



UNIVERSITY OF MINNESOTA  
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## MnTAP IMPACT

Since 1984, MnTAP has contributed to Minnesota's economic well-being by reducing waste at the source and training the next generation of engineers through the MnTAP Intern Program.

Among the 2016 highlights, MnTAP:

- completed a two-year Economy, Energy and Environment outreach in the fiberglass reinforced plastics and paint and coating industries
- identified and encouraged implementation of water efficiency opportunities through 10 intern projects

- continued a three-year effort to provide energy efficiency and distributed energy generation assessments and assistance to publicly-owned wastewater treatment facilities
- educated 50 small businesses in Duluth about less hazardous degreasing products with lower volatile organic compound content and supported trials of safer products.

The companies implementing these changes are having a positive impact on both their environmental footprint and their profitability. This is good business for Minnesota.

Be sure to check out the full 2016 annual report, IMPACT, at: [www.z.umn.edu/Impact2016](http://www.z.umn.edu/Impact2016). ■

### Inside

- pg. 2 **What's new**
- pg. 3 **Waste**
- pg. 4-5 **Lean**
- pg. 6 **Energy**
- pg. 7 **Intern program**
- pg. 8 **Lean glossary**

## Here's what we accomplished in 2016



Helped 279 small and large companies optimize performance



Encouraged companies to save 45.3 million gallons of water



Strengthened Minnesota's workforce by training 14 engineering interns in 20 host companies



Discovered opportunities for companies to reduce energy use by 1.7 million kWh & 42,000 therms



Added \$1.38 million to the bottom line of 56 businesses



Motivated companies to divert 1.4 million pounds of waste

### Route

- health and safety
- maintenance
- owner/president
- process engineer
- purchasing

## Optimize Your Outcomes

### Air quality in Phillips

Emissions from small business, in the form of volatile organic compounds and hazardous air pollutants, contribute to air pollution in Minnesota, which can cause a range of health problems including asthma, cancer and heart attacks, according to the Minnesota Pollution Control Agency. As part of a state effort to reduce air pollution and funded by a grant from the U.S. Environmental Protection Agency, MnTAP will be reaching out to several small businesses in the Phillips communities of Minneapolis to encourage adoption of products and processes that eliminate

HAPs and decrease VOC emissions, as well as fine particulates, such as dust and fine sand, that adversely affect the air we breathe.

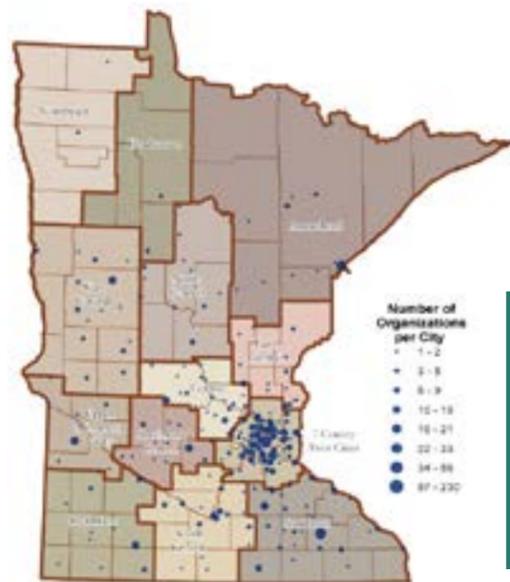
Staff and interns will assess and identify site-specific solutions at auto repair shops, janitorial services and healthcare facilities, among other industries. Project partners include Lake Street Council and Hope Community.

For info, contact Jane Paulson: 612-624-1826 or janep2@umn.edu. ■

### Saving water in Washington County

Working under a Washington County Public Health and Environment grant, MnTAP will work with industrial water users to identify water conservation opportunities. In 2017, MnTAP will conduct three onsite assessments and support one intern project for nonresidential water conservation. All Washington County industrial water users are eligible.

To apply, contact Mick Jost: 612-624-4694 or jostx003@umn.edu. ■



### Working for Minnesota

In 2016, MnTAP reviewed its five-year impact on economic development in Minnesota. We found that MnTAP efforts — supported in large part by the state via the Minnesota Pollution Control Agency — resulted in impressive outcomes for businesses who voluntarily implemented recommendations for process improvements, leading to avoided costs. These savings can be

reinvested to strengthen and expand the businesses and support healthy local jobs. Additionally, MnTAP places high-performing science and engineering students in companies across the state, giving students hands-on experience in a variety of industries while those industries reap the rewards of a well-trained workforce. ■

- Between 2011-2016 MnTAP conducted 1,300 projects at 800 companies in 70 counties across the state, and identified solutions to save:
- 3.6 million gallons of water
  - 172 million pounds of waste
  - 11.9 million kWh of electricity
  - 1 million therms of natural gas
  - \$3.9 million to add back to companies' bottom lines.

