

**Mn
TAP**

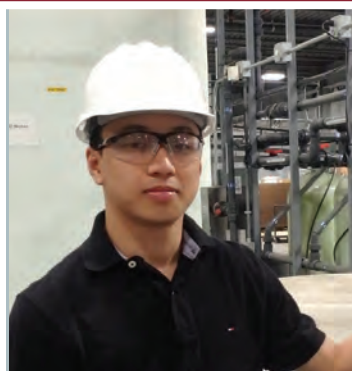
SOLUTIONS



2019 MnTAP Intern Program



**“It takes a village to realize the business and environmental SOLUTIONS reported for 2019. Thank-you MnTAP Interns, company partners and program sponsors for your continuing effort and support.”
~ Laura Babcock, MnTAP Director**



2019 Intern-Proposed Solutions

Recommendation	Reduction	Cost Savings	Equivalents (annual)
Water Conservation	96,000,000 gallons	\$475,000	Water for 4,200 Minnesota residents
Waste	3,500,000 lbs	\$490,000	Annual waste from 2,000 Minnesota residents
Chemicals	415,000 lbs	\$70,000	Over 800 55 gallon drums
Electricity	6,000,000 kWh	\$460,000	Electricity for over 600 Minnesota homes
Gas	340,000 therms	\$160,000	CO2 emissions from 400 passenger vehicles
Production Impacts	---	\$730,000	---
Total Potential Cost Savings	---	\$2,385,000	---

Table of Contents

Focus	Organization	Intern	MnTAP Advisor	
Energy, Waste	Aveda Corporation.....	Bailey Erickson	Michelle Gage, Engineer	8
Water, Energy	Ball Corporation	Sayandeep Biwas ...	Jane Paulson, Sr. Engineer	10
Water, Chemicals	Boston Scientific	Heather Levy	Matt Domski, Waste Prevention Specialist ...	12
Water	City of Plymouth	Sam Mader	Nathan Landwehr, Waste Prevention Specialist .	14
Water, Energy	Health Systems Coop. Laundries ..	Josiah Budiman	Brent Vizanko, Assoc. Engineer	16
Energy, Chemicals	Hutchinson WWTP	Josh Kirk	Jon Vanyo, Engineer	18
Water, Waste, Chemicals	Kerry	Noah Siem	Jon Vanyo, Engineer	20
Water	Minnesota Zoo	Erin Maxson	Michelle Gage, Engineer	22
Energy	North Memorial Health	Josh Goetz	Brent Vizanko, Assoc. Engineer	24
Chemicals	Phillips Neighborhood Businesses .	Elizabeth Joncas ...	Jane Paulson, Engineer	26
Waste, Chemicals	Pond Systems Nutrient Removal ..	Amit Itkin	Jon Vanyo, Engineer	28
Water	Seneca Foods	Larry Lau	Daniel Chang, Assoc. Engineer	30
Water, Energy, Chemicals	TreeHouse Foods	Nick Tulshibagwale .	Matt Domski, Waste Prevention Specialist ...	32
Water, Chemicals	Verta	Christopher Yun....	Paul Pagel, Sr. Engineer	34
Energy, Waste	Wenger Corporation	Patrick Gibbons	Daniel Chang, Assoc. Engineer	36
Chemicals	White Bear Lake Chamber.....	Melody Markert ...	Jane Paulson, Engineer	38

**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 2019.
Their support helps maintain our continuing pollution prevention,
energy efficiency and water conservation work.**



"It's really amazing to consider the total results achieved by the 300 interns employed by this program since it began. Equally impressive is how many interns identify solutions that require little to no upfront investment yet still produce substantial savings, like the conservation recommendations for Ball Corporation that is expected to save them \$350,000 per year after an upfront investment of \$750. I'm not sure why any company wouldn't want to take advantage of an opportunity like this."

~ Mark Snyder

Pollution Prevention Coordinator, MPCA



"MnTAP interns consistently produce real-world results that support EPA's mission to protect human health and the environment, and they are instrumental in carrying out our pollution prevention goals. The work experience gained through the internships is

grooming our next generation of leaders in the fields of pollution prevention and sustainability."

~ Christine Anderson

Pollution Prevention Coordinator, U.S. EPA, Region 5



"The Metropolitan Council is proud to be a partner with MnTAP in effecting increased water efficiency at companies and organizations throughout the Twin Cities metropolitan region. In addition



to the millions of gallons of water saved each year, the summer intern training that this program provides to engineering and science college students is critical in creating the environmental leaders of the future."

~ Brian Davis, Ph.D., P.G., P.E.

Senior Engineer, Water Supply Planning



The students participating in the Wastewater Treatment Plant and Pond Pilot Program have shown exceptional creativity and they worked with our municipal permittees to show what is possible through operational changes to

gain better treatment of wastewater. These students' efforts place an exciting new emphasis on working with what we already have, in ways we haven't done before, to do what we didn't know we could achieve for the waters of the state of Minnesota and to the regions our flow.

~ Joel Peck

Municipal Liaison and Project Manager for Wastewater Treatment Plant and Pond Optimization Pilot Program



"CenterPoint Energy has been a strong supporter of the MnTAP Intern Program for several years. Our customers see great value in working with these young professionals and they appreciate the fresh perspective the interns often bring to their organizations. The program is a great partnership that benefits both the businesses and the students through a real-world learning experience."

~ Todd H. Berreman

Director of Energy Efficiency, CenterPoint Energy



"Xcel Energy has supported MnTAP interns at our customer's facilities for the past several years. It goes without saying that the energy savings that are discovered by interns and implemented by customers are of great interest and value to us. However, just as important, is that we (Xcel Energy) are part of a larger effort to help train and educate young people on the importance of efficiency and sustainability. What MnTAP has created by bringing students, businesses, and other partner organizations together for the purpose of tackling waste and energy challenges has been a recipe for success!"

~ Lori Nielsen

Program Manager, Xcel Energy

Award Winning Program

MnTAP Receives U.S. EPA Regional Administrators Award for Excellence

During the MnTAP 35th Anniversary celebration, Christine Anderson, Environmental Specialist and Pollution Prevention Coordinator with U.S. EPA, Region 5 presented MnTAP with the U. S. Environmental Protection Agency Region 5, **Regional Administrator's Award for Excellence.**

This award was to recognize collaborative partnerships to reduce hazardous pollutants in the automotive repair sector. MnTAP has worked to develop and refine this collaborative partnership model through efforts in Duluth, Minneapolis, and with businesses throughout the Twin Cities area in order to share it with others here and throughout the country.

"Safer Products That Work" was a 2014-16 effort supported by EPA Region 5 under the Source Reduction Assistance Program to demonstrate the use of lower hazard degreasing solvents at industrial and automotive sites. Companies received technical assistance, resulting in **annual reductions of 4,000 lbs/yr of air pollution and saving \$7,500 in material costs.**



MnTAP researchers developed an outreach process to engage automotive repair businesses, evaluate their degreasing products, recommend functional alternatives with less hazardous components and

support businesses in transitioning to the safer products that work.

Alternative degreasing information was presented to the automotive repair sector in the St. Louis River corridor of Duluth in 2016. A key feature of this project was collaboration with a local partner engaged with the community, Ecolibrium³ to introduce MnTAP to the businesses.

A MnTAP Intern in the Phillips Communities in Minneapolis with partners Hope Community, Lake Street Council and Franklin Area Business Association and funding from U.S. EPA shared safer

product information with 24 companies.

The project was expanded to include safer janitorial products for a variety of buildings in Phillips, including apartment complexes, small businesses, and automotive businesses in North Minneapolis with partners University of Minnesota Urban Research and Outreach-Engagement Center (UROC), and West Broadway Business and Area Coalition (WBC), and funding from the Minnesota Pollution Control Agency (MPCA).



Join the MnTAP Intern Program



2019 Interns

Front, L-R: Heather Levy, Melody Markert, Larry Lau, Sayandeep Biswas, Elizabeth Joncas, Joshua Goetz, Erin Maxson, Bailey Erickson
Back: Josiah Budiman, Amit Itkin, Sam Mader, Nick Tulshibagwale, Josh Kirk, Noah Siem, Patrick Gibbons-Peterson, Chris Yun

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 28 different majors and more than 28 colleges and universities. In total, 280 students have gained experience through a MnTAP internship over the past 35 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 \$16.00/hr and work 40/hrs a week

Student applications are being accepted for summer 2020 internships. Interviews will be held January, 2020 through March, 2020. 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

For more information and applications, contact Nathan Landwehr, Intern Program Administrator, at 612-624-4697, landwehr@umn.edu, or at www.mntap.umn.edu/interns/student

Be a Part of the 2020 Intern Program

A History of Success

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

When MnTAP started there was no internet, there were no computers, no social media or cell phones. Site visits, classroom based training and information sharing through physical mail were the tools used to share the message of source reduction and pollution prevention.

With the speed of information moving ever faster, current staff continue to promote source reduction, and site visits still serve an important role in helping companies improve their processes.

Over the past 35 years there have been 63 MnTAP staff members and 280 MnTAP student interns. Past and present MnTAP staff and interns have worked to help Minnesota businesses prevent

Companies Reap Rewards

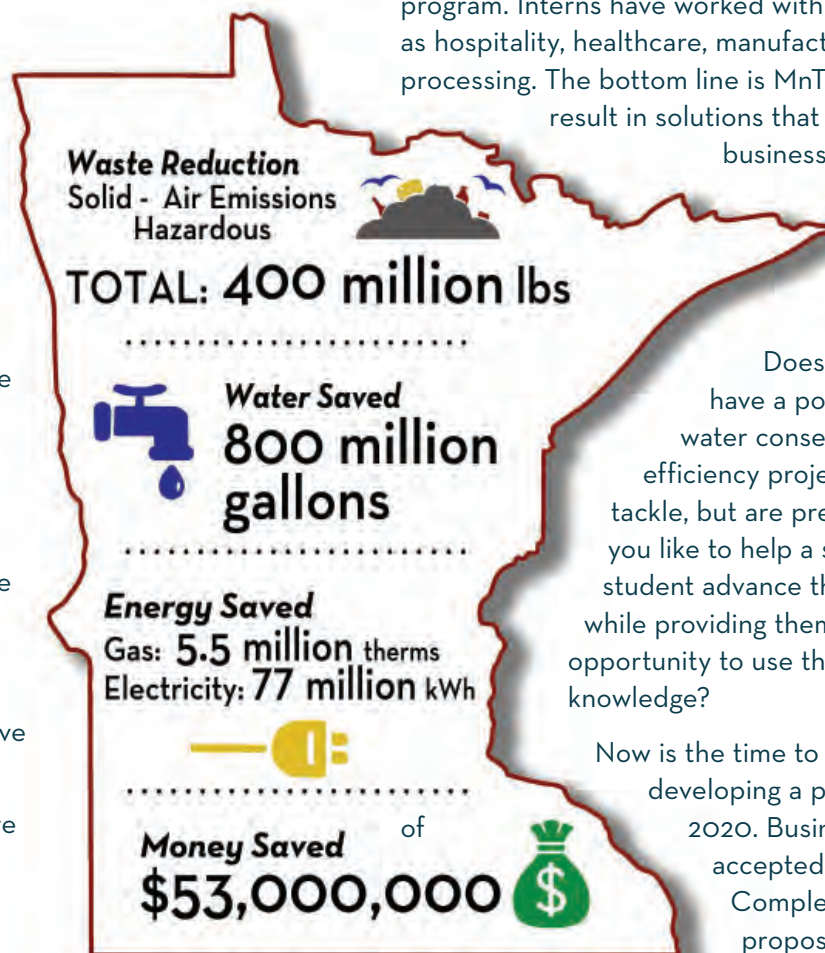
Participating businesses work with an intern to research and provide solutions for pollution prevention and energy efficiency which are designed specifically for the facility. Often, the savings realized from implementation far outweigh a company's cost-share.

