# IMPACT

## Minnesota Technical Assistance Program

## 2016 Annual Report

MnTAP strengthens Minnesota business by lowering costs through raw material, water and energy optimization

MnTAP

University of Minnesota
Driven to Discover℠

Submitted to the Minnesota Pollution Control Agency

Original Publication: March 1, 2017

# About MnTAP

The Minnesota Technical Assistance Program (MnTAP) is an outreach and assistance program at the University of Minnesota. MnTAP helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources — including water and energy — reduce costs, and improve public health and the environment.

Pollution technical assistance is tailored to individual businesses through a number of services, including site visits, student interns, the Minnesota Materials Exchange, facilitated teams, workshops and industry specific resources. Since MnTAP's inception in 1984, staff members have conducted over 3,800 site visits in all parts of the state and have developed creative solutions to **help Minnesota businesses save $47 million in first-year savings** through conservation and avoided regulatory costs. MnTAP services allow businesses to avoid regulatory burdens, reduce their impact on the environment, be better neighbors, and reinvest savings in improvements, expansions and new jobs. MnTAP strengthens businesses, supports local economies, preserves Minnesota's natural environment and promotes regional public health.

Discovering a need for waste reduction and pollution prevention assistance, the Minnesota legislature amended the Waste Management Act in 1984 to "provide for the establishment of technical and research assistance for generators of hazardous and industrial waste in the state." The Minnesota Toxic Pollution Prevention Act, enacted by the legislature in 1990, directed the then Minnesota Office of Waste Management to "establish a pollution prevention assistance program" for all persons in the state using, generating, or releasing toxic pollutants, hazardous substances or hazardous wastes. Today, the Minnesota Pollution Control Agency (MPCA) supports that assistance primarily by providing funding to the University of Minnesota School of Public Health, Environmental Health Sciences Division for MnTAP. MnTAP has leveraged direct MPCA funding to win additional competitive grant funding, which totaled 33 percent of the FY2016 budget.

## MnTAP Staff Members

Laura Babcock, PhD
Director

Anna Arkin
Graduate Research Assist.

Peggy Bradley
Office Admin. Supervisor

Karl DeWahl, CEM
Senior Team Leader

Matt Domski
Waste Prevention Specialist

Monique Dubos
Communications Specialist

Michelle Gage
Associate Engineer

Mick Jost
Program Coordinator

Linda Maleitzke
Communications Specialist/Intern Program Administrator

Paul Pagel, CEM
Senior Engineer/ Intern Program Coordinator

Jane Paulson
Senior Engineer

Alaina Ryberg
Website Designer

Francis Strahan
IT Supervisor

A.J. Van den Berghe, CEM
Engineer

Jon Vanyo
Associate Engineer

**2016 MnTAP Staff**

**Back row, left to right:** AJ Van den Berghe, Paul Pagel, Brandon Noel, Matt Domski, Jon Vanyo, Francis Strahan, Karl DeWahl
**Front row, left to right:** Alaina Ryberg, Linda Maleitzke, Monique Dubos, Laura Babcock, Jane Paulson, Michelle Gage, Peggy Bradley
**Not pictured:** Mick Jost

# *Technical Assistance Delivered Across Minnesota*

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## Director's Note

Over the course of 2016, MnTAP continued to deliver high quality technical assistance to industrial facilities across Minnesota. Over the course of the year, **279 businesses** across the state received assistance from MnTAP engineers and scientists; 56 companies have implemented 124 MnTAP recommended process changes and **realized reductions totaling over 45.3 million gallons of water, 1.4 million pounds of waste**, **1.7 million kWh and over 42,000 therms of energy**. Combined, these reductions are **saving companies $1.38 million annually.** Highlights of MnTAP's efforts in 2016 include:

- Completing Economy, Energy and Environment (E3) outreach in the fiberglass reinforced plastics and paint and coating industries
- Identifying water efficiency opportunities through 10 intern projects and engaging businesses to implement these water efficiency measures
- Continuing a three-year effort to provide energy efficiency and distributed energy generation assessments and assistance to publicly owned wastewater treatment facilities
- Educating 50 small businesses in Duluth about less hazardous degreasing products with lower volatile organic compound (VOC) content and supporting trials of safer products.