### P2 in food processing

Cleaning operations are critical to most food processing industries, with companies subject to many food safety regulations. These operations often make use of hot water, steam and chemicals to sterilize equipment. Over time, processes may deviate from standard operating procedures and equipment specifications, opening opportunities to improve water efficiency and lower strength charges and overall operating costs.

MnTAP will provide no-cost assessments as well as intern projects focused on chemical and wastewater optimization, thanks to a grant from the MPCA and the U.S. EPA.

For info, contact Matt Domski: 612-624-5119 or domsk004@umn.edu. ■



MnTAP staffer Matt Domski (right) with chemical engineering student Stephen Raab, 2015 intern at Davisco Foods

## Waste Not, Want Not

### Lessons in food waste prevention

MnTAP completed a one-year project building on the progress made in waste diversion by Minnesota schools. Although many schools are composting, donating left-over food or sending food waste to be used as animal feed, MnTAP aims to reduce the sources of waste. Supported by the U.S. Environmental Protection Agency, we took a look at a successful program of source reduction at Lakeside Elementary School in Chisago City.

At the school, students take part in three to five minutes of quiet time at the beginning of lunch, which helps them finish more of their food during the mealtime. Bite-size portions of certain foods also made it easier for students to finish their meals.

Another strategy that helped Lakeside curb food waste was to empower students themselves by setting up a student tasting panel that has a direct say in what goes on the menu.

Incorporating learning opportunities into the curriculum could also improve outcomes. Ideas that bubbled up during the project include creating simple math problems to help students understand the environmental cost of getting food to their plates and comparing it to something relevant to them, such as the cost of a trip to Disney World! ■



Nordic Ware intern, industrial and systems engineering student Roopesh Pushpala

### Know your waste stream

Two recent projects conducted in northern Minnesota illustrate the importance of knowing your waste stream.

An extended care facility sought assistance from MnTAP when it began seeing a rise in infectious waste disposal charges. MnTAP dispatched a collaborating healthcare sustainability expert who found that the facility was mistakenly sending non-hazardous items through the infectious waste stream, which carries higher disposal charges.

Facility staff were retrained on what constitutes infectious waste, leading to a reduction in the volume of infectious waste as well as an adjustment to their

waste hauling contract. The changes resulted in 1,500 pounds diverted from the infectious waste stream and \$4,300 in savings from fewer pick-up days.

Partnering with Western Lake Superior Sanitary District, MnTAP presented hazardous waste training to dental providers, defining the difference between hazardous and non-hazardous waste in that industry, and offering management strategies for reducing hazardous waste and associated costs.

View the dental hazardous waste training PowerPoint at [www.z.umn.edu/DentalHazWaste](http://www.z.umn.edu/DentalHazWaste). ■

### Nordic Ware optimizes paint line

At Nordic Ware, a cookware manufacturer in St. Louis Park, fabricated and cast parts are cleaned in one of two large belt conveyor washers to remove stamping oils and machining coolants prior to being painted and packed for shipping. Parts are painted on one of six lines which move parts on a chain-on-edge conveyor past automated paint spray guns, while parts spin on fixtures as they are painted. Parts are then manually transferred to a belt-driven curing oven and the process is repeated for the second side of the part.

The MnTAP intern worked with Nordic Ware team members and suppliers to propose the installation of a new paint line and an orientator for one of the current lines. The new line would increase the production rate in the coatings line, spray both sides in one pass, and improve the transfer efficiency of the paint. This proposal includes electrostatic painting equipment, an overhead conveyor and an infra-red curing oven. The new line has the potential to save:

- 3,300 gallons of paint, 6.8 tons of VOCs, 75% labor costs and \$367,000.

The orientator system has been implemented and significant savings have already been realized, specifically:

- 1,500 gallons of paint, 3.4 tons of VOCs and \$147,000.

This project was funded with a grant from the MPCA and the Twin Cities chapter of Chemical Coaters Association International. ■

# Lean: Streamlining for Maximum Profit

## Waste meets its match

Anyone who runs a business understands the need to avoid waste, which helps keep production costs down. Waste can take many forms: excess inventory, redundant steps in the production process, or defects in the product that require rework. Each category of waste can intertwine and multiply with the other, creating a feedback loop that is detrimental to the bottom line.