More than 300 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

Does your company have a pollution prevention, water conservation, 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 the summer 2020. Business applications are accepted until February, 2020. Complete an online project proposal or call MnTAP today.



35 years of pollution prevention.

- solid and hazardous waste from being generated
- water from being used unnecessarily
- all while saving companies money.

For more information and applications, contact Paul Pagel, Intern Coordinator, at 612-624-4638, ppagel@umn.edu, or at www.mntap.umn.edu/interns/business



Aveda Corporation



Bailey Erickson

Chemical Engineering,
University of Minnesota, Twin Cities

Company Background

Aveda Corporation is a division of Estée Lauder Companies with their production facility located in Blaine, MN, employing 750 people. The Blaine location produces a variety of cosmetics, beauty, and personal care products for Aveda, as well as other brands owned by Estée Lauder Companies. This includes hair color, lotions, shampoos, and many other products. Aveda has been a part of the Estée Lauder Companies since 1997.



"This internship gave me the opportunity to learn practical skills and gain industry experience outside of the classroom. Working for Aveda gave me an opportunity to work with a large process manufacturing plant, which is beneficial in starting my career as a chemical engineer. I also gained unique problem-solving skills and had the chance to work with several teams of varying disciplines, giving me insight into the many different aspects of engineering as well as environmental health and safety." ~ BE

Project Background

The goals of reducing off-grade waste generation and energy consumption of the compressed air and chilled water processes align with Aveda's mission of minimizing the environmental impact of their processes. Compressed air accounts for around 14% of the total electrical energy consumed by the Blaine Aveda facility annually, and compressed air use is estimated to include around 15 - 20% leaks. Reducing compressed air leaks and compressed air use can significantly reduce the cost of energy for Aveda. The chiller system accounts for around 18% of the total energy consumed by the Aveda facility annually and has not been updated in around 20 years. A new chiller system with improved efficiency can reduce energy costs and environmental impact, as well as improve the production process by supplying more consistent and lower chilled water temperature.

Incentives to Change

Aveda is an environmentally conscious company that produces personal care products and is always looking for ways to improve their processes while reducing environmental impact. Aveda participates in waste reduction programs such as a zero waste to landfill policy

and uses a Waste to Energy waste management system. Aveda products are also cruelty free.

Aveda is always looking for ways to continually improve their processes while also reducing their impact on the environment. Aveda is working to reduce its industrial waste generation and additionally will identify opportunities for water and energy efficiencies through various means including our chilled water and compressed air systems.

"Our MnTAP interns over the past two years have done a fantastic job of identifying energy and water opportunities. These individuals have been part of the team and worked to exhibit how these projects could help us to improve. We see MnTAP as a valuable resource and look to partner with them in the future."

*~ Jeff Eidenschink
HVAC Mechanic, Aveda Corporation*

Solutions

Improve Air Compressor Energy Efficiency

The current compressed air system uses both constant and variable speed drive compressors. Variable frequency drive compressors are more energy efficient than constant speed compressors, as they have the ability to consume less power when demand is lower. By replacing the constant speed compressors with a single, variable speed drive compressor, energy efficiency can be optimized, saving energy and reducing energy costs. This energy reduction is estimated to save 55,000 kWh of energy and \$5,500 of associated energy costs annually.

Reduce Compressed Air Use

Leaks in the compressed air system account for 15-20% of all use.

Implementing a maintenance program to check, report and repair leaks, and standardizing pressure regulators and fittings will eliminate wasted energy.

Other opportunities to reduce compressed air use include: replacing compressed air motors with electric, replacing end uses with electric blowers, and turning off air to production lines that are not in use. All together there is an opportunity to reduce 95,000 kWh and \$13,000 annually.

Improve Chiller Energy Efficiency

Heat recovery chillers remove heat from chilled water and use the rejected heat energy to heat water for the

plant's hot water processes. A new chiller system will have a larger total capacity to reflect the increased chilled water demand from production. This increase in chiller capacity will supply more consistently low chilled water temperatures, increasing production efficiency in jacketed cooling tanks. By replacing the current chiller system with a heat recovery chiller, the improved energy efficiency of the new chiller is estimated to save 130,000 kWh of energy and \$14,000 in energy cost savings annually, as well as increase production efficiency



Filter Liquid Waste Stream

Currently, off-grade waste is rinsed down the drain with hot water. Adding a rotating vacuum drum filter to the waste stream process will remove suspended solids in the liquid waste, separate and dry the solids. The separated solids can then be disposed of through the "waste to energy" program, in which

solid waste is converted to electrical energy instead of being sent to a landfill. This filter can reduce SAC and strength charges, as well as environmental impacts. This reduction option is estimated to save 18,000 gallons of water and 180 kWh per year, as well as save up to \$31,000 in energy costs and waste disposal fees.

Recommendation	Annual Reduction	Annual Savings	Status
Improve Air Compressor Energy Efficiency	95,000 kWh	\$13,000	Implementing
Replace Current Air Compressors with a Single Variable Speed Compressor	55,000 kWh	\$5,500	Planned
Replace Chiller with Carrier Heat Recovery Chiller System	130,000 kWh	\$14,000 + increased capacity	Planned
Procedure Changes to Off-Grade Waste Management System	18,000 gallons water 180 kWh 188,000 lbs water pollution	\$31,000 + \$170,000 product saved	Recommended
Nitrogen Generation In-house	--	\$19,000	Recommended

MnTAP Advisor: Michelle Gage, Engineer



Ball Corporation



Sayandeep Biswas

Chemical Engineering
University of Minnesota, Twin Cities

Company Background

Ball Corporation is a global leader in innovative, sustainable metal packaging for beverage, personal care, and household products headquartered in Broomfield, Colorado. It was founded in Buffalo, New York in 1880 by Frank C. and Edmund B. Ball and was then known as the Wooden Jacket Can Company. Ball Corporation has come a long way since then and has more than 100 international locations and 17,500 employees. Ball Corporation's St. Paul facility makes aluminum beverage cans, and employs approximately 200 people.



"This summer has been a great learning experience. I was extremely happy to make a difference by implementing changes which helped preserve scarce natural resources. MnTAP empowered me to do my part in building sustainable processes and a greener future." ~ SB

Project Background

The project at Ball Corporation focused on improving systems for tracking the water usage in different segments of the plant and trying to reduce the total water consumption of the plant. Water is used in the can manufacturing process: to create the lubricant which allows the cans to be worked, to wash off the lubricant in a 7-stage washer, in the wastewater treatment system, and in the cooling tower. The 2018 water consumption of the plant was approximately 26 million gallons, costing the company \$250,000.

"Our MnTAP intern was energetic and truly motivated to make a difference in our plant operations. After some discussions about water savings opportunities, he investigated the solutions, proposed the equipment and assisted in the installation. The results were immediate savings of water and some potential projects for future implementation. "

*~ Mike Cloud
Engineering Manager, Ball St Paul*

Incentives To Change

Water scarcity, quality and discharge are operational and reputational risks for Ball Corporation and their value chain partners. Reduction in water consumption reduces a significant cost to the business and helps them meet corporate efficiency targets for gallons of water consumed per can. Ball also focuses on environmental and social sustainability and is widely recognized for its sustainability efforts around the globe. Therefore, Ball continuously implements projects directed towards water savings and has created a culture of water conservation by appointing water champions in each of its facilities.



Solutions

Reusing Treated Wastewater in the Lime Silo

A system to reuse wastewater for the lime silo was present, however, it was not being used as it lacked reliability. This system was restarted by cleaning the existing pipes which were blocked with sludge. Additionally, a float valve was installed to supplement the treated wastewater supply with tap water if needed. This makes the system more robust by preventing failure in the unlikely event of low supply of treated wastewater. This project has saved 9-10 GPM amounting to almost 5 million gallons annually.

Reusing Treated Wastewater for Polymer Delivery

Anionic polymer is added to the wastewater treatment system as a flocculant. To activate and disperse this polymer, fresh tap water was being used. A pump system was installed which allowed the treated wastewater to be used for the application. This system led to a savings of 2 gpm, amounting to a million gallons annually.

Adding Tap Aerators

The washroom within the factory floor did not have aerators on the taps. To maintain quality, the plant requires its employees to wash hands every time they return to work. Installing aerators helped save 33,000 gallons of water annually by reducing water usage per hand wash.



Replace Compressed Air with Blowers

After defective cans are removed from the production line, compressed air was used to carry them to a recycle drum located about 10 feet away. This compressed air line was replaced with a blower which is capable of carrying the cans more efficiently. The change saved almost 5 million kWh of energy and \$350,000 annually. Reducing the compressed air usage has also decreased the heat load allowing a more efficient cooling tower management.

Recommendation	Annual Reduction	Annual Savings	Status
Reuse Water in Lime Silo	4,700,000 gallons water	\$44,000	Implemented
Reuse Water in Polymer Delivery	1,000,000 gallons water	\$10,000	Implemented
Adding Tap Aerators	33,000 gallons water	\$300	Implemented
Replace Compressed Air with Blowers	4,700,000 kWh	\$350,000	Implemented

MnTAP Advisor: Jane Paulson, Sr. Engineer



Heather Levy

Chemistry

University of Minnesota, Twin Cities

Company Background

Boston Scientific is an internationally recognized medical device researcher and manufacturer. The Maple Grove, MN, site is focused on interventional cardiology devices and surgical equipment, including drug coated stents, balloon catheters, and WATCHMAN™, a device that reduces the risk of stroke.



"Boston Scientific welcomed me with open arms. Throughout my entire internship, I had full access to specialists, technicians, engineers, and the campus. Everyone was extremely interested in my ideas and brought their own too! Some of the best ideas were discussed right on the production floor. I am incredibly grateful for my supportive co-workers, thank you for the fantastic opportunity and the amazing friendships!" ~ HL

Project Background

The site in Maple Grove consumes 40,000,000 gallons of water annually for production, domestic, and operational needs. This water is purchased from the City of Maple Grove and discharges are regulated by Metropolitan Council. A major goal of the internship was to identify gaps in knowledge related to the use and discharge of water. A process analysis and water balance were performed to determine gaps and find opportunities for water conservation.