MnTAP continues to contribute to Minnesota's economic well-being by reducing waste at the source and training the next generation of engineers through the MnTAP Intern Program, with the fundamental goal of improving public health and the environment. Throughout this report are stories celebrating 2016 sucesses. On page 4, a map shows the **71 Minnesota counties** in which MnTAP has provided technical assistance over the past five years, along with the total recommended and implemented economic and environmental impacts for first year savings. **The companies implementing these changes are having a positive impact on both their environmental footprint and their profitability.** This is good business for Minnesota.

We thank our clients, partner organizations and sponsors for the opportunity to work with them in 2016, and we look forward to serving your business in 2017.

*Laura Babcock*
*Director, Minnesota Technical Assistance Program*

## Links to MPCA's Strategic Plan

### Water
**Goal - Pollution from all sources is reduced or prevented**
MnTAP provides technical assistance to POTWs and industrial water users through on-site assessments.

### Air
**Goal - Ensure emissions do not create unacceptable exposures**
MnTAP provides information and assistance for businesses to reduce VOCs and HAPs.
**Goal - Reduce contribution to greenhouse gas emissions**
MnTAP provides industrial energy efficiency solutions to businesses through on-site assessments and outreach.

### Land/Waste
**Goal - Solid waste is managed to conserve resources and energy**
MnTAP has active outreach and assistance efforts to reduce waste through source reduction and reuse.

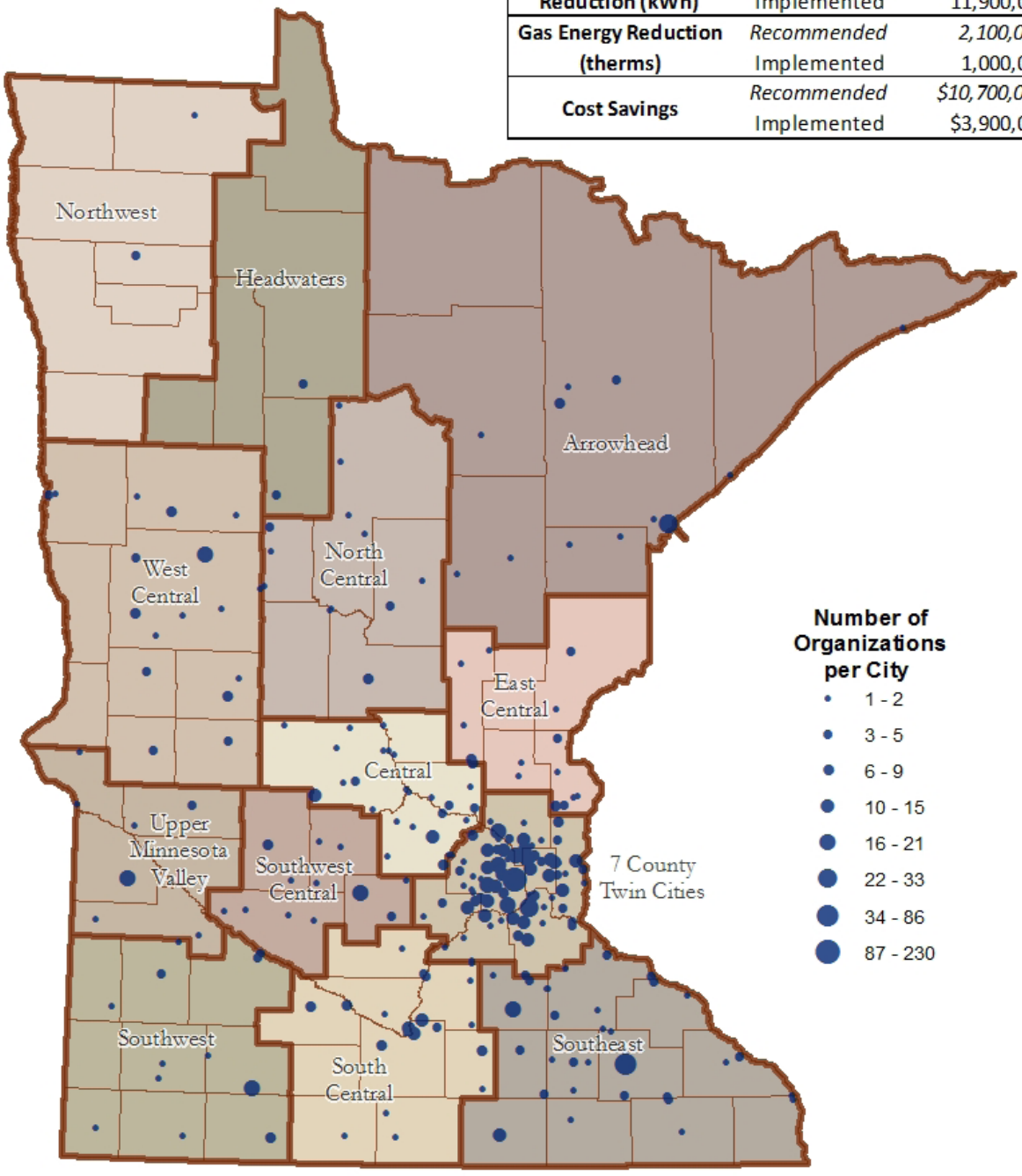
### People and Approaches
**Goal - Conserve resources and prevent pollution to protect the environment and economy**
MnTAP is an outreach and assistance program that helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and cost to improve pubic health and the environment.

