food industry. Headquartered in St. Paul, the MGA has 300+ members consisting of nearly 1,300 locations which employ over 150,000 people across the state. MGA dispenses educational material and topical information on the food retail industry, highlights and distributes member achievements, provides funding for community events and scholarships, and is involved in state government affairs and initiatives that support its members' interests.

"I am so grateful to MnTAP for allowing me the chance to work on a real-world energy efficiency and emissions tracking project. I know the professional and pollution prevention skills I've learned here will be invaluable for my future career." ~ PG

Project Background

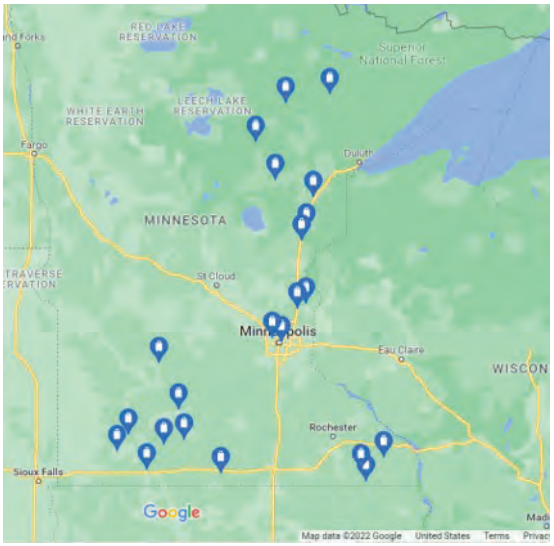
This project builds on a 2021 MnTAP intern project that developed a Best Practices in Commercial Refrigeration guide focused on optimizing the energy efficiency of grocery store refrigeration systems. This year's project goal was to check for refrigerant leaks and implement the best practices guide at small to medium-size grocery stores across the state. Priority was given to sites in areas of environmental justice concern.

Twenty-two refrigeration systems (see Site Map) were checked for leaks and other possible energy efficiency optimizations in the form of insulation repairs, condenser cleanings, proper case loading, gasket replacements, and evaporator de-icing. After each site assessment, store managers were given a list of any energy optimization recommendations (if any were found), along with estimated cost savings for each energy optimization measure, common refrigeration rebate options and their cost analyses, last year's original best-practices guide, and grant information for refrigeration system updates from the MPCA. Pursuant to the project goals, over half of the visited sites were in areas of environmental justice concern.

Incentives To Change

Grocery stores are indispensable community hubs across the state that offer employment, nourishment, and community funding for their neighbors. They also spend a large portion of their energy budget on refrigeration. Leaks of potent greenhouse gas refrigerants can contribute to urban pollution and climate change. Leaks, inefficient system setups, and neglected maintenance can all lead to over-use of these refrigerants, costing businesses money and time while also negatively impacting the environment. In severe cases, improper maintenance can lead to failure of the entire refrigeration system, leading to further losses in time, products, and the resources that brought them to the grocery store shelves. Helping stores eliminate refrigerant leaks and optimize the efficiency of their systems helps prevent pollution and saves money, since older refrigerant mixes are becoming more expensive to refill, and energy costs are currently high and uncertain.

Site Map



Solutions

Leak Testing

EPA estimates that around 25% of a supermarket's refrigeration load is expected to leak every year. However, no refrigerant leaks were detected at the 22 stores visited. Valve caps, piping joints, and fittings were tested with a portable leak detector probe in compressor rooms and walk-in freezers, around rooftop condenser units, and over front-of-house equipment. One possible reason that MGA members may be above average in this respect is regular maintenance by refrigeration contractors. Even the smallest stores had visible service logs exhibiting frequent system check-ups.

Energy Efficiency

A checklist based off last year's best practices guide was used at each store visit to scout for energy efficiency recommendations. Rooftop condensers were cleaned of sheets of dust, insulation repairs were recommended, iced-over evaporators were discovered, case loading was monitored, and case door gaskets were checked for damage. The implemented condenser cleanings helped save approximately 72,000 kWh of electricity, and the rest of the recommended actions combined would save an additional 110,000 kWh, for a total of 180,000 kWh saved. Based on a conservative figure of $0.10 per kWh, this represents potential cost savings of $18,000 for Minnesota businesses, with payback times ranging from immediately to just over two years. The energy use avoided also saves an estimated 140 tons of carbon dioxide every year, which is the equivalent of taking 30 gas-powered vehicles off the roads.