Some waste is also toxic to the environment, such as some cleaning chemicals, or is a carbon-intensive resource, such as energy. Avoiding waste in these forms has the dual benefit of payback to the company's bottom line and the environment.

"Lean" is the principle of improving process efficiency to reduce waste and costs. Incorporating lean manufacturing tools with process energy assessments has resulted in the identification of additional energy savings opportunities that wouldn't be realized through standard assessments.



Over the past several years MnTAP's lean projects have been supported through grants from the Minnesota Pollution Control Agency, the U.S. Environmental Protection Agency, and the Minnesota Dept. of Commerce Conservation Applied Research and Development program. Read the "Motivating Manufacturing Energy Efficiency" report at [www.z.umn.edu/LeanManufacturing](http://www.z.umn.edu/LeanManufacturing).

In the next two pages we'll share case studies in which companies have adopted lean processes and have been rewarded with lower costs and smoother work flows while conserving precious resources. See the back page for a short list of lean terms and their meaning. ■

## Sunrise saves with lean focus

Sunrise Fiberglass in Wyoming, Minnesota used Manufacturers Alliance's peer to peer training model to integrate lean principles into its operations. Five full-day workshops were presented at the Sunrise plant, with class participants chosen from every department to spread the lean philosophy throughout the organization.

Sunrise put a core lean tool, 5S, to good use in the mold prep area, where they used non-skid paint to visually mark the area to be used for waxing, improving product flow and safety.

In another 5S project, all sanding was moved away from the painting area; the reduction in dust allowed them to bring back finish painting that was previously outsourced, saving money and over 400 highway miles per year.

The 5S project in the closed molding area had perhaps the biggest impact from a production and air emissions standpoint. The project improved work flow and increased capacity by 100 percent, allowing new products to be brought in using the closed molding process, which has 90 percent lower styrene emissions compared to open molding.

After participating in the lean training and seeing results from the first projects, employees were motivated to come up with improvement projects of their own. An employee suggestion to install an acetone recycling system has eliminated 19,000 lbs of hazardous waste and over \$14,000 per year in acetone purchases. ■



## Materials Exchange-it!

Why pay to dispose of something you no longer need when someone else can use it? The Minnesota Materials Exchange offers a convenient way to list your reusable goods. Ask MME administrator Nathan Landwehr how he can help you save money and keep waste out of the landfill by calling 612-624-4697 or emailing [landwehr@umn.edu](mailto:landwehr@umn.edu). ■

## Staff snapshot: Lean expert Jane Paulson



Senior engineer Jane Paulson has been facilitating lean projects around the country for almost two decades. She graduated with a chemical engineering degree from the University of Wisconsin-Madison in 1998 and began her career as a manufacturing engineer for 3M. While there, Jane was certified as a Six Sigma Green Belt, a program that uses "define, measure, analyze, improve and control" to improve industrial processes. Jane arrived at MnTAP in 2013 and has led several lean-focused projects, including one at Sunrise Fiberglass discussed on the previous page.

"Using lean tools can help identify waste in areas that might not have been considered otherwise," says Jane. She points to the intern project at Lou-Rich in 2015 as an example. The intern used lean principles to analyze the production process in foaming and coiling operations in the manufacture of freezer assemblies. He determined that by standardizing work — a primary lean principle — in those operations they could save 420 labor hours per year, along with 4,800 kWh and \$11,900.

This year, lean will be among the many tools Jane will use to help communities and businesses reduce their toxic air emissions. She will also be working to integrate lean principles into the services MnTAP provides everyday. ■



Mechanical engineering student Carter Tollefson at Lou-Rich in 2015

**This month, MnTAP will be honored by business magazine Finance & Commerce's Progress Minnesota, an award for organizations that "drive business growth and economic development across Minnesota."**

## Profitability potential at Atlas

Atlas Manufacturing, a Minneapolis precision sheet metal fabricator, partnered with MnTAP and Enterprise Minnesota to streamline production and reduce waste and energy use. Process managers met for five days to improve the flow of materials and orders through the facility. The mapping process identified bottlenecks, resulting in an action plan to optimize production.

Increasing order visibility has helped the paint line manager reduce changeover times, resulting in a more effectively managed department.

Specific paint line improvements include:

- defining an ideal work flow rate
- organizing department meetings to help the production team develop and share best practices
- creating standard procedures, outlining the responsibilities for each position within the department.

If implemented, Atlas could increase profitability by over \$100,000 annually. ■

## Firmenich finds more hands promote productivity gains

Food flavor and fragrance manufacturer Firmenich hosted a MnTAP intern to optimize the drying operation of its spray-dried products at the New Ulm facility.