The project was divided into 2 stages: first, major water-consuming areas in the facility were identified and quantified; second, opportunities for water and/or energy and material conservation were evaluated.

Incentives To Change

Anticipated audits and a re-application period for an industrial wastewater discharge permit spurred the desire for a better understanding of water usage at the Maple Grove site. A MnTAP intern could help the site find new ways to conserve resources, support their ISO 14001 Environmental Management System, and reduce costs.

"Boston Scientific has a long history providing summer intern opportunities for students - this was the Maple Grove site's first experience with a MnTAP Intern and it was a great experience. The work on water life cycle and water conservation that Heather did this summer was of the highest quality. The projects that Heather completed and the ideas that she has generated fit exactly with Boston Scientific's Global EHS policy to protect 'the planet, our people and our property.' By the completion of the summer Heather had saved the company many times the small fee that it cost to have her here. So, would we recommend the MnTAP summer intern program - Yes most definitely, these students are carefully selected and do a really great job."

~ Sonia James

Environmental, Health & Safety Manager
Boston Scientific

Solutions

Reduce Corrosive Rinse Tank Dump Frequency

Corrosive rinse tanks account for most of the water consumed by the site's industrial processes. By switching a configuration setting in several tanks from one rack per dump to five racks per dump, a considerable amount of water and money could be saved with immediate payback.

Add Faucet Aerators

Several faucets in high-use coffee station sinks did not have faucet aerators. The installation of these aerators could allow for a reduction in domestic water usage.

Self-report Evaporative Losses to the Utility

The site in Maple Grove pays sewer charges on water lost to evaporation. By reporting evaporative loss calculations and meter readings to the utility for relevant cooling tower and boiler systems, the facility could reduce their water bill costs.



Reclaim Water Softener Brine Discharge

Brine discharge during water softener regeneration can be rerouted back into a salt tank for a 30% salt savings. This could reduce chlorides released into the environment and facility salt costs.

Fix Steam Valve Leak

The facility loses energy due to a small steam valve leak. Fixing this leak during planned production shutdown time could save future energy loss and fixture damage.

Recommendation	Annual Reduction	Annual Savings	Status
Reduce Corrosive Rinse Tank Dump Frequency	3,800,000 gallons water	\$15,000	Implemented
Add Faucet Aerators	177,000 gallons water	\$700	Implemented
Self-Report Evaporative Losses to Utility	N/A	\$18,000	Planned
Reclaim Water Softener Brine Discharge	96,000 lbs salt	\$8,000	Recommended
Fix Steam Leak	2,000 therms	\$900	Implemented

MnTAP Advisor: Matt Domski, Waste Prevention Specialist



City of Plymouth



Sam Mader

Chemical Engineering
University of Minnesota, Twin Cities

City Background

Plymouth is a suburb about twelve miles northwest of Minneapolis.

With a population of 78,000, Plymouth is the seventh largest city in Minnesota. Additionally, Plymouth is known for its natural amenities, including 8 lakes and an extensive array of parks and trails. Plymouth provides water to its residents and businesses from groundwater sources: Prairie du Chien-Jordan, Prairie du Chien Group, and Jordan aquifers. The City of Plymouth supports water conservation and encourages practices to reduce the demand for municipal water.



"The MnTAP internship was a great opportunity for me to learn and practice skills not taught in my engineering curriculum, such as communication, project management, and economic reasoning. I am super thankful for this experience." ~ SM

Project Background

In the summer, the City of Plymouth can consume more than 430 million gallons of water monthly; more than double the monthly water consumption compared to the rest of the year. Irrigation of public and private green spaces accounts for a significant portion of increased water usage during the summer months. Steps should be taken to reduce peak water demand in the summer and conserve water year-round to ensure the existing system will continue to deliver reliable and affordable water for years to come.

Incentives To Change

Peak water consumption in the summer may strain Plymouth's groundwater sources, prompting the need for more efficient practices and equipment. The Minnesota Department of Natural Resources (DNR) manages water across the state, and has conservation goals and

"Partnering with MnTAP has helped us better understand where cost effective practices can be implemented in our community. The project was complex and challenging. The guidance and information provided by MnTAP is beneficial and will help the City implement improvements going forward."

*-Ben Scharenbroich
Interim Water Resources Manager, City of Plymouth*

SOLUTIONS

regulations regarding water losses and data collection. Reduction of water losses and improved tracking of water use can both be achieved through water auditing.

Conduct Water Audit Annually

The results from the audit of Plymouth's 2018 water consumption using American Water Works Association (AWWA) auditing tool indicate that improved data is needed before any major actions regarding leakage control are taken. The Overall Water Audit Validity Score was 72 out of 100, indicating there is room for improvement in the collection and handling of metering and billing data. Continual water auditing in the future will increase the overall data validity.

Calibrate and Volumetrically Test All Source Meters Annually

Two meters on wells at the central treatment plant had known inaccuracies. During meter calibration, a registered flow was greater than what the influent Rosemont meters would read. By calibrating all 19 source meters, the total volume supply and the total losses can be better estimated.

Solutions

Test a Sample of Customer Meters Annually

Testing customer meters regularly allows for validation of metering data. Testing a sample would also provide a gauge of the overall accuracy of the customer meter population, and determine when meter replacements or maintenance are needed.

Install Moisture Sensors at All Playfields

Soil moisture sensors allow irrigation systems to water only when needed to achieve the optimal soil moisture content. A one-month test of soil moisture sensors at Zachary Field found that water consumption was reduced by 44% compared to the original settings. It was recommended that moisture sensors be installed at all playfields irrigated by the city. This would save almost 5 million gallons of water annually.



Optimize Zone Run Times of Non-Playfields with Evapotranspiration Calculator

Evapotranspiration (ET) calculations were used to determine soil-moisture needs for irrigated spaces

with less foot traffic. Water is conserved by adjusting irrigation runtimes to provide the optimal amount of water needed to irrigate non-playfields.

Replace/Repair Flow Diverters in Showers w/Leaks

Maintenance or replacement of leaky diverters would result in water savings and natural gas used to heat lost water.

Install WaterSense Certified Aerators and Showerheads in Assisted Living Properties

Installing WaterSense certified flow aerators and showerheads in all bathrooms in the senior living buildings would reduce fixtured water use without significantly affecting performance.

Replace Common Area Washers with ENERGY STAR Certified Washers

There are nine coin-operated commercial washers in the common area at Plymouth Towne Square. On average, ENERGY STAR certified washers use 40% less water and 25% less energy than standard washers. Replacing the nine standard washers with ENERGY STAR certified washers would result in significant water and energy savings.

Recommendation	Annual Reduction	Annual Savings	Status
Conduct Water Audit Annually	Improved Data	\$0	Recommended
Calibrate and Volumetrically Test All Source Meters	Improved Data	\$0	Recommended
Test a Sample of Customer Meters Annually	Improved Data	\$0	Recommended
Install Moisture Sensors at All Playfields	4,940,000 gallons	\$11,600	Recommended
Optimize Zone Run Times of Non-Playfields with ET Calculator	790,000 gallons	\$2,000	Recommended
Replace Flow Diverters in Showers with Leaks	56,000 gallons 300 therms	\$300	Recommended
Install WaterSense Certified Aerators and Showerheads in Bathroom Faucets	1,300,000 gallons 7,700 therms	\$7,000	Recommended
Replace Common Area Washers with ENERGY STAR Certified Washers in Plymouth Towne Square	318,000 gallons 700 kWh 600 therms	\$1,000	Recommended

MnTAP Advisor: Nathan Landwehr, Waste Reduction Specialist



Health Systems Coop. Laundries



Josiah Budiman,
Chemical Engineering
University of Minnesota Twin Cities

Company Background

Health Systems Cooperative Laundries (HSCL) is a cooperative association that processes linen from 31 hospitals and 600 clinics in the Minneapolis-Saint Paul metropolitan area. Its water usage is much more efficient than a conventional laundry due to its size, standardized linen, and tunnel washer technology.



"Working at my host company of Health Systems Cooperative Laundries has been a great experience. I don't think I will ever be able to look at laundry or water the same way again. I am very grateful to the staff at MnTAP and HSCL for their help while I was trying to understand the process. I've grown as an independent thinker and as an engineer, and I feel much better prepared to face challenges with the skills I've learned during this project." ~ JB

Project Background

Based on data from 2018, the plant is projected to consume 30 million gallons of water, 1,200,000 therms of natural gas, and 3.5 million kWh of electricity in 2019. Most of the water is used in three main tunnel washers and three medium washers. The third tunnel washer was added last year to accommodate volume growth and allow for more efficient washing of more linen. Research provided the identification of opportunities for increased water and energy efficiency. A similar balance was completed for natural gas. The three primary sources of gas consumption are the two boilers, dryers, and space heaters.

Incentives To Change

In the past year, HSCL has seen 12% volume growth due to the addition of two new clients. This means an additional 4 million pounds of laundry annually. As such, HSCL is looking for ways to improve operations while lowering costs for its member hospitals and clinics.



"The MnTAP intern program provided us with some great resources and insight. Josiah gave us a fresh view of our equipment and use of energy through his detailed recommendations – some of which have already been implemented. We even shared his final report and presentation with several other plants in our company, as we all have similar equipment."

*~ Lori Nyberg, PMP
HSCL Project Manager*

Solutions

Regular Maintenance of Air and Steam Trap Leaks

An audit of the compressed air and steam distribution systems identified five steam trap leaks resulting in an opportunity to save approximately 180,000 gallons of water and 1,300 therms, or \$2,500 if sealed correctly. In addition, air leaks found throughout the plant present an opportunity to save about 4,700 kWh, or \$400 per year.

Increase Load Weight in Medium Washers

Medium washers are hand-loaded, which can lead to under-loading. The average load weight was 150 lbs, though steam dryers can process 400 lbs at a time and the washers can wash 225 or 275 lbs per cycle. Since two loads are dried at a time, washer loads should be increased to 200 lbs. Estimated savings would be 2,300,000 gallons of water, 300 therms, and \$2,700 worth of chemicals per year.

Optimize Medium Washer Water & Chemical Usage

Chemicals used in the machine are currently set to accommodate either 225 or 275 lbs of laundry. Scaling down chemical usage for only 200 lbs would result in an estimated savings of 1,100,000 gallons of water, and \$1,400 in chemicals per year.

Decrease Dryer Time

Dryers make up a large portion of gas and electricity consumption. Reducing drying time for the 14 gas dryers would result in a reduction of 31,000 kWh, 12,000 therms, and \$8,000 per year.