"The Minnesota Grocers Association greatly appreciated the opportunity to partner with the MnTAP summer intern program. This experience was an outstanding value to our membership. The professionalism and expertise provided achieved our collective objective to optimize the energy efficiency of grocery store refrigeration systems. The tangible solutions and valuable best practices benefit the grocery industry and the entire state. We are proud to have been a part of the summer intern project."

~ Jamie Pfuhl, President
Minnesota Grocers Association

Recommendation	Annual Reduction	Annual Savings	Status
Condenser Cleaning	72,000 kWh	$7,200	Implemented
Insulation Repairs	3,440 kWh	$344	Recommended
Case Loading	7,500 kWh	$750	Recommended
Gasket Replacements	26,940 kWh	$2,694	Recommended
Evaporator De-icing	68,400 kWh	$6,840	Recommended

MnTAP Advisor: Jane Paulson, Senior Engineer

Mustad USA

Nathan Miller
Chemical Engineering
University of Minnesota Duluth

Organization Background

Mustad USA's production facility and warehouse are located in Forest Lake, MN. Owned by Mustad, an international hoofcare product company, Mustad USA is the leading manufacturer of steel horseshoes in North America. They produce over 500 varieties of steel horseshoes and employ 85 people.

"This internship was a great experience! I was blessed to work with some really friendly people and lead a handful of exciting projects. This summer showed that my schooling and passion for engineering can have a positive impact and make a meaningful difference in the world." ~ NM

Project Background

In the past, Mustad USA has completed several projects in order to reduce waste and energy consumption, including two other internships with MnTAP, but there are still opportunities to reduce further. Currently, about 31% of all processed steel becomes scrap, and 93% of energy consumption is electrical energy. Improving practices and reducing scrap will reduce energy consumption and waste generation at the facility.

Incentives To Change

The primary motivation in pursuing the intern project was to reduce material consumption and energy usage. It is a company-wide goal to reduce their carbon footprint as much as possible, which can be done through energy reduction

SOLUTIONS

Die Material Change

Currently, the material used for dies is H13 tool steel. Switching the engraved die material to LSS 2367 and the rib die material to CPM 1V can increase die lifetime significantly. Increasing die lifetime reduces scrap and machining energy consumption, leading to savings of 10,600 lbs of steel, 20,000 kWh and $139,000.

Reducing Die Size

The majority of the dies used are all sized according to the dimensions of the largest shoe produced. Consequently, many dies have excess material. Making the die dimensions proportional to the shoe dimensions could save up to 6,100 lbs. of steel and $37,000 annually.

Punch Material Change

A2 tool steel is used for punches. However, it is only rated for applications that don't exceed 400°F, whereas the punches used in production can reach 500°F or more. Switching to M2, the common tool steel used in this application, would reduce punch changeouts and increase machining energy efficiency, saving 1,700 lbs of steel, 15,000 kWh and $58,000 annually.

Reducing Crop Length

The crop is the part of the shoe the robot holds onto during the forging process. The current crop length is 5/8 inches. Purchasing new grippers for the robots that have greater grip strength may allow a reduction of 1/16 inches; doing so would have annual savings of 41,000 lbs. of steel and $27,000.

Reducing Robot Re-teaching Time

At each startup, the operators re-teach the robots where to position the horseshoe at each point of the process. There is a function in the robot programming to save the previous positioning of the robot for a given shoe. Implementing a standard of having the operators check if the previous programming will work could save downtime. A 10% reduction in re-teaching time through standardizing changeovers would lead to an annual savings of $10,000.

Solutions

Lighting Optimization

The Mustad warehouse uses fluorescent lighting fixtures for its lighting, and the forge does not have occupancy sensors or dimming features. Converting all warehouse lighting to LEDs and installing occupancy sensors and dimming in the production facility would annually save of 100,000 kWh and $8,200.

Punch and Clip Press Motor Shutoff

The punch/trim and clip press motors are always running unless a tooling change is required or the entire line goes down. When just one side of a line goes down, the motors on that side continue to run, which wastes energy. Programming these motors to turn off when their side goes down would save 35,000 kWh and $2,500 annually.

"Nathan Miller has had self-confidence and ability to get his project done successfully."

~ Bill Nguyen, Manufacturing Engineer
Mustad USA

Additional Opportunities

Mustad can realize additional energy, steel scrap and cost savings through induction heater upgrades, installing a new pyrometer control loop, and power factor correction.