# *MnTAP Contributes to Minnesota's Economic Well-Being*

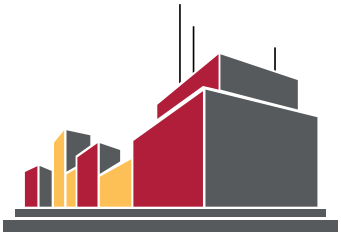
## MnTAP Impacts for Minnesota

2011-2016

| MnTAP Impacts | | |
|---|---|---|
| Number of Companies | | 800 |
| Number of Projects | | 1,300 |
| Waste Reduction (lbs) | *Recommended* | *14,700,000* |
| | Implemented | 3,600,000 |
| Water Reduction (gal) | *Recommended* | *441,700,000* |
| | Implemented | 172,000,000 |
| Electric Energy Reduction (kWh) | *Recommended* | *51,000,000* |
| | Implemented | 11,900,000 |
| Gas Energy Reduction (therms) | *Recommended* | *2,100,000* |
| | Implemented | 1,000,000 |
| Cost Savings | *Recommended* | *$10,700,000* |
| | Implemented | $3,900,000 |



## STRENGTHENING MINNESOTA'S ECONOMY



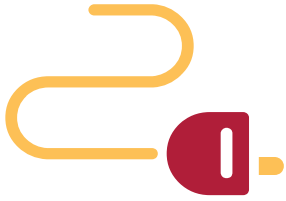
Helped **279 companies** —from single owner to Fortune 500— optimize business performance

Added **$1.38 million** to the bottom line of 56 businesses and provided tips with the potential to save a total of $2.2 million when implemented

Strengthened Minnesota's workforce by training **14 engineering interns** to find waste, water, energy and cost savings at **20 host companies**

## PRESERVING MINNESOTA'S ENVIRONMENT

Encouraged companies to implement strategies to save **45.3 million gallons of water** through reuse, process optimization and equipment upgrades



Discovered opportunities for companies to reduce energy use by **1.7 million kWh & 42,000 therms** by optimizing compressed air use and other critical operations

Motivated companies to divert **1.4 million pounds of waste** by implementing the 3 Rs: reduce, reuse & recycle

## *2016 Outcomes

| Activity | Waste | | | Energy | | Water | Savings |
|---|---|---|---|---|---|---|---|
| | Air Emissions (lbs) | Hazardous Waste (lbs) | Non-Hazardous/ Solid Waste (lbs) | Electric (kWh) | Gas (therms) | (gallons) | |
| Site Visits | 32,600 | 59,700 | 732,100 | 810,000 | 13,000 | 1.1 million | $898,000 |
| Interns | 0 | 6,000 | 547,500 | 890,000 | 29,000 | 44.2 million | $477,000 |
| Materials Exchange | 0 | 0 | 3,100 | --- | --- | --- | --- |
| **TOTALS** | **1,381,000** | | | **1.7 million** | **42,000** | **45.3 million** | **$1,375,000** |

*Implementation reported in 2016 for all years

## 2016 Outputs

| Technical Assistance Activity | 2014 Results | 2015 Results | 2016 Results |
|---|---|---|---|
| Contacts (calls/emails/meetings) | 671 | 830 | 611 |
| Requests for Assistance | 76 | 96 | 109 |
| Total Staff Site Visits (unique facilities) | 121 (69) | 144 (90) | 158 (97) |
| Student Interns | 11 | 13 | 14 |
| Materials Exchanges | 83 | 27 | 27 |
| Events and Presentations | 46 | 70 | 45 |
| Externally-Placed Publications | | | 14 |
| MnTAP Website Unique Visitors | 91,088 | 37,009 | 39,302 |