Decrease Operating Speed on Motors

The motors on finishing machines currently operate at speeds too quick for operators to keep up with. Slowing the motors to just above the operators' speed would use less electricity while maintaining the same level of production. An estimated 24,000 kWh and \$2,100 would be saved annually.

Decrease Operating Pressure in Air Compressors

All machines on the production floor require an operating pressure at or below 85 psi, yet the air compressor is set at 105 psi. By reducing the air compressor pressure to 92 psi, an estimated 16,000 kWh and \$1,500 would be saved.

Catch Mis-fed Linen

Mis-fed linen in the finishing machines needs to be rewashed if it touches the floor. Catching mis-fed linen would save 98,000 gallons of water, 5,600 therms, 14,000 kWh, and \$3,700 in chemicals annually.

Recommendation	Annual Reduction	Annual Savings	Status
Fix Faulty Steam Traps	180,000 gallons 1,300 therms 4,700 kWh	\$2,500	Recommended
Increase Medium Washer Loads	2,300,000 gallons 300 therms \$2,700 in chemicals	\$21,900	Implementing
Optimize Medium Washer Water and Chemical Usage	1,100,000 gal \$1,400 in chemicals	\$11,000	Recommended
Decrease Dryer Time	12,000 therms 31,000 kWh	\$8,000	Implemented
Decrease Electric Motor Speed	24,000 kWh	\$2,100	Recommended
Decrease Operating Pressure on Air Compressor	16,000 kWh	\$1,500	Implemented
Catch Mis-fed Linen	98,000 gallons 5,600 therms 14,000 kWh \$3,700 in chemicals	\$8,200	Recommended

MnTAP Advisor: Brent Vizanko, Associate Engineer



Hutchinson WWTP



Josh Kirk

Environmental Engineering
University of Minnesota, Twin Cities

City Background

The Hutchinson Wastewater Treatment Facility was placed in service in 1988 as a “Class A” extended aeration activated sludge wastewater treatment facility. It was initially constructed as an oxidation ditch facility, and those ditches were, until recently, the largest of their type in the Midwest. In response to projected community growth and industrial expansion, a major construction project to increase capacity was completed in 2008. This project consisted of the installation of a membrane bioreactor (MBR) system. Since the MBR and the oxidation ditch systems would be run in parallel, this addition increased the average daily design flow of the plant.



“This summer I had the chance to explore and understand the process of municipal wastewater treatment from head to toe. Being onsite in Hutchinson this summer allowed me to access and utilize industry-standard equipment, as well as consult with professionals in the field. This boots-on-the-ground experience allowed me to enhance my theoretical knowledge base with practical experience.” ~ JK

Project Background

The Hutchinson Wastewater Nutrient Optimization Project was focused on promoting biological nutrient removal (BNR) at the Hutchinson plant. The project is important because the city is expecting to receive tighter limits on effluent phosphorus, and meeting these new limits through chemical additions would be financially burdensome for the city. Biological nutrient removal will allow the wastewater plant to meet discharge nutrient limits without chemical additions, helping to keep Minnesota waters clean.

Incentives to Change

Phosphorus discharge is currently limited at the Hutchinson Wastewater Treatment Facility to 1.0mg/L. The plant stays in compliance with this limit by chemically treating with ferric chloride down to about 0.64 mg/L of phosphorus in the effluent. However, there is a more stringent effluent phosphorus limit proposed for the summer months from May - September that may go into effect within the next few years. This means that Hutchinson would need to keep their effluent phosphorus concentrations below 0.2 mg/L in order to consistently remain below this limit. It is unclear if this limit can be met by increasing chemical feed rates, and

regardless, there are several disadvantages to increasing the use of iron salts at the plant. For one, iron salts are a safety hazard (the material is highly corrosive), they also consume alkalinity, and can stain UV bulbs, which reduces disinfection efficiency. In addition, chemical removal of phosphorus is expensive in regard to both purchase of the chemical, and the creation of additional sludge volume which must be stored and handled.

“The City of Hutchinson WWTP requested the help of a MnTAP intern due to implied MPCA NPDES permit limit adjustments to our phosphorous discharge and the possibility that we might not be able to achieve the new limit solely with the use of chemical precipitants. We wanted to examine the possibility of making changes to both our oxidation ditch and membrane bioreactor treatment trains in order to facilitate biological nutrient removal. Our team was very excited to view the result of the study that Josh has developed for us.”

~ Tim Gratke
City of Hutchinson WWTP

Solutions

Oxidation Ditch Operational Changes

The oxidation ditch, like the membrane bioreactor system, currently does not have any true anoxic zones along its flow path. Near the bottom of the ditch, the dissolved oxygen levels sit consistently around 0.25 mg/L, but at higher points in the vertical column, these levels increase. At dissolved oxygen concentrations of 0.25 mg/L denitrification is inhibited. This suggests that the oxidation ditch is performing nitrification (the conversion of ammonia to nitrate under oxygen-rich conditions) successfully, but that oxygen levels are never low enough to promote denitrification (the conversion of nitrate to nitrogen gas).

A number of changes to the operation of the oxidation ditch treatment train at the Hutchinson Wastewater Treatment Facility were evaluated using computer modeling software. Ultimately, it was found that the most effective and efficient biological nutrient removal occurred by cycling aeration to the ditch at a rate of 1 hour on and 1 hour off for a period of one week. During periods when aeration is off, the oxygen levels drop to zero, enabling denitrification and biological phosphorus removal. It is believed that this first, one week period would create conditions allowing the microorganisms responsible for BNR to grow. After this one week period, aeration rates are changed to cycling for 2 hours on, 1 hour off, resulting in effective biological nutrient removal.



Membrane Bioreactor Configuration and Operational Changes

Using the ASIM (Activated Sludge SIMulation Program), a number of changes to the operation of the membrane bioreactor (MBR) system at the Hutchinson Wastewater Treatment Facility were evaluated.

Ultimately, it was found that the most effective and efficient biological nutrient removal occurred after creating separate anaerobic and anoxic zones, reducing aeration dissolved oxygen levels to 2 ppm, reducing the Return Activated Sludge rate, lowering the sludge age to 10 days, and recirculating flow from the anoxic tank to the anaerobic tank.

These changes would create an anaerobic zone to facilitate phosphorus removal, an anoxic zone to facilitate denitrification, and are expected to create the conditions that would make biological nutrient removal successful.

The change requires constructing a wall to separate each aeration tank into two, which would create the space required for the anaerobic and anoxic zones. The change would also require recirculation pumps and re-piping to implement the new flow strategy.

Recommendation	Annual Reduction	Annual Savings	Status
Oxidation Ditch Aeration Cycling	135,000 lbs ferric chloride solution 69,000 lbs of nitrogen 65,000 kWh	\$30,000	Planned
MBR Operational/ Configuration Changes	136,000 lbs ferric chloride solution 1,800 lbs of phosphorus 40,600 lbs of nitrogen 330,000 kWh	\$48,000	Recommended

MnTAP Advisor: Jon Vanyo, Engineer



Noah Siem

Bioproducts & Biosystems Engineering
University of Minnesota, Twin Cities

Company Background

Kerry is a global food company headquartered in Naas, Ireland with a North American headquarters in Beloit, Wisconsin. The Rochester, MN facility specializes in applied health and nutrition. What makes the Rochester facility unique is its process of creating products through fermentation followed by conversion to solid form using evaporators and spray dryers. They produce spray-dried fermented ingredients that are used as natural shelf-life extenders in breads and as natural meat cultures. They also produce liquid buffered vinegars and peptides. Kerry takes pride in the ability to deliver high-quality fermented products in dry form to its customers.



"My experiences at Kerry have been very beneficial in discovering what it's like to be an engineer. I've been able to work on a diverse set of projects that complimented my existing computer science background and challenged my engineering skills. It's exciting to see the value Kerry put on my recommendations as they begin implementation." ~ NS

Project Background

The Rochester, MN, plant of Kerry is undergoing a major expansion project. The increase in production capacity will demand more electricity, natural gas, air, and raw materials for plant operations. Additional water will be needed to accommodate the expansion. Kerry would like to review opportunities to optimize their water usage without increasing water capacity due to sewer and permit limitations as well as corporate sustainability goals.

Incentives To Change

Kerry must be conscious of wastewater discharge to the Rochester Water Reclamation Plant. Sewage pretreatment requirements are set by City of Rochester, Minnesota City Ordinances to avoid wastewater loading that unbalances the city's wastewater treatment process. The wastewater must have a pH between 5 and 11. If it is out of range or has other corrosive properties, the water can harm the desired microbes used in wastewater treatment, cause damage to equipment, or be hazardous to personnel of the wastewater plant.

Kerry is also charged for biochemical oxygen demand (BOD) discharges and seeks opportunities to divert BOD from waste streams as well as regain product by reducing

BOD pollution at its source. There are opportunities for Kerry Rochester to reduce BOD loading and optimize pH management that will allow Kerry to achieve permit compliance. This includes source reduction of waste and pollution prevention.

The Kerry 'Towards 2020' program sets goals and targets to reduce environmental impacts of its operations. Kerry is committed to reducing water use by 7% by 2020 compared to baseline year 2018. Focusing on energy efficiency, water conservation, and chemical optimization opportunities will advance the Kerry 'Towards 2020' targets. Beyond 2020, Kerry also has a goal of reducing water usage to the 2017 baseline by the year 2025. Kerry also can save money by reducing energy consumption and wastewater loading.

"MnTAP is a valued partner for Kerry, and has provided key capabilities in wastewater management that will enable the company to continue growing more sustainably."

*~ Brian Morgan
Mechanical Engineer Project Manager, Kerry*

Solutions

Water Conservation Through Water Reuse

City water is used for boiler make-up, process, clean-in-place (CIP) processes, plant cleaning, and glycol chiller make-up. Approximately 7.5 million gallons per month of city water is used. The main water conservation opportunity explored in this project is the opportunity to take condensate water, filter it, and reuse it for other processes such as cooling tower make-up and first-rinse CIP water.



BOD and Waste Reduction

Kerry Rochester specializes in fermented and cultured ingredients. The ability to deliver products such as cultured celery product for meat curing as a dry ingredient is important for customers. Two evaporators are used to concentrate product. Kerry then utilizes spray dryers to convert products from a liquid form to a dry form. The dry ingredient is packaged onsite and is prepared for shipping. Opportunities to reduce BOD and product being washed down the drain were also explored as part of this project.

Effluent pH Control

Kerry is implementing a new wastewater effluent pretreatment system that consists of two 30,000 gallon equalization tanks and two 7,500-gallon adjustment tanks. Water is held in the tanks to allow for mixing and pH correction before flowing to city sewer. A portion of this project focused on designing and programming this pH control system to increase residence time and neutralize water discharges to meet compliance for pH.