Recommendation	Annual Reduction	Annual Savings	Status
Die Material Change	10,600 lbs 20,000 kWh	$139,000	Recommended
Reducing Die Size	6,100 lbs	$37,000	Testing
Punch Material Change	1,700 lbs 15,000 kWh	$58,000	Testing
Reducing Crop Length	41,000 lbs	$27,000	Recommended
Reducing Robot Re-teaching Time	N/A	$10,000	Testing
Lighting Optimization	102,000 kWh	$8,200	Implementing
Punch and Clip Press Motor Shutoff	35,000 kWh	$2,500	Implementing
Correct Power Factor	N/A	$2,600	Recommended
Pyrometers with Control Loop	58,300 lbs 4,500 kWh	$33,400	Recommended
Replace Induction Heaters with 25 kHz models at end of life	240,000 kWh	$17,000	Recommended

MnTAP Advisor: Gabrielle Martin, Associate Engineer

Seagate Technology

Megan Tardoni
Bioproducts & Biosystems Engineering
University of Minnesota Twin Cities

Company Background

Seagate Technology started in the late 1970's when its founders seized an opportunity to join the growing technology industry. Seagate started producing 5.25-inch HDDs, the first of its kind, and found success by supplying them to some of the earliest personal computers. Since then, they have sold over 3 zettabytes of storage capacity. They have operations in 30 countries around the world and employee a team of over 40,000. Seagate produces a variety of data storage technologies today, and the Bloomington campus serves as both a manufacturing and developmental space for semiconductor wafers.

"I am incredibly grateful for my internship with MnTAP and Seagate this summer. I really enjoyed being able to work with and learn from such a wide range of professionals, and gain valuable real-world experience in industry. This opportunity allowed me to truly grow as a leader, engineer, and sustainability advocate. I look forward to utilizing all the skills I've learned in my future career!" ~ MT

Project Background

With operations running 24/7, Seagate manufacturing facilities consume a large amount of energy. As a company, Seagate saved 23,000 MWh of electricity last fiscal year through energy conservation projects, more than double the initial target. They continue to work towards new goals each year to further reduce their energy use and GHG emissions. One of the projects this summer was focused on improving lighting efficiency to further the facility's energy use goals and decrease electricity costs.

The Bloomington facility's manufacturing process requires water of extremely high purity. In order to achieve this, much of the total incoming city water is sent through intensive filtration. This process was explored in great depth in order to find the most effective and viable water conservation opportunities. The other outcome from this project was overall mapping of the facilities average water usage. Seagate has cited water reuse and recycling to be one of the biggest opportunities for the company's future sustainability progress.

Incentives To Change

Seagate rules by values of Integrity, Innovation, and Inclusion. These values transfer over to their environmental stewardship where they continue to improve their carbon footprint, advance sustainable solutions, and provide transparent metrics and goals to the public. They aim to continue this progress by reducing energy use, improving water management, and decreasing waste.

"Megan excelled at collaborating with engineers on-site to uncover the distribution of water use across the campus to determine where the best opportunities were located. By the end of the summer, Megan delivered water reuse and LED lighting proposals with significant consumption and cost savings."

~ Carter Sola, Engineer, Project Advisor
Seagate

Solutions

EDI Reject Recycling

For part of the high purity water purification process, water flows through an electrodeionization system which removes charged ions with an applied electric field. This system produces a reject stream that is currently sent to drain. A chemical analysis performed found the reject stream to be relatively pure quality. It holds a much lower concentration of minerals even compared to the incoming city water. The frequency of the system was also investigated, and it was found to have a consistent timing with the RO skids. The recommendation is to recycle this stream back through the high purity water process. This would result in 1.5 million gallons of water saved annually, as well as a decrease in the volume of chemicals needed to pretreat the feed water.

RO Reject Reuse

The high purity water process also includes a RO system that produces reject. This reject stream flows to an intermediate storage tank and then to drain. The recommendation is to mix this stream with city water in the existing tank and use it for irrigation during the summer months. This would result in 1.2 million gallons of water saved annually.

LED Fixture Upgrade

The facility is currently lit by fluorescent bulbs that are mostly on 24/7. In order to improve energy use, more efficient upgrades were investigated. This involved performing tests and collecting data on the current lighting system and working with vendors to find the best replacements. A complete cost analysis was performed to consider the energy and maintenance changes along with the full implementation cost. It is recommended that all common and lab spaces upgrade the current fixtures to LED kits. This would result in an annual 1.7 million kWh reduction and a savings of $114,000.