One of the spray dryers has a single operator to prepare each batch and run the dryer. After each batch, he shuts down the equipment, cleans the spray dryer, then reassembles the equipment. The intern, working with the operator, found they could gain 320 hours of production, translating to a potential production increase of

53,000 pounds and \$100,000 per year with the additional help.

Another cost-saving measure involved increasing the concentration of feed solids into the spray dryer. With the increased concentration, less energy would be required to evaporate water.

This change has the potential to increase production by 75,000 pounds, and reduce water and energy use by 28,000 gallons and 2,200 therms, respectively. ■

## Efficiency Powers Savings

### Students expand research capacity



Recently, MnTAP began dipping into the deep pool of engineering students at the University of Minnesota to accomplish our research goals.

In 2015, we directed chemical engineering student Joe Carlson to conduct a survey of plastics and resin suppliers around Minnesota aimed at understanding the drivers, customer demands and technical challenges to using

safer alternatives to phthalates and halogenated flame retardants, which are known carcinogens. Half the survey respondents said that customers make the decision over which additives to use, based on cost and performance. View the results of "Plastics in Minnesota" on MnTAP's YouTube channel.

Over the past year, electrical engineering student Brandon Noel (pictured) has been conducting the compressed air tool assessment (story at right). "This project relates to my interest in energy and energy conservation," says Brandon, who finds the job preferable to typical student work because he has autonomy as well as input into the process. "This is hands-on work using a broad set of skills I wasn't aware I needed, such as interviewing people. Plus it will look good on my resume." ■

### Data centers stream energy savings

MnTAP and project partner Center for Energy and Environment conducted a two-year assessment of energy use in small (< 1,000 square feet) in-house data centers to identify energy efficiency opportunities, supported by the Minnesota Department of Commerce.

After surveying manufacturers, healthcare providers, advertising agencies, schools and government offices to determine how many servers were in use in their server rooms, how old they were and what they were being used for, we installed metering equipment at 11 organizations.

The initial assessments revealed under-utilized universal power supplies (UPS) and server racks ripe for consolidation. Recommendations for reducing electricity use include:

- placing a larger load on the UPS, which will increase its efficiency slightly and reduce the number of power supplies needed, decreasing material waste

### Compressed air tool assessment

Compressed air is the least efficient energy source in industrial operations and often the highest energy user, according to the U.S. Department of Energy. To help energy providers understand industrial power tool use in Minnesota, MnTAP launched a two-year study to determine the statewide energy savings opportunity, cost and greenhouse gas impacts of replacing compressed air-driven power tools with electric or battery-driven alternatives.

Through interviews with manufacturing representatives in 43 industries we are identifying the level and type of compressed air tool use in fabrication, furniture manufacturing and machining operations, to name a few, and barriers to switching to electric or battery-operated tools.

The next step in the project is to develop a cost and energy calculator to provide facilities with estimates of their unique energy-saving opportunity, as well as produce a guide for state utilities to standardize estimates of energy conservation potential on a per site basis, with the aim of influencing new prescriptive incentives under their conservation improvement programs. ■

**MnTAP director Laura Babcock was recognized by Clean Energy Resource Teams' 2017 Minnesota Women in Energy, highlighting influential women who contribute to the state's energy efficiency and renewable energy industries.**

- balancing the loading between the power supplies in the server room, which also balances expected battery life
- consolidating idle and low-activity servers via virtualization, including removing servers that are consuming energy without contributing to the network
- raising the server room temperature to 77° F (ASHRAE guidelines suggest room temps can be raised up to 80.6° F).

Through this project, Nordic Ware was able to find energy and cost savings by implementing some of these simple changes. Optimizing the loading on their UPSs involved removing two UPS units, resulting in \$2,400 in future cost avoidance on equipment that will not need to be purchased during upgrades. Increasing the temperature setpoint within server rooms from 69° F to 77° F is expected to save the company nearly \$600 per year in cooling energy (6,000 kWh). Additionally, the company was able to remove some idle servers from their server rooms to reduce the impact of vampire power draw. ■

## Success Spurs Growth

### 17 projects lined up for summer 2017

MnTAP is coordinating the largest number of intern projects since launching the inter program in 1985. Seventeen students will analyze processes, investigate alternatives and suggest strategies to conserve water and energy, reduce waste and improve process efficiencies in companies across Minnesota.