Recommendation	Annual Reduction	Annual Savings	Status
Update pH Process Control Logic on Effluent System	4,000,000 gallons of water with unsafe pH	\$20,000	Implemented
Reuse Evaporator Condensate Water	30,000,000 gallons of water	\$300,000	Planned
Reduce BOD and Product Loss by Prioritizing Efficient Spray Dryer	190,000 lb BOD	\$233,000 product and BOD savings	Planned
Reduce BOD and Product Loss Through Spray Dryer Upgrade	511,000 lb BOD	\$624,000 product and BOD savings	Future Project

MnTAP Advisor: Jon Vanyo, Engineer



Minnesota Zoo



Erin Maxson
Chemical Engineering
University of Minnesota, Duluth

Organization Background

Established in 1978, the Minnesota Zoo is a zoological garden, accredited by the Association of Zoos and Aquariums. They care for 533 species of animal and conduct 133 conservation projects worldwide.

Open 363 days of the year, the zoo's staff of 300 maintains strong bonds and devotion to their animals, while providing education and outreach programs to school age children. The zoo's mission is to employ sustainable practices as it connects guests to the natural world in order to preserve wildlife.



MINNESOTA ZOO

"My summer working with MnTAP and the Minnesota Zoo provided me with excellent project management and communication skills that will benefit me in my future career as an engineer. It was great knowing that my work will create a difference at the Minnesota Zoo and in the environment." ~ EM

Project Background

In 2017, the Minnesota Zoo used a total of 72,000,000 gallons of water. The Zoo utilizes water in many aspects, including in animal care and exhibits, domestic use, ground maintenance, recreation and HVAC purposes. Prior to the beginning of this project, the staff had envisioned many different ideas to implement more sustainable practices at the Zoo. The project helped investigate and refine these ideas into recommendations.

Incentives To Change

The Minnesota Zoo has developed a set of goals aimed at creating a more sustainable establishment. One of those goals is to reduce water usage by 15% by the year 2025. Creating changes directed towards sustainable processes at the Minnesota Zoo has become an ambition for the Zoo, not only to achieve those goals, but also to inform and educate the many guests that visit the Zoo about sustainability and conservation. As an establishment committed to animal conservation, initiatives and education funded by the Zoo have already provided positive impacts by creating a healthier environment for wildlife globally. The Minnesota Zoo intends to continue making positive impacts on animal preservation and the community by reducing water usage.

"The Minnesota Zoo is a responsible steward of all resources entrusted to us. Our partnership with the MnTAP program gave us the opportunity to examine the Zoo's use of water and consider a variety of different ways in which we will be able to conserve this resource while maintaining the highest standards of animal welfare. Erin's work this summer laid the foundation for projects that will reduce our water usage and educate our guests on how they, too, can conserve water."

*~ Mary Ann Saurino, MA & EdS
Internships & Youth Development Coordinator
Minnesota Zoo*



Solutions

Circulation and Treatment to the Gibbon Pond

The Gibbon Pond is a 48,000-gallon body of water that flamingos and many species of ducks call home. To provide a safe and healthy environment, the pond changes water once a week. To reduce the number of water changes required, a circulation and treatment system were recommended. The circulation system would improve the quality of water by introducing oxygen. This would reduce bad smells, accelerate the breakdown of organic materials, and create more contact opportunities for the treatment system. The treatment system will also reduce both the cloudiness of the water, nitrogen, and phosphorous. These changes would result in a reduction of 1,300,000 gallons annually.



uncontaminated, it is capable of being reused for the same purpose. By using a geo-exchange cooling loop to get the needed temperature drop, the system could be converted to a closed loop cooling system. This would amount to an annual water reduction of 1 million gallons.

Install Motion Sensors to Moose Cooling Showers

Five moose are cared for by Minnesota Zoo staff. To provide the moose with the best care possible during warm days, the zookeepers turn on misting showers in each of the moose's holding pens. Since the water may or may not be used by the moose, it was recommended to install motion sensors to detect when the moose are nearby and turn the water on. The estimated

annual water reduction would be 100,000 gallons.

Install Solenoid Valves to Dump and Fill Pools

Many animal exhibit and holding rooms contain pools that require frequent water changes to maintain a healthy environment. Some of these pools are refilled with water manually by the zookeeping staff. It was recommended to implement an automated fill system on the Snow Monkey and Komodo holding pools by installing timers and solenoid valves. This change would conserve 190,000 gallons of water every year.

Re-Use Central Heat Plants Single Pass Cooling Water

The Central Heat Plant provides hot water to most of the buildings using two circulation pumps. To maintain the pumps at safe operating temperatures, a single pass cooling system is applied. Since this water remains

Reduce Backwashes on Grizzly Bear Sand Filter

The Grizzly Bear habitat is a beautiful, award winning exhibit that provides an excellent view to see the bears playing, and sometimes fishing in their 16,000-gallon pool. The water is run through an extensive filtration system that includes two sand filters. Due to the high amount of sediment that can run into the pool, the sand filters become dirty quickly and require extra backwashes or cleanings. By installing a fine screen filter prior to the sand filters, the amount of sediment entering the sand filters will be reduced and, in turn, will halve the number of backwashes on this system. This recommendation would result in 1,600,000 gallons of water being conserved every year.

Recommendation	Annual Reduction	Annual Savings	Status
Improve Water Circulation in the Gibbon Pond	1,300,000 gallons	\$1,700	Implementing
Install Solenoid Valves to Fill Ponds	190,000 gallons	\$3,000	Planned
Single Pass Cooling Water Re-Use	1,000,000 gallons	\$5,300	Recommended
Motion Sensors for Cooling Showers	100,000 gallons	\$600	Recommended
Reduce Sand Filter Backwashes	1,600,000 gallons	\$9,300	Recommended

MnTAP Advisor: Michelle Gage, Engineer



North Memorial Health



Josh Goetz

Chemical Engineering
University of Minnesota, Twin Cities

Organization Background

North Memorial Health is a series of non-profit hospitals, health clinics, and a cancer treatment center providing medical care and services to the Twin Cities and its surrounding suburbs. The North Memorial Health Hospital in Robbinsdale, Minnesota is a Level I trauma center that employs over 3,300 people and houses over 350 beds. The Robbinsdale campus consists of the main hospital building and atrium, the West Hall, the hospital parking garage, the Robbinsdale Medical Building (RMB), the hospital's helipad, and the RMB parking garage.



"Working with MnTAP this summer has been an incredible and unforgettable experience. The people at both MnTAP and North Memorial treated me with kindness and respect, and encouraged me to learn and grow in a multitude of ways. If I could go back and do it all again, I would in a heartbeat. Thank you, North Memorial, and thank you, MnTAP!" ~ JG

Project Background

North Memorial Health has been actively working to decrease its natural gas and electricity consumption to reduce the cost of its utilities and improve its carbon foot print. North Memorial Health enlisted the help of MnTAP to provide a summer intern that could assist with the assessment, justification, and implementation of cost-effective opportunities for short and long-term energy savings. For the summer of 2019, North Memorial's primary focus was increasing the efficiency of its boiler plant and HVAC systems with an overall focus on energy conservation.



Incentives To Change

As a non-profit organization, North Memorial Health is hoping to decrease its energy consumption to gain additional funding for the operation, maintenance, and renovation of the rest of the hospital, to ultimately provide better care to more individuals. North Memorial looked to its current boiler system, requiring 1.27 million therms of natural gas annually, as a major opportunity for savings due to its number of complex components. These components include the boilers, flue stacks, steam equipment (valves, traps, etc.), heating, ventilation and air conditioning (HVAC) system, and the condensate return system.

"This is the second year we have worked with MnTAP interns to investigate opportunities for water and energy reduction that have resulted in savings. This year's intern researched energy reduction ideas including using a smaller summer boiler in non-heating months, adding an exhaust stack economizer, insulating steam valves and traps, and upgrading other equipment for energy efficiency. We are evaluating operational changes based on his findings."

*~ Bob Johnson
North Memorial*

Solutions

Summer Boiler System

North Memorial utilizes three steam boilers to manage its steam demand. During the summer, the hospital's boiler utilization is 3 to 4 times smaller than in winter. By installing a smaller summer boiler, the greater efficiency of steam production could save 41,000 therms and \$19,000 per year.

Stack Economizer

When natural gas is burned to make steam, the combustion exhaust is expelled through boiler stacks. By installing a stack economizer in-line on the three boilers, the heat from these stacks can be recovered and used to preheat water being sent to the boiler and could save 78,000 therms and \$37,000 per year.

Summer Boiler and Economizer Combination

By installing an economizer in line of the three current boilers as well as a summer boiler with an economizer built in, there could be an annual savings of 130,000 therms and \$56,000.

Removable Insulation Jackets

Most of the equipment involved in the steam distribution and condensate return systems are insulated. Due to some unconventional shapes and/or accessibility, some equipment were not insulated and remain uncovered. Removable insulation jackets could save 2,900 therms and \$1,500 per year.

Decrease Operating Boiler Pressure

The boilers currently produce steam at 105 PSI year-round as it is the lowest the pressure point can be set before problems with the winter demand are observed. These issues are not present in summer. By lowering the boiler pressure in the summer the facilities could save 23,000 therms and \$10,000 per year.

Occupancy-Based HVAC Controls

The hospital currently uses variable air volume (VAV) controls to modulate the temperature in patient rooms. When these rooms are unoccupied in the winter, the temperature is set to a minimum of 65 F. It is recommended to lower the temperature to 55 F and tie in the VAV controls to the hospital's occupancy database. The software could automatically switch rooms to an unoccupied mode and would save 5,200 therms and \$2,500 per year.

New Steam Cooker

The oldest of the two steam cookers in the kitchen is coming to the end of its operating life. By replacing the steam cooker with a natural gas powered ENERGY STAR approved model, the cooking process would become efficient and save 700 therms, 47,000 gallons of water, and \$600 per year.

Recommendation	Annual Reduction	Annual Savings	Status
Summer Boiler	41,000 therms	\$19,000	Recommended
Boiler Stack Economizer	78,000 therms	\$37,000	Recommended
Summer Boiler w/ Stack Economizer	130,000 therms	\$56,000	Recommended
Removable Insulation Jackets	2,900 therms	\$1,500	Recommended
Decrease Boiler Operating Pressure	23,000 therms	\$10,000	Testing
Occupancy-based HVAC Controls	5,200 therms	\$2,500	Recommended
Replace Steam-Cooker	700 therms 47,000 gallons water	\$600	Recommended

MnTAP Advisor: Brent Vizanko, Associate Engineer



Phillips Neighborhood Businesses



Elizabeth Joncas

Sustainable Systems Management
University of Minnesota, Twin Cities

Organization Background

Hope Community is a non-profit housing and leadership development organization that is located in the Phillips Community; a diverse and historically underserved area of Minneapolis that is comprised of four thriving neighborhoods. Hope Community strives to empower local Phillips residents and business owners through a variety of leadership development programs, events, and equitable housing opportunities. Lake Street Council is a non-profit organization that advocates, serves, and engages to ensure the vitality of the commercial corridor on Lake Street.