Recommendation	Annual Reduction	Annual Savings	Status
Reuse EDI Reject in HPW System	1.5 million gal water	$14,000	Recommended
Use RO Reject for Irrigation	1,200,000 gal water	$11,000	Recommended
Upgrade Lighting to LED	1,700,000 kWh	$114,000	Recommended

MnTAP Advisor: Jon Vanyo, Engineer

St. Cloud NEW Recovery Facility

Brandon Knick
Chemical Engineering
University of Minnesota Twin Cities

Organization Background

The St. Cloud Nutrient, Energy, and Water Recovery Facility (St. Cloud NEW Recovery Facility) operates 24/7 to treat 9.6 million gallons of wastewater each day from residents in St. Cloud and the surrounding cities. The facility is owned by the City of St. Cloud and is operated by 24 employees, including plant operators, laboratory analysts, and maintenance personnel. In addition to biological nutrient removal from the influent wastewater, the site produces Class A biosolids through anaerobic co-digestion of municipal solids and high strength waste. It is recognized nationally as a premier resource recovery facility, utilizing renewable energy from solar and biogas produced onsite to achieve nearly net zero energy consumption.

"Working on the pilot this summer allowed me to combine my passions for engineering, laboratory analysis, and sustainability to work toward providing a more sustainable disposal option for Minnesota's food waste. It was an honor to be on the research end of such an exciting project, and I am grateful for both MnTAP and the City of St. Cloud for providing me the opportunity." ~ BK

Project Background

The Food Waste Co-Digestion Pilot was a collaborative effort between the City of St. Cloud, the Tri-County Solid Waste Commission, Donohue & Associates, and MnTAP to pilot a food depackaging system at the NEW Recovery Facility. Packaged food waste from local businesses that would ordinarily enter a landfill was delivered to the facility and depackaged before entering the existing anaerobic digesters at the NEW Recovery Facility. A study was conducted over a 10-week period in which the depackaging process was refined and laboratory samples were collected to characterize the food waste properties and monitor digester health. The data collected will be used to help the City of St. Cloud and Tri-County Solid Waste make informed decisions concerning the sustainable implementation of a permanent food waste co-digestion program.

"I appreciated Brandon's work ethic and commitment, ability to work independently and ask great questions, and his attention to detail. Brandon's contributions were instrumental to the success of the project."

- Shanna Czeck, Water Quality Coordinator
St. Cloud Public Utilities

Incentives To Change

Food waste makes up over 14% of the Tri-County region's landfill waste, representing a significant source of avoidable greenhouse gas emissions. Diverting food waste toward anaerobic digestion at existing facilities in St. Cloud would substantially reduce emissions and produce additional renewable biogas for energy production. The development of a full-scale food co-digestion program would be step forward for sustainable waste disposal in the US. This facility would be the third of its kind in the Midwest and the first in Minnesota.

SOLUTIONS

Depackaging Process

To expand collection beyond packaging free organics, a T30 Turbo Separator was used to depackage food waste collected from several local businesses in St. Cloud. Over 50 tons of food waste from commercial vendors was depackaged over the course of the 10-week pilot, including a mix of expired produce, deli food, dairy products, and canned goods. Operating data was collected to determine useful values such as the observed processing rates, equipment usage, and the volume of high strength waste needed for organics dilution. This information was used to develop estimates for full-scale production capacity.

Solutions

Laboratory Analysis

Routine laboratory analysis was completed on samples from the NEW Recovery Facility's four digesters to determine what effects the continued loading of food waste may have on digester health and gas production. Tests were completed on-site to monitor pH, alkalinity, total solids content, volatile solids content, and volatile fatty acids concentration. No significant changes were observed to any parameters over the course of the pilot, concluding that the addition of food waste poses little risk to digester health.

Regular laboratory analysis was also completed on food samples collected from the depackaging unit to determine their energy and nutrient content, including tests for chemical oxygen demand, volatile solids content, nitrogen, and phosphorous. These tests concluded that the food waste possesses a beneficial energy to nutrient ratio and has an estimated biogas potential that is over three times that of the municipal solids currently digested at the facility. External laboratory analysis is being completed to determine the exact methane production potential of the food waste, as well as a composite mixture of food, high strength wastewater, and municipal solids.

Financial Analysis

Operational data from the pilot was used to estimate labor and capacity requirements for a full-scale system that would keep the program financially viable. A variety of factors including hauling costs, electricity demand, additional gas production, and tipping fees were considered. An estimation of capital costs was used to provide a payback period over a range of production annual capacities.