# On-Site Assistance

## 2016 Outputs

158 site visits

97 unique facilities

109 requests for assistance

## 2016 Outcomes

1,381,000 lbs waste

45.3 million gal water

1.7 million kWh

42,000 therms

$1,375,000 annual savings

## What they said...

"MnTAP provides a triple win opportunity for Minnesota. Their work helps maintain a healthy environment for all residents, improves business performance for companies, and provides workforce experience for students through the intern program."

*-- John Linc Stine, Commissioner, MPCA*

## 2016 Goals

Conduct 5,000 site visit hours at 100 different facilities to identify opportunities for companies to prevent waste and pollution and conserve resources, including water and energy. Support Minnesota businesses by responding to questions about waste generation and resource utilization.

## 2016 Accomplishments

During site visits, MnTAP staff members analyze the current production situation, research possible alternatives to achieve reductions, and complete a report with facility-specific recommendations for improving material, water or energy use.

MnTAP staff made 274 recommendations for process and resource efficiency in 2016, valued over $2.2 million. Many companies have started implementing these recommendations, and are avoiding waste and saving money.

## 2016 Environmental Recommendations*

| Recommendation Area | | Recommeneded Reduction | Implemented | First Year Implementation |
|---|---|---|---|---|
| Water Use | gal/yr | 75,900,000 | 33,600,000 | 44% |
| Energy | kWh/yr | 6,300,000 | 500,000 | 8% |
| Energy | therms/yr | 148,000 | 11,000 | 7% |
| Air Emissions | lbs/yr | 22,000 | 2,600 | 12% |
| Hazardous Material/ Waste | lbs/yr | 380,000 | 1,520 | -- |
| Non-Hazardous Material/ Solid Waste | lbs/yr | 600,000 | 330,000 | 55% |
| **Savings** | **$/yr** | **$2,200,000** | **$365,000** | **17%** |

*Recommendations and implementation for 2016 activities


## Properly Identifying Waste Streams Saves Money

An extended care facility in northern Minnesota 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 a realignment of their waste hauling contract to adjust for the change. The changes resulted in **1,500 lbs** diverted from the infectious waste stream and **$4,300** in savings from fewer waste pick-up days.

Partnering with Western Lake Superior Sanitary District, MnTAP provided hazardous waste training to dental providers in northern Minnesota, delineating the difference between hazardous and non-hazardous waste, and offering management strategies for reducing hazardous waste and associated costs. The PowerPoint notes can be viewed at www.mntap.umn.edu/health/wastetraining.html

# On-Site Assistance: Intern Program

## 2016 Outputs

14 intern projects at 20 businesses

197 student and 24 company applications processed

9 electronic promotions

6 articles and promotions placed externally

6 intern program videos

## What they said...

"The internships support our green initiatives and our overall company environmental policy, vision and goals."

*-- John Walker, Vice President of Operations, TEL FSI, Inc.*

## Funding Partners

Minnesota Pollution Control Agency

Xcel Energy

Dakota Electric Association

CenterPoint Energy

Metropolitan Council Environmental Services

Minnesota Power

Chemical Coaters Association International-Twin Cities Chapter

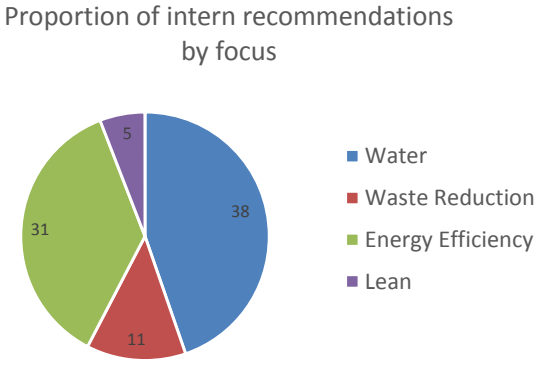
## 2016 Accomplishments

MnTAP guided 14 intern projects in 2016, creating new partnerships to support these activities. The Twin Cities chapter of Chemical Coaters Association International sponsored a painting and coating-focused intern project, and four long-time utility partners sponsored energy efficiency projects. Grant funding allowed MnTAP to support projects in resource and process optimization.