"I'm incredibly thankful to have been able to work on a MnTAP internship this year. It was an amazing experience that taught me a lot of skills that I will use in future careers, and I'm really appreciative of all of the guidance and support from MnTAP, Hope Community, and Lake Street Council. Improving the air quality of the Phillips Community has been extremely rewarding and a great experience!" ~ EJ

Project Background

After two years of Safer Products work in the Phillips Community, this year's project focused on replacing janitorial products used in restaurants and child care facilities, with a goal of further improving the local air quality and general community health. This project particularly focused on reducing the amount of bleach and quaternary ammonium compounds (QUATs) used in disinfectants and sanitizers, because each are attributed to negative human health effects. Bleach is a known asthmagen, and QUATs are known endocrine disruptors which cause developmental problems. Along with these two ingredients, this project also aimed to reduce or eliminate volatile organic compounds (VOCs) and hazardous air pollutants (HAPs).

Incentives To Change

The systems of environmental health and human health are tightly intertwined. According to the United States Environmental Protection Agency, poor air quality is the largest environmental health risk in the United States. The Phillips community is currently one of the most environmentally stressed and vulnerable neighborhoods in the Twin Cities, which makes hazardous health effects for its residents far more common than most other areas. This project provides restaurants, child care facilities,

and other small businesses in Phillips the opportunity to switch to safer cleaning products in order to help improve the air quality and general health of their community. Local, small businesses such as the ones that operate within the Phillips neighborhood often don't have the time or resources to invest in environmental projects for themselves. When approached with an opportunity to easily transition to healthier products, many were very interested in improving the chemical safety of their workplaces in order to positively contribute to worker and community health.

"The MnTAP Intern Program has brought so many benefits to our organization and our community. This year, Elizabeth was able to reach and provide direct support to several small business owners who otherwise would not have been aware that they could improve their indoor air quality. She went above and beyond expectations, even calling a dozen public agency staff to make sure her recommendations didn't conflict with regulations. It's been a fantastic partnership."

*~ Matt Kazinka
Sustainability Program Coordinator
Lake Street Council*

Solutions

Community outreach efforts were conducted in order to educate business owners about their cleaning products as well as record information about their current products and cleaning practices. This information was used to make customized recommendations of new janitorial products that were healthier for both employees and the environment.

MnTAP assessed the cleaning products and recommended alternatives when a product did not meet the criteria to qualify as a safer product. These safer product criteria included low VOCs, no HAPs, and all components classified as a “best available chemical” on the EPA’s Safer Chemical Ingredients List (SCIL), or third-party certifications from Green Seal, EcoLogo, or EPA Safer Choice.

Special attention was placed on making the recommended products as accessible, affordable, and efficient as the original products so that businesses could make the transition easily. After alternatives were found, sample products were purchased and provided



to the businesses. After a week or two of use, the products were evaluated again to make sure that they were effective replacements in terms of quality and performance. In the case that the products were not performing as well, new alternatives would be identified and purchased for a trial period. If the business reported being satisfied with their sample products, a case of product would be purchased and delivered to ease the business’ transition to the newer product.

In summary, 87 total cleaning products were analyzed in Phillips neighborhood businesses, and 41 met MnTAP’s criteria for safer products. After working with businesses to test and approve alternative product samples, 25 cleaning products were replaced with safer alternatives. By replacing these products, 2 lbs of HAPs, 10 lbs of VOCs, and 1,100 lbs of bleach and QUATs have been eliminated from the Phillips community annually.



Recommendation	HAPs Reduction	VOCs Reduction	Bleach/QUAT Reduction	Status
Switch to Safer Janitorial Products, Eliminate Bleach/QUATS	2 lbs per year	10 lbs per year	1,100 lbs per year	Implemented

MnTAP Advisor: Jane Paulson, Senior Engineer



Pond Systems Nutrient Removal



Amit Itkin

Environmental Engineering
University of Minnesota, Twin Cities

Organization Background

Minnesota Rural Water Association (MRWA) was founded in 1978. They are a non-profit association governed by a board of directors. They are staffed with full-time personnel trained to offer professional on-site technical assistance and training to water and wastewater system personnel in managerial, financial, and operation and maintenance of systems, as well as in source water protection. MRWA has partnered with the Minnesota Pollution Control Agency (MPCA) and MnTAP to find and implement wastewater treatment optimization strategies with Minnesota wastewater treatment ponds.



"Working at MnTAP has been a wonderful experience that has allowed me to take initiative on an interesting and important project. During the summer I learned a lot about how wastewater pond systems operate, and it was satisfying turning my findings into fleshed-out recommendations that will improve Minnesota's nutrient outflow." ~ AI

Project Background

MnTAP is partnered with the Minnesota Rural Water Association (MRWA) and the Minnesota Pollution Control Agency (MPCA), with funding through a grant by the LCCMR Legislative-Citizen Commission on Minnesota Resources (LCCMR). The goal of this partnership is to work with cities to reduce the phosphorus and nitrogen effluent in their wastewater treatment ponds (WWTPs). The project involves analyzing the pond systems and suggesting operational changes, as well as finding source reduction opportunities within the sources of inflow. The project's scope focused on the waste water ponds of the cities of Sandstone, Onamia, and Grand Meadow.

For the reasons listed above, the MPCA has started setting phosphorus discharge limits for facultative ponds. Only around 37% of Minnesota's facultative ponds meet the new effluent limit.

"I enjoyed working with the MnTAP interns on the Wastewater Optimization Project."

*~ Tim Hagemeyer
Minnesota Rural Water Association*

Incentives To Change

Nutrients discharged from facultative ponds are released into the ecosystem of local water bodies. If this nutrient loading is large, the local waters experience extreme algae growth in a response to the overabundance of their nutrient food source. The oxygen demand of the algae will lead to low dissolved oxygen within the water. This harms local aquatic animals and plants, putting the whole system at an imbalance. These waters have odor issues, taste strange, and are aesthetically displeasing. It also raises the cost of treating the water and converting it into acceptable drinking water.



Solutions

Use Alum for Chemical Phosphorus Removal

The three pond systems assessed this summer were not using chemical treatment to aid with phosphorus removal. Aluminum sulfate (alum) and ferric chloride (ferric) are common phosphorus removal chemicals. The chemicals can be distributed into the secondary pond from a small boat, or with more complex mixing systems.

Onamia and Grand Meadow: Adopt Waterfowl Prevention Techniques

Geese are attracted to the ponds in both Onamia and Grand Meadow, contributing fecal matter to the system. The solutions identified to prevent this loading is the use of wolf decoys along with an anti-bird odor chemicals to deter the geese. This recommendation could reduce 150 lb and 130 lbs of phosphorus per year from the respective effluent streams.

Improve the Flow Scheme of the System

The flow scheme of all the pond systems could be improved to increase hydraulic retention time (HRT) and hold water at higher depths on average. By holding water at higher depths, there is more room for bacteria and algae to grow to assist with the treatment process. This goal of higher depths is implemented in the first primary pond, which is kept near maximum depth as often as possible. HRT improvement alone could reduce phosphorus effluent

annually by 100 lbs, 70 lbs, and 35 lbs for Sandstone, Onamia, and Grand Meadow respectively. Since the scheme utilizes gravity flow, there is no need for pumping between ponds, saving Sandstone \$4,800 per year in energy.

Onamia and Grand Meadow: Identify and Reduce Inflow and Infiltration (I&I) Coming from Storm Water

There is evidence that storm water is making its way to the pond system in Onamia and Sandstone. Although the water introduced through I&I should not contain phosphorus, it would reduce the pond system's retention time and phosphorus treatment effectiveness. Performing flow monitoring, manhole inspections, dye testing, property inspections, televising of sewers, and/or smoke testing can help to identify sources of I&I.

This would prevent up to 27 million gallons (Onamia) and 28 million gallons (Grand Meadow) of water per year from being unnecessarily treated as wastewater. Assuming 70% of I&I can be identified and treated, this would increase the hydraulic retention time of the systems to reduce the annual phosphorus effluent by 130 lbs and 90 lbs respectively.

Recommendation	Annual Reduction	Annual Savings	Status
Sandstone: Alum Phosphorus Removal	3,600 lb phosphorus	N/A	Recommended
Sandstone: Modify Flow Scheme	100 lb phosphorus 60,000 kWh	\$4,800	Implementing
Onamia: Alum Phosphorus Removal	760 lb phosphorus	N/A	Recommended
Onamia: Modify Flow Scheme	70 lb phosphorus	N/A	Implementing
Onamia: Waterfowl Prevention	150 lb phosphorus	N/A	Implementing
Onamia: I&I Identification and Reduction	180 lb phosphorus	N/A	Recommended
Grand Meadow: Modify Flow Scheme	35 lb phosphorus	N/A	Implementing
Grand Meadow: Alum Phosphorus Removal	1,000 lb phosphorus	N/A	Recommended
Grand Meadow: Waterfowl Prevention	130 lb phosphorus	N/A	Implementing
Grand Meadow: I&I Identification and Reduction	120 lb phosphorus	N/A	Planning

MnTAP Advisor: Jon Vanyo, Engineer



Seneca Foods



Larry Lau
Chemical Engineering
University of Illinois - Urbana-Champaign

Company Background

Seneca Foods Corporation is a food processing and distributing company specializing in frozen and canned fruits and vegetables. Founded in 1949, the company has grown vastly from its beginnings as a frozen juice manufacturer in upstate New York to one of the most highly integrated fruit and vegetable processing companies in the US, operating plants in eight states and distributing its products worldwide. Seneca owns well-recognized national brands such as READ, Aunt Nellie's, and Libby's and exports US-grown food to over 95 countries. The company's facility in Glencoe, MN, is a seasonally-operated plant that produces primarily corn and peas in both frozen and canned varieties.



Farm Fresh Goodness Made Great

"Working with Seneca Foods was a wonderful experience and I learned a lot about what it takes to make a process more sustainable. This experience has furthered my skills as an engineering student and my ability to gather data to find creative solutions. I am grateful to MnTAP and Seneca for giving me the opportunity to do so. It was a lot of fun." ~ LL

Project Background

In 2018, Seneca Foods' plant in Glencoe sent approximately 1,330,000 gallons of wastewater per day of production to the site's stabilization ponds; this amounted to 210,000,000 gallons of wastewater annually. With the ponds nearing the maximum capacity of 290,000,000 gallons, Seneca's project goal was to reduce wastewater reaching their ponds as much as possible, while determining potential reasons for apparent losses in the water balance of the facility. The company also sought to further investigate and evaluate the potential for previously identified solutions towards water conservation.



Incentives To Change

As water usage guidelines set by Seneca and the MPCA have tightened and the amount of product being processed has grown, the priority of reducing wastewater reaching Seneca Foods' stabilization ponds has increased. The Glencoe facility is reaching the point where the ponds may start limiting their ability to produce product. Finding water savings opportunities would help alleviate this constraint and allow them to invest in other areas of the plant, rather than spending resources on treatment of wastewater in the pond system.