Environmental Impact

The environmental impacts of diverting food waste toward anaerobic digestion compared to the current practices of landfilling and incineration in the Tri-County region were explored. Information from the depackaging process and published emissions factors from the Environmental Protection Agency were used to estimate the reduction in greenhouse gas emissions per ton of food waste diverted. Additional environmental impacts were considered, including improvements to public health and water bodies. Data was also collected to determine the risk of plastics contamination from the depackaging process, and recommendations were made to reduce contamination through physical and behavioral means.

Recommendation	Annual Reduction	Annual Savings	Status
Implement Pilot Scale Depackaging, 10 Weeks	51.7 tons Landfill Waste Diversion 19,000 kg CO_2 EQ 12,200 kWh energy produced 1320 therm biogas produced	$1,000	Implemented
Implement Full Scale Depackaging (Annual)	13,000 tons Landfill Waste Diversion 4,800,000 kg CO_2 EQ 3,000,000 kWh energy produced 330,000 therms biogas produced	$250,000	Proposed

MnTAP Advisor: Kira Peterson, Engineer

Stylmark Inc.

Toby Pablo
Chemical Engineering
University of Minnesota Twin Cities

Company Background

Stylmark is an aluminum anodizing company that processes aluminum parts through a mechanical and chemical line to create a variety of finishes. Founded in 1954 as Designware Industries, the company began as a small garage operation focusing on medicine cabinet parts. Since then, the company greatly expanded its reach to retail, industrial equipment, indoor light fixtures, and more. There are currently 109 employees at its 200,000-square-foot facility in Fridley.

"This internship made me more aware of how opportunities for sustainability exist in all forms of industry, particularly since the anodizing process at Stylmark was something completely new to me. I am very grateful to MnTAP and Stylmark for helping me gain valuable problem-solving experience, build confidence with and strengthen my appreciation for networking, as well as get a better understanding of how engineering concepts are used outside of the classroom." ~ TP

Project Background

The aluminum anodizing process consumes large quantities of water. This is because the rinse baths on the line are fed constant amounts of water to limit the buildup of chemicals as parts were rinsed off. These rinse tanks consume approximately 12.5 million gallons per year (GPY) combined.

In addition, Stylmark runs approximately 13,300 racks of aluminum extrusions through its baths in a year. Current operating procedures generate 128,000 gallons of wastewater per year due to dragout and constitutes a water cost of about $1,300 and a chemical cost of $82,500.

Incentives To Change

As a growing company, Stylmark can benefit considerably by improving their operating conditions regarding water use. Using conductivity-controlled rinse tanks will minimize operating costs that would be magnified by increasing order volumes and rising water prices.

Reducing dragout will not only cut down on water consumption and wastewater generation but allow the company better control of product quality. With the water that is dragged out from each tank comes chemicals that can potentially interfere or adversely react with processes further down the line, so lower volumes of dragout can allow for a more controlled finishing environment and potentially reduce product loss through anodizing failures.

SOLUTIONS

Implement Conductivity-Based Rinse Control

It is recommended that the input of city water for rinse tanks be regulated using conductivity sensors and automated valves rather than manual control. This should allow for effective rinsing while reducing water use when tanks are below the conductivity limit for extended periods of time, indicating they are not currently in use. Implementation of conductivity control to 14 of the rinse tanks has the potential to conserve 12.6 million GPY of water and save $123,000 annually.

"Our MnTAP intern surpassed all our expectations by taking the time to learn our operation and company first. While initially he was reserved, he quickly began to establish meaningful relationships to facilitate an excellent working relationship throughout the company. In doing so he found solutions that upheld our quality of work and water saving opportunities. His research was comprehensive and incorporation of ideas across our entire team has allowed him to optimize the projected design."

~ Casey Charging, Senior Chemist
Stylmark, Inc.

Solutions

Regulate Dragout Timing

It is recommended that line operators pull racks out of tanks in the anodizing bay over a minimum of 10 seconds and allow racks an additional 5 seconds to drain above each tank before moving to the next tank. This change will not only save 48,100 gpy and 10,500 lbs of chemicals, but also provide better conditions for chemical baths by minimizing cross-contamination.

Insulate Exposed Boiler Pipes

Approximately 17 feet of exposed boiler pipes can be insulated to increase boiler efficiency and reduce natural gas use. This recommendation would result in 400 therms of gas energy saved annually.

Address Compressed Air Leaks

The facility air compressor can run more efficiently with repairs to air leaks. Six leaks were addressed, with a total estimated savings of 33,500 kWh or $4,600 per year and a repair/equipment replacement cost below $100.