We owe the success of these projects to our expert MnTAP advisors, talented students, generous funding partners and dedicated companies that host MnTAP's intern projects:

- Students are hand-picked from across the University of Minnesota system and around the country, representing chemical, aerospace, bioproducts and biosystems, electrical, industrial and systems, petroleum and geological, and other engineering and science disciplines.
- State and local agencies along with private companies support MnTAP projects, which this year include Minnesota Pollution Control Agency, Metropolitan Council Environmental Services (MCES), Minnesota Department of Commerce, the Southern Minnesota Municipal Power Agency, the U.S. Environmental Protection Agency, Connexus Energy, Washington County, East Central Energy, and Xcel Energy.

- Over 240 Minnesota companies since 1985 have invited MnTAP technical advisors and their interns in to improve operational performance. The companies joining the list this summer are:

- Advanced Extrusion
- Aqseptence Group, Inc.
- Bailey Nurseries
- Center for Energy and Environment
- CertainTeed Roofing, Inc.
- City of Minneapolis Water Treatment and Distribution Services
- City of New Prague Wastewater Treatment Facility
- Diasorin, Inc.
- Electric Machinery Company
- Fulton Brewing Company
- Kerry Ingredients and Flavours
- Phillips Communities Small Businesses
- Phillips Distilling
- Plastech Corporation
- Seneca Foods
- SkyWater Technology Foundry
- Smith Foundry. ■



2016 Xcel Energy intern, chemical engineering student Christine Lucky

### A flood of water savings

Water efficiency scored big in 2016, with support from MCES and MPCA grants. Eleven of 14 intern projects had recommendations to reduce more than 58 million gallons in a variety of industries, with 44.2 million gallons saved to date. This sampling of conservation solutions identified by our interns illustrates how, by reducing water use, companies can also reap associated labor and energy savings.

- Installing automatic shut-off nozzles, reusing weir water, installing load-and-go wash systems, and collecting rainwater for reuse is estimated to save 16.4 million gallons and at least \$322,540 a year at 12 Twin Cities' Cemstone plants, which includes 5,900 hours in reduced labor.
- Updating fixtures, replacing washers, dishwashers and sterilizers, and reusing reverse osmosis reject water has the potential to save 13 million gallons annually at Hennepin County Medical Center. Potential cost savings of \$182,700 include reduced energy use.

- Repairing leaking valves, optimizing rotor air cooler blowdown and water softeners, and reducing auxiliary water use could save Xcel Energy seven million gallons and \$58,730 per year, adding in the savings for reduced energy and salt use. ■

## Minnesota Technical Assistance Program

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# Minnesota Technical Assistance Program

The Minnesota Technical Assistance Program (MnTAP) strengthens Minnesota businesses by maximizing efficiency and reducing costs through energy, water and waste reduction. As an outreach program at the University of Minnesota, MnTAP provides technical assistance tailored to individual businesses. By reducing waste and increasing efficiency, companies save on disposal and raw-material costs and make working conditions healthier and safer for employees.

MnTAP is funded primarily by the Minnesota Pollution Control Agency's Resource Management and Assistance Division and is located at the University of Minnesota in the School of Public Health, Division of Environmental Health Sciences. 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. The University of Minnesota shall provide equal access to and opportunity in its programs, facilities and employment without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity or gender expression.



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### Glossary of lean terms (continued from pg 3-4)

**T**he concept of lean is derived from the Toyota Production System, and has roots in the Ford Motor Company production line approach. Here we offer a brief list of lean terms to get you started on your exploration of lean manufacturing principles.

**5S** Five Japanese words which refer to systemically tidying up and maintaining a clean, efficient working environment have been translated into English:  
SORT - keep just what is needed  
SET - a place for everything and everything in its place  
SHINE - clean, paint and repair everything  
STANDARDIZE - create a system to effectively continue the first three steps  
SUSTAIN - keep the process going.

**Flow Production** describes how goods, services and information are processed.

**Kaizen** "Continuous improvement," the key to maintaining competitive advantage through a well-managed dynamic change process.

**Throughput Time** The time required for a product to go through the production process from raw material to shipping the product to the customer.

**Value Stream Mapping** Identification of all specific activities occurring along a value stream of a product or product family. ■

Editor: Monique Dubos. Contributors: Anna Arkin, Laura Babcock, Matt Domski, Karl DeWahl, Michelle Gage, Mick Jost, Nathan Landwehr, Paul Pagel, Jane Paulson, AJ Van den Berghe and Jon Vanyo. Copyright 2017, MnTAP. This newsletter is sent free to Minnesota businesses and is available online at [www.mntap.umn.edu/source](http://www.mntap.umn.edu/source). This publication/material is available in alternative formats upon request. Articles published in *Source* may be reprinted only with permission from MnTAP. Direct requests to Monique Dubos 612.624.1300 or [mdubos@umn.edu](mailto:mdubos@umn.edu).