"Seneca Foods is always looking for ways to conserve water. When we had the opportunity to work with MnTAP and have an extra set of eyes look at our process, we were excited to see their recommendations."

*~ Mike Stumm
Plant Superintendent
Seneca Foods Corporation*

Solutions

Reduce Water Flow Rate for Pushing Product from 3rd to 2nd Floor

Water is used throughout the facility to push peas and corn via pipes and flumes during production. One such pipe running from the third to second floor of the facility is an opportunity for water reduction. It was suggested that the valve controlling the flow of water through this pipe be turned down rather than left fully open in order to take advantage of gravity to move product along. Decreasing the flow by 30% would save 1,350,000 gallons per year of water.

Optimize Frother Flow Control

Frothers are used to separate skins and split peas from the product stream by floating them out of a tank; the good product then sinks to the bottom and is pumped to the next processing step. While many of these frothers were working properly, some were operated with constant overflow which was not the original design and presented a significant opportunity for water savings. Conducting a thorough assessment of each of the twelve frothers in the pea dock provided individualized solutions to minimize overflow. These included adding or adjusting float valves to the tanks, fixing or replacing broken valves, adding signage, and increasing the height of splash guards. The cumulative water reduction in this area would be 28,000,000 gallons per year, with a cost savings of \$5,400.

Replace Nozzles on Hoses

Hoses are used throughout the plant for general cleaning, foam knock down, and pushing fallen product to drains.

Replacing the nozzles on 40 hoses in the production building with more efficient nozzles that have equal maximum rated pressure but a lower flow rate could decrease total water usage by approximately 90%. This would save 8,000,000 gallons of water per year.

Fix Leaks Throughout the Plant

Several identified leaks from tanks and process piping were measured and quantified. Fixing these leaks would save up to 1,940,000 gallons per year.

Readjust Spray Nozzles Rinsing the Wash Reels

Several wash reels are used to mechanically separate and remove defects from the product stream. As they rotate, they are continuously rinsed by spray nozzles that hang above the equipment. These nozzles should be optimized to provide the minimum rate of spraying to clean the reel. A 20 minute test on one of the reels demonstrated that operating at 70% of the current flow during production would be feasible. If similar settings were to be implemented across all 24 spray nozzles rinsing the reels, the savings would be 275,000 gallons of water per year.

Use Brooms Instead of Hoses to Clean Floors

Regular reminders from supervisors to plant staff to use brooms to clean floors is encouraged to decrease overall water usage. While using hoses may be more convenient and at times necessary for adequate cleaning, switching to the use of brooms as the standard practice will lead to water savings. A modest reduction in hose usage for cleaning could save 500,000 gallons per year.

Recommendation	Annual Reduction	Annual Savings	Status
Reduce Flow of 1st Reclaim Water From 3rd to 2nd Floor	1,350,000 gallons	\$300	Recommended
Optimize Frother Flow Control	28,000,000 gallons	\$5,400	Recommended
Replace Nozzles on Hoses	8,000,000 gallons	\$1,600	Recommended
Fix Leaks Throughout the Plant	1,940,000 gallons	\$400	Recommended
Readjust Spray Nozzles at the 5th Reclaim	275,000 gallons	\$50	Recommended
Use Brooms Instead of Hoses to Clean Floors	500,000 gallons	\$100	Recommended

MnTAP Advisor: Daniel Chang, Associate Engineer



TreeHouse Foods



Nick Tulshibagwale

Mechanical Engineering
University of Minnesota, Twin Cities

Company Background

TreeHouse Foods is an international producer of privately labeled packaged foods and beverages. The Fridley, MN facility specializes in the production of artisan bread and ready-to-bake frozen cookie dough.



"Working in a food processing facility has exposed me to fundamental thermodynamic processes in practice. I can now associate abstract theory with things I have seen in person. Tackling the project has also given me confidence in approaching problems without a clear solution. The project was challenging, but TreeHouse Food's enthusiasm for my work made my time there worthwhile." ~ NT

Project Background

In 2018, 14 million gallons of water were used by the commercial bakery. Only 38% of this incoming water was tracked by submeters for use in different facility processes. The project was undertaken to shed light on the unmetered water use, which makes up 62% of the total incoming water. Moreover, with only 10% of the previous year's water used in production and the majority of other water intensive equipment being metered, TreeHouse believed that this unmetered water use was worth investigating.

Incentives To Change

Creating a detailed water balance would reveal water reduction opportunities and provide TreeHouse Foods with a better understanding of their facility's water use. Additionally, the bakery was interested in monitoring changes in product loss as a way of tracking the effectiveness of future process improvements. By tackling these concerns, TreeHouse Foods hopes to lower their cost of production while improving the facility's sustainability.



"The MnTAP program provided us with a cost effective way to evaluate our overall water usage in the plant and the summer intern provided very reasonable and sustainable solutions to our problem."

*~ Jeff Severseike
Environmental Health & Safety Manager
TreeHouse Foods, Inc.*

Solutions

Deducting Product Water from Sewage Bill

The facility sewer charge is calculated from the total amount of water that enters the facility. Water that is used in the products should be deducted from the city sewage bill. The city agreed to investigate the facility's sub meters measuring product water and reassess the sewage charges.

Condensate Return on Line 1

Steam used by the proof box and oven is drained once it condenses. To ensure water temperatures meet effluent standards, cool city water is poured on the condensate as it drains. Two condensate recovery units and piping could be installed to deliver the equipment's condensate into preexisting condensate lines over the oven. Reusing this hot water for steam generation will eliminate utility costs associated with treating and heating new boiler feedwater.

Maintenance of Softeners and Regeneration Frequency Adjustment

With a new boiler installation, the facility has been focused on ensuring the softeners function properly. The plant should have softeners regularly maintained to ensure regeneration occurs properly, and the outgoing water is softened. The softeners should be slowly adjusted to regenerate less frequently. By doing so, the plant will greatly reduce water and salt usage.

Aerators on Sinks

There are 23 faucets within the facility whose flowrates could be reduced to save on hot water usage. Aerators were installed on all hand and utensil sink faucets.

Board Washer Maintenance

The conveyor washer should be inspected every few months. The mechanical floats currently used are damaged easily and should be replaced with more durable level sensors. Missing jet nozzles, endcaps, or rubber washers means water is used at a high rate. Placing a priority on the maintenance will greatly reduce hot water usage.

Ball Valve on Line 2's Freezer CIP System

A valve on the hot water line running to the line 2 freezer CIP system must be opened prior to the start of the cleaning cycle. If the valve is not shut off following the end of the CIP cycle, water will continue to be sprayed above the spiral freezer stacks. The sanitation crew was made aware of the importance of shutting off the ball valve.

Strategic Meter Placements

Sanitation activities account for approximately 25% of the unmetered water use. Strategic water meter placements would provide a more detailed account of water usage, which would help TreeHouse find additional water conservation opportunities.

Recommendation	Annual Reduction	Annual Savings	Status
Deducting Product Water from Sewage Bill	N/A	\$8,000	Recommended
Condensate Return on Line 1	450,000 gallons water 3,000 therms 4,300 lbs salt	\$3,700	Recommended
Maintenance of Softeners and Regeneration Frequency Adjustment	363,000 gallons water 35,000 lbs salt	\$3,900	Implemented
Aerators on Sinks	43,000 gallons water 100 therms	\$200	Implemented
Board Washer Maintenance	270,000 gallons water 5,000 therms	\$3,600	Recommended
Ball Valve on Line 2's Freezer CIP System	50,000 gal water 300 therms	\$40	Recommended
Strategic Meter Placements	N/A	N/A	Recommended

MnTAP Advisor: Matt Domski, Waste Prevention Specialist



Christopher Yun

Chemical Engineering
University of Minnesota, Twin Cities

Company Background

Verta Inc. is a provider of sustainable, long-lasting, high-performance architectural metal finishes. Verta has been the exclusive finisher for its sister company, Industrial Louvers, Inc. since they were established in 1985. They employ 19 people in Delano, Minnesota.



"My summer spent working with MnTAP has been full of learning and new experiences. It was very fulfilling working to save resources and increase efficiency with the company I worked with over the summer." ~ CY

Project Background

Verta's continuous paint line was installed during the summer of 2018. They wanted to evaluate paint transfer efficiency improvements and options for reuse of cleaning solvents. The paint line consists of manual spray finishing as well as automated sprayers which are linked to light curtain measuring sensors. Prior to painting, parts are chemically washed and rinsed with water purified by a reverse osmosis (RO) system.

Incentives To Change

Improved paint transfer efficiency and solvent utilization reduces purchase and disposal costs. These improvements decrease solvent air emissions and minimize solid and hazardous wastes. Minimizing hazardous wastes would help Verta switch their waste license classification from a large to a small quantity generator of hazardous waste.



"The MnTAP internship program provided us with new perspective on our coatings process and equipment. At this time last year we had installed new automated equipment and while our operators had a general understanding of its functionality we did not have the resources to fine tune the equipment or our process. The internship program created a research and development resource which we would not have had. The program has opened the door to changes that will increase our efficiency and provide significant cost savings."

*~ Brett Reinhardt
President, VERTA, Inc.*

Solutions

Recycle Solvent

Paint lines and equipment require cleaning with solvent at the end of each shift and when changing paint colors. Solvent re-use options were evaluated such as settling, filtering and distilling. Several equipment vendors were contacted, and a sample of the spent cleaning solvent sent for testing. Pending test results, purchasing a recycling unit for solvent recovery will allow reuse of 1,300 gallons of solvent annually and reduce hazardous waste disposal by 10,000 pounds.

Adjust the Light Curtain

The current set-up of the part detecting light curtains places the part load bars in the first spraying zone, which triggers the automatic paint sprayers a large distance above the parts. A gap between the light bars also affects the resolution potential of the light curtain. Moving the bars down, eliminating the gap and reprogramming the automatic paint sprayers will increase the transfer efficiency. Savings are estimated at 85 gallons of paint and 20 gallons of solvent paint thinner which results in a reduction of 600 lbs VOC and 400 lbs of waste.

Increase the Number of Light Curtain Zones

In addition to adjusting the light curtains, a vendor quote was obtained to reprogram the automatic spray system and increase the number of object detection zones of the light curtains. Increasing the number of zones and decreasing the zone sizes will increase the part resolution and improve paint transfer efficiency with more accurate estimations of the part dimensions. This fix would save an

additional 330 gallons of paint and 60 gallons of solvent, which results in a reduction of 2,100 lbs VOC and 1,600 lbs of waste.

Extend Rinse Tank Life

Part cleanliness is critical to achieving high quality, durable, outdoor finishes. Reverse osmosis (RO) purified water is overflowed into two cleaning line rinse tanks. These rinse tanks are currently monitored daily for conductivity, emptied once a month and re-filled with RO water. Increasing the period in between tank dumping from monthly to every six weeks would reduce water usage by 9,600 gallons per year.