Install Spray Bars

Spray bars are capable of significantly reducing dragout of chemicals. By installing spray bars to select chemical baths on the anodizing line, not only will the baths require less additions over time due to chemical loss, but chemical waste in the facility's sewer line can be directly addressed.

Install a Jet Rinser for Dye Storage Tanks

Installation of a jet tank rinser to clean the storage dye tanks is recommended. These tanks occasionally develop biological contaminants, making the stored dye unusable, and are also rinsed manually with a low-pressure hose. Installing the rinser and accompanying pressure-boosting pump at $5,870 would reduce the risk of contaminant buildup, provide more efficient rinsing, and cut cleaning time for operators, leading to a potential savings of $1,200 per year dye batch.

Recommendation	Annual Reduction	Annual Savings	Status
Implement Conductivity-Based Rinse Control	12,580,000 gal water	$123,000	Recommended
Regulate Dragout Timing	48,100 gal water 10,460 lb chemicals	$18,000	Recommended
Insulate Exposed Boiler Pipes	400 therms	$380	Recommended
Address Compressed Air Leaks	33,500 kWh	$4,600	Implemented
Install Spray Bars	1,300 gal water 1,600 lb chemicals	$1,700	Needs Further Investigation
Install a Jet Rinser for Dye Storage Tanks	3,400 gal water 26.1 lb dyestuff	$1,200	Recommended

MnTAP Advisor: Daniel Chang, Associate Engineer and Kelsey Klucas, Engineer

Twin City Tanning Co.

Shane Johnson
Chemistry and Environmental Studies
Macalester College

Company Background

Twin City Tanning began operation in 1987 in their current facility in South Saint Paul. True Blue Tanning was running the facility until TCT took control. The 79,100 square foot facility employs 79 people. TCT is majority owned by S.B. Foot, who is also a primary customer most known for Red Wing Shoes. The company primarily processes raw cattle hides into wet blue leather that is further processed at other facilities to turn into eventual leather products. TCT also performs several collagen processes that are used in products such as pet bones and sausage casings.

"Working at TCT gave me a new found appreciation for the leather making industry as it was far more complex and fascinating process than I had initially realized. I appreciate both MnTAP and TCT for giving me the opportunity to learn and grow in an independent yet supportive atmosphere." ~ SJ

Project Background

Leather tanning and manufacturing is an inherently water-intensive process, and TCT wished to find ways to lower the amount of spending associated with influent water use and wastewater generation. Additionally, organic wastes and chemicals from the tanning process generate high concentrations of chemical oxygen demand (COD) and total suspended solids (TSS) in wastewater. Having these parameters be high is common in the leather tanning industry and is impossible to fully avoid due to the nature of the industry.

Incentives To Change

Twin City Tanning sought assistance through MnTAP for primarily economic motives. The facility used approximately 135,000,000 gallons of city water in 2021 which amounted to $1,034,000 in the year. For wastewater surcharges, TCT spent another $1,174,000 due to high COD and TSS present in the facility effluent. By lowering the amount of water used in the process and sent through the effluent, there is plenty of opportunity to save a lot of water and money.

SOLUTIONS

Recycle Tanning Water

Within TCT's operations, tanning drums use approximately 28% of all daily water. Approximately 24% of the water used within the drums can be recycled. TCT already had a preexisting system in place to recycle this water after it goes through on-site pre-treatment. However, the system was not operational during this summer. Reimplementation of this system would involve performing maintenance of the system that holds the water for reuse in other parts of the tanning drum process. With the recycling system reimplemented, TCT can reduce their annual water usage by 7,900,000 gallons. Maintenance on the drums is projected to cost $48,000 with an annual savings of $174,000.

"Our intern's time here was focused on areas of production and water usage at a much deeper, more analytical level than the company normally can do as staff are busy with daily operations. It was good to see the data and have the questions asked outside of our regular work view. Our intern is going to make some company very happy as a future employee."

~ Garrett Kramer, Assistant Plant Manager
Twin City Tanning

Solutions

Lower Bate Wash Volume

One single step in the tanning drum process, referred to as the bate wash step, uses approximately 18% of all daily water or 64% of all tanning drum water. This step was a generalized 30-minute running wash done to remove residual chemicals from the hides and lower their temperature. This step did not take into consideration the incoming flow rate for the given drum nor the size of the tanning drum load to streamline the process for the drum operators. Analysis was performed on this step in the operation to determine which drums were running most optimally, defined as using the least amount of water per pound of hide. It was suggested to TCT that the wash time should be more specific to the variables of the load to avoid using excessive water. Lowering the bate wash volume for the drums using excess water would lower annual water usage by 4,300,000 gallons with an annual savings of $95,000.