Recommendation	Annual Reduction	Annual Savings	Status
Recycle Solvent	10,000 lbs of waste	\$25,000	Implementing
Adjust the Light Curtain	600 lbs of VOC 400 lbs of waste	\$11,000	Recommended
Increase the Number of Light Curtain Zones	2,100 lbs of VOC 1,600 lbs of waste	\$42,000	Recommended
Extend Rinse Tank Life	9,600 gallons water	\$200	Recommended

MnTAP Advisor: Paul Pagel, Senior Engineer



Wenger Corporation



Patrick Gibbons-Peterson
Chemical Engineering
University of Minnesota, Twin Cities

Company Background

Wenger Corporation is a custom manufacturing company that produces an assortment of equipment for music and theater education, performing arts, sporting, and storage and transport to customers all over the world. Located in Owatonna, MN, Wenger Corporation's facilities include a 432,000 square foot manufacturing floor, distribution center and administrative offices. The company was founded locally seventy years ago and has given community members a place of employment since. To this day, Wenger Corp. continues to have deep pride in its roots.



"Working for MnTAP this summer has given me a great chance to learn in a personal and professional sense. The community at Wenger Corporation welcomed me and helped me succeed in any way possible. I am thankful for the connections, friendships and industry growth I will retain forever." ~ PG-P

Project Background

In a typical year, Wenger Corporation produces approximately 1,200 tons of solid wood scraps from production. The company was able to reuse this wood scrap by sending it to an animal bedding producer up until mid-2018, when the recycler decided the wood provided by Wenger no longer met their requirements. At the loss of the recycling option, Wenger was forced to landfill all of their wood waste and began looking for other options.

The second part of the project focused on finding energy conservation opportunities throughout the main facility, which consumes 402,000 therms of natural gas and 6.5 million kWh of electricity per year.

Incentives To Change

Prior to the loss of their recycling option with the animal bedding producer, Wenger only paid transportation fees for disposal of their wood waste. In contrast, landfilling this wood waste was costing Wenger over \$100,000 per year, which prompted the company to reach out to MnTAP. Generation and disposal of wood waste and consumption of energy had clear potential for improvement from both environmental and economical perspectives. With this in mind, the company sought to reinforce its sustainability values while also improving its bottom line.



"During his very first week on site, Patrick hit the ground running and was already diving deeply into potential energy savings. His perspectives and tools went into areas that we had not previously considered and/or had the time to investigate. One of our intern's most impressive and helpful characteristics was that he took immediate ownership of the project. He continually leveraged the necessary resources, which kept the burden off our regular staff and allowed them to focus on implementation."

*~ Thad Rosenberg
Environmental, Health and Safety Manager
Wenger Corporation*

Solutions

Recycle Wood Block Spacers with Current Recycler

Wood block spacers, which protect boards from scratches in transit, come to the facility with each order of raw wood that Wenger receives. Because these spacers are primarily particle board, Wenger's current pallet recycler would be able to take them for recycling at no additional charge. This option would save \$1,700 per year in lower disposal costs.

Recycle Wood Waste with New Vendor

After researching possible vendors to take Wenger's scrap wood, a recycling company was contacted and an arrangement was made for the vendor to haul off 100% of the wood waste at the facility. To minimize transportation costs, it was recommended to use a larger semi-trailer dumpster rather than the two 40 yard dumpsters currently in use, saving hauling costs and again lowering impact on the environment with less transportation. Working with a new vendor would save \$45,000 annually. This change would also benefit the environment by diverting 2,400,000 lbs of wood waste from landfill.

Lower Compressed Air System Pressure

To operate a significant number of pneumatic tools and equipment at the facility, Wenger uses an extensive compressed air system which is maintained at a constant pressure of 110-115 psi. Reducing the current pressure setting while remaining above the minimum pressure needed is a simple, no-cost option that could save an estimated \$3,700 in energy costs annually.

Reuse Heat from Air Compressors

Use of existing duct work in combination with new ducting upgrades would allow Wenger to vent heat generated from the three in-use air compressors into one of the main work regions of the manufacturing facility. The additional heat coming from the compressors can reduce gas consumption in winter and save \$12,000 per year.

Upgrade Office and Exterior Lighting to LED

Current fluorescent lights throughout the office space and exterior property can be replaced with more efficient, brighter and longer lasting LED bulbs to save a total of \$15,000 per year in energy costs.

Minimize Air Blow Guns Used for Cleaning

Currently, air blow guns are used in a variety of different ways in almost all work regions on the manufacturing floor. Replacing the air guns with alternative methods and tools could save up to \$5,200 per year in energy costs.

Change Pneumatic Hand Tools to Electric Equivalents

Wenger has a variety of pneumatic hand tools for employees to use at their disposal. Substituting these with their electric equivalent hand tools, when available, could save an estimated \$12,000 per year in energy costs.

Recommendation	Annual Reduction	Annual Savings	Status
Recycle Wooden Block Spacers	37 tons wood	\$1,700	Planned
Recycle Wood Waste With New Vendor	1,200 tons wood	\$45,000	Planned
Lower Compressed Air System Pressure	62,000 kWh	\$3,700	Recommended
Reuse Leftover Heat from Air Compressors	20,200 therms	\$12,000	Recommended
Upgrade Office and Exterior Lighting to LED	72,600 kWh	\$15,000	Recommended
Minimize Blow Air Gun for Cleaning	87,000 kWh	\$5,200	Recommended
Change Existing Pneumatic Hand Tools to Electric Equivalent	207,000 kWh	\$12,000	Recommended

MnTAP Advisor: Daniel Chang, Associate Engineer



White Bear Lake Chamber of Commerce



Melody Markert

Bioproducts & Biosystems Engineering
University of Minnesota, Twin Cities

Organization Background

The White Bear Area Chamber of Commerce is

one of the largest business non-profits in the Northeast Metro suburbs, serving 12 communities over an area of 100 square miles. The organization is a dedicated community leader, fostering projects and programs that strengthen business through advocacy, networking, and education. The Chamber continually supports 400 businesses resulting in the prosperity and enrichment of its communities. This project focused on four of these communities: White Bear Lake, White Bear Township, Gem Lake, and Vadnais Heights.



**WHITE BEAR AREA
CHAMBER OF COMMERCE**

"It was so encouraging seeing the enthusiasm and willingness of the automotive shops to try different, safer products. The small shops participating collectively make a huge impact. I learned so much at MnTAP this summer. Thank you to everyone at the Chamber for creating such an inviting community and helping through this process." ~ MM

Project Background

The objective of the White Bear Lake project was to recommend and promote the adoption of safer cleaning and degreasing products in local automotive shops. Recommendations included safer alternatives for brake cleaners, penetrants, and degreasers, among others. A wide variety of businesses participated, ranging from small one-man auto repair shops to corporate automotive retailers.

The project began with outreach to the auto shops to connect with business owners and spread awareness about the project and the safer products available in the automotive industry. Through this process, 36 vehicle maintenance shops were contacted, with 19 participating in the project. During the same introductory visit, interested owners shared information on the current products they were using. That information was used to conduct an assessment of the cleaning products' safety, followed by researching products available at local auto parts retailers to identify safer alternatives. Businesses were provided with free samples of the alternative products for the technicians to test for functionality and performance. If they were satisfied with the sample and verbally agreed to change products, a starter case of the recommended product was purchased for the

business to try out for a longer period and encourage the continued use of the safer alternatives.

Incentive for Change

Automotive maintenance and repair shops in the White Bear Lake area had the opportunity this summer to switch to safer cleaning and degreasing products to improve worker safety and air quality for the entire community. Many automotive products have high levels of hazardous air pollutants (HAPs) and volatile organic compounds (VOCs) that degrade local air quality and are hazardous to human health. Individually, these small degreasing operations produce relatively small amounts of these harmful compounds. Businesses, especially small businesses, typically do not have the time nor the resources to put towards environmental projects, but when given the opportunity to address the issue of air quality in an accessible and affordable way, many were interested and open to improving their cleaning and degreasing processes to benefit worker and community health.

Solutions

Assessments were made by the intern of the current cleaning and degreasing products used in each facility. When products did not meet the criteria to qualify as a safer product they were provided with recommendations for alternatives. Selection criteria were based on three values: HAPs, VOCs, and air pollution potential. Products were considered environmentally safer if they contained no HAPs, had less than 10% VOCs, and generated less than 1 lb of ozone per pound of product. Additionally, recommendations minimized Chemicals of Concerns whenever possible.

Safer Products

Choosing safer products is not as simple as just looking at product labels. Products can look very similar but vary greatly in levels of safety for health and the environment. Language such as “50-State Compliant,” “Ultra Low VOC,” “Low VOC,” and “Non-Chlorinated” can help consumers identify a safer product, but Safety Data Sheets (SDS) are the best way to know what ingredients are contained in each product and to understand the health and environmental risks.

Results

In total, 74 automotive products were assessed in the White Bear Lake Area communities, and 28 of these already met MnTAP’s criteria for safer products. After testing and approving samples of alternative products, 7 substitutions were made, resulting in 35 lbs of HAPs and 300 lbs of VOCs eliminated from the community each year. In addition, 10 businesses are still evaluating samples and deciding if they will switch to the recommended alternatives. In cases where products were not adopted, increased cost was the most commonly cited reason.



“What a great and educational experience it was to have a MnTAP intern like Melody reside with us for the summer. She amazed me with her tenacity in taking a project that she knew little about, and then ending up with the empirical data collected from all of her visits and interviews with auto shops. It was an important project that included showing safer products than can be used in their daily business. With White Bear Lake currently dealing with a business that exposed surrounding neighborhoods to high TCE levels, it was timely and well received information.

~ Maureen Francis
Office Manager
White Bear Lake Chamber of Commerce

Recommendation	HAPs Reduction	VOCs Reduction	Ground-level Ozone Reduction	Status
Switch to Safer Automotive Products	35 lbs per year	300 lbs per year	260 lbs per year	Implemented

MnTAP Advisor: Jane Paulson, Senior Engineer



SOLUTIONS



Front: Carol Wiebe, Nathan Landwehr, Laura Babcock, Shelly Ring, Alaina Ryberg
Middle: Frank Strahan, Daniel Chang, Matt Donski
Back: Paul Pagel, Brent Vizanko, Jon Vanyo, Jane Paulson, Michelle Gage

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, decrease energy use, and reduce costs to improve public health and the environment.

MnTAP provides technical assistance customized 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.



UNIVERSITY OF MINNESOTA
Driven to Discover®

© 2019 Regents of the University of Minnesota. All rights reserved. The University of Minnesota is an equal opportunity educator and employer. The University's mission, carried out on multiple campuses and throughout the state, is threefold: research and discovery, teaching and learning, and outreach and public service.



MnTAP Solutions is printed on chlorine-free, recycled and recyclable paper made in Minnesota with at least 10% post-consumer material.