Minimize Wringer Pre-Wash Loss

Prior to the wringing process, where excess water is removed from the hides, the hides receive a brief wash to remove excess organic matter from the hides to extend the life of the wringing machine. The washing system experiences significant loss due to the hides splashing water out of the system as the enter the wash. Minimizing this loss is conservatively estimated to save 18,000 gallons of water and $300 annually. The experiment performed to determine this did not catch as much lost water as hoped and more study is necessary to get a better idea of the potential savings.

Collagen Accounting

TCT was interested in tracking how much water was being retained in products leaving the facility. Collagen processing was identified as a process that tended to absorb a lot of water. By accounting and reporting for how much water was being absorbed by the product, TCT could save up to $2,300 annually.

Recommendation	Annual Reduction	Annual Savings	Status
Recycle Tanning Water	7,900,000 gal water	$174,000	Recommended
Lower Bate Wash Volume	4,300,000 gal water	$95,000	Investigating
Minimize Wringer Pre-Wash Loss	18,000 gal water	$300 (est.)	Investigating
Collagen Accounting	N/A	$2,300	Investigating

MnTAP Advisor: Kevin Philpy, Senior Engineer

U Market Services

Hope Werstler
Environmental Sciences,
Policy & Management
University of Minnesota Twin Cities

Company Background

U Market Services (UMS), in its current capacity, began in 1983, with the goal of streamlining how deliveries are made on the University of Minnesota – Twin Cities campus. U Market Services manages the entire supply chain experience for the University. Making over 240,000 deliveries annually, the company plays a key role in ensuring orders made by university personnel are delivered in a cost efficient, secure, and timely manner.

"This internship gave me a sneak-peak at what it would be like to have a career in environmental policy. I learned so much about myself, my abilities, and sustainability. I am forever grateful to MnTAP for their support throughout the summer and for providing me with this amazing opportunity." ~ HW

Project Background

U Market Services purchases around 20,000 cardboard boxes annually, weighing approximately 13,000 lbs. These boxes cost UMS over $15,000 every year and serve as tertiary packaging for items ordered by university personnel from U Market Services storage, Facilities Management stock, and/or PAR-Level supplies. PAR stands for Periodic Automatic Replenishment; it is a type of inventory system that determines the amount of product an organization should have at all times. Costs for additional packaging supplies including tape, packing list envelopes, labels, and transfer ribbon total approximately $14,500 annually. With packing materials being essential to their operation, the type of packaging used by U Market Services has become increasingly important for managing operating costs and environmental performance.

Incentives To Change

As campus returns to full activity, the quantity of packaging materials needed may rise. The higher volume, coupled with increases in prices per unit, will result in higher material use and overall costs for U Market Services.

U Market Services is also always looking for opportunities to improve in an effort to support the University of Minnesota's sustainability goals. Reducing the packaging waste created by UMS aligns with the University of Minnesota's goal to eventually replace 90% of its municipal solid waste (MSW) with options that are recyclable, compostable, or reusable. Evaluation of reusable packaging for U Market deliveries will be an important component to improving the sustainability of their operations.

SOLUTIONS

Reusable Bins for PAR-Deliveries

The primary change suggested by this project is a switch from cardboard boxes to reusable bins for PAR-Level deliveries. Reusable transport packaging has been successfully implemented in several industries. U Market Services is well positioned to consider reusable transport packaging alternatives because the company makes frequent, localized shipments with minimal seasonal fluctuations, has control over their shipping process, and has demonstrated an effort to improve their sustainability. Transitioning from purchased cardboard delivery boxes to reusable delivery totes will save the University 13,000 lbs of cardboard waste and reduce purchase costs for U Market Services by $15,000.

Recyclable Label Liners

A waste sort conducted over the summer indicated 20% of the trash generated at the site was the liner material that serves as the backing for labels, stickers, and other adhesive products. Through research, labels with curbside recyclable liners were found. Switching to this recyclable product would save little over $5,000 in product cost and redirect 620 lbs of waste away from the trash stream to a recycle stream annually.

Stickers, used on boxes to indicate special handling or hazard for a package, also contributes to the generation of liner. Replacing the stickers used in high volume with stamps can eliminate 3% of the label waste generated.

Solutions

Waste Stations

The waste sort results also indicated that almost 25% of the waste disposed of in the trash stream is recyclable materials. To capture more of the recyclable material being sent to waste, inspection of waste and recycling bins around the facility was conducted to identify contaminants, moving materials to their proper stream when possible. New waste stations were established in various parts of the warehouse to provide immediate access to the correct disposal bins. Training materials were developed to ensure UMS staff understood how to use the waste stations and the value of properly disposing of their waste. Continued inspection of the waste systems showed improvements in contamination levels after the installation of new waste stations. Optimizing waste management systems can result in reduction of 760 lbs of material from the trash and save $30 in disposal fees.

"This was our first time working with MnTAP and the experience exceeded our expectations. Our intern was committed, observant, productively critical and a real pleasure to work with! She identified opportunities that we had not addressed previously or had not noticed. Our intern brought new energy to our sustainability practices which will bring value long after her time with us."

~ Dave Saniti, Campus Operations Manager
U Market Services, University of Minnesota

Recommendation	Annual Reduction	Annual Savings	Status
Reusable bins	13,000 lbs	$15,000	Implemented
Direct thermal recyclable labels	690 lbs	$5,000 + end of life management	Implemented
Stamps replacing stickers	20 lbs	$110	Further evaluation needed
Recyclable packing list envelopes	290 lbs	$20 + end of life management	Implemented
Reorganize waste stations	760 lbs	$310 in end of life management	Implemented

MnTAP Advisor: Laura Babcock, Director

Apply to Become a MnTAP Intern

Students See Success

MnTAP is seeking junior and senior-level college students to work on water conservation, energy efficiency, lean manufacturing, source reduction, and pollution prevention projects at companies in Minnesota. The projects are located at companies in a variety of industries around the state.

As with many internships, the MnTAP intern program provides students with an experience that helps prepare them for their future careers. Past interns have attributed their experience in the MnTAP program to their career successes.

MnTAP internships not only provide hands-on experience in a variety of facilities, but also provide students with the opportunity to manage a project, develop and test ideas, and often see their solutions implemented. When asked about their experiences, past interns credit the MnTAP intern program with providing a variety of opportunities.

Interns have represented 31 different majors and more than 29 colleges and universities. In total, 339 students have gained experience through a MnTAP internship over the past 38 years.

Student Benefits

- Positively impact a facility's environmental footprint.
- Gain hands-on project management experience.
- Use your classroom knowledge in a real-world setting.
- Earn $18.00/hour and work 40 hours a week.

Applications are being accepted for summer 2023 internships. Interviews will be held January, 2023 through March, 2023. Selected applicants will be matched to a project based on academic background and performance, relevant experience, and technical skills.

To apply, complete the online application form.
www.mntap.umn.edu/interns/student

2022 Interns

Front Row L-R: Olajumobi Akeeb, Parker Grundvig, Devin Fleck, Shane Johnson, Madeline Danforth, Megan Tardoni, Hope Werstler, Nicole Thompson
Back Row L-R: Thomas Stocking, Sai Ramreddy, Brandon Knick, David Isaac, Michael Fleming, Toby Pablo, Payton Buendorf

"My role as a MnTAP intern gave me hands-on experience in a dynamic manufacturing setting. I had the opportunity to network with industry professionals and improve my project management skills. This project has also shown me the importance of combining my career in mechanical engineering with my passion for environmental stewardship."

~ Michael Fleming, Ball Corporation

MnTAP SOLUTIONS

About MnTAP

MnTAP is an outreach program at the University of Minnesota that helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, reduce energy use, and reduce costs to improve public health and the environment.

MnTAP provides technical assistance tailored to each business. By reducing waste and increasing efficiency, businesses in Minnesota can save on disposal and raw material costs, decrease regulatory compliance burdens, and make working conditions safer for employees. Services in addition to the intern program include site visits, team facilitation and phone assistance.

MnTAP is funded by a grant from the Minnesota Pollution Control Agency's Resource Management and Assistance Division to the University of Minnesota School of Public Health, Division of Environmental Health Sciences and other grant and partner sources. MnTAP has no regulatory responsibilities or obligations and our work is confidential.

Laura Babcock
MnTAP Director

Daniel Chang
Associate Engineer

Matt Domski
Intern Program Manager

Kelsey Klucas
Engineer

Gabrielle Martin
Associate Engineer

Jane Paulson
Senior Engineer

Kira Peterson
Engineer

Kevin Philpy
Senior Engineer

Alaina Ryberg
Website Designer

Jon Schroeder
Sustainable Materials Management Specialist

Laura Sevcik
Pollution Prevention Specialist

Jon Vanyo
Engineer

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