MnTAP interns come from a variety of disciplines. In 2016, chemical, aerospace, bioproducts and biosystems, electrical, and industrial and systems engineering, as well as environmental science and policy management were represented. Most interns hailed from the University of Minnesota system, while two were from Washington University in St. Louis and one was a University of North Dakota student.

This summer's projects predominantly followed by energy efficiency, waste reduction and lean process integration, as shown in the chart at right.

Read more about MnTAP's intern projects in our annual program summary, *Solutions:* www.mntap.umn.edu/resources/solutions.html




## 2016 Outcomes - Intern Program Implementation*

| Project Year(s) | Waste (lbs) | | | Energy | | Water (gallons) | Savings |
|---|---|---|---|---|---|---|---|
| | Air Emissions (lbs) | Hazardous Waste (lbs) | Non-Haz/ Solid Waste (lbs) | (kWh) | (therms) | | |
| 2013 | -- | -- | 775,000 | 1.4 million | 182,000 | 24.8 million | $512,000 |
| 2014 | -- | 53,170 | 50,100 | 3.2 million | 440,000 | 1.39 million | $648,000 |
| 2015 | -- | 98,500 | 156,100 | 2.0 million | 238,000 | 15 million | $673,000 |
| **2016** | -- | **6,000** | **548,000** | **898,000** | **28,700** | **44.2 million** | **$478,000** |

*Implementation reported in listed year for intern projects from all prior years

## Interns Monitor Multiple Sites to Cover More Ground

In recent years, MnTAP began placing interns on projects that involve more than one host organization. This implementation model lets smaller companies and organizations, those that would otherwise not be able to support an intern on their own, benefit from intern assistance.

In 2015:

- Southwest Regional Solid Waste Commission hosted an intern to make solid waste reduction recommendations at nine businesses in three Southwest Minnesota counties
- Antea Group's intern identified energy savings opportunities at nine metro area breweries.

In 2016:

- Center for Energy and Environment's intern pinpointed energy savings at five companies
- Ecolibrium3 hosted an intern who found resource efficiency solutions at three sites in Duluth.

# *Minnesota Materials Exchange*

## 2016 Outputs

64 new organizations/ companies

386 new individual members

1,380 unique visitors

2,360 website visits

39 listings

27 successful exchanges

## 2016 Outcomes

3,142 lbs diverted material

## What they said...

"As a result of posting our items on the MN Materials Exchange website, we were successfully able to give the items to another organization, thus eliminating these items from going to the landfill."

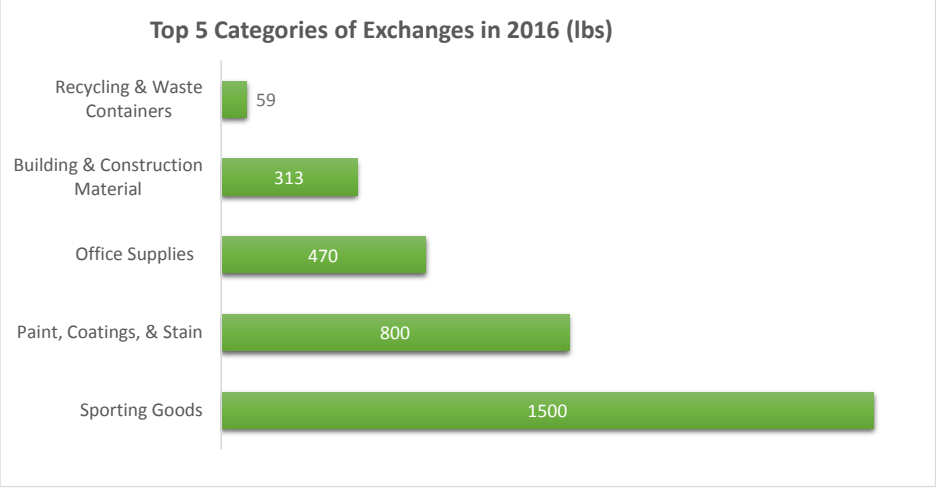
-- *MCF-SCL Warehouse*

## 2016 Overview

The Minnesota Materials Exchange is a website that links organizations that have reusable goods they no longer need to others who can use them. In 2016, MnTAP focused on publicizing this service to businesses, organizations, and institutions throughout Minnesota. Promotional efforts tied into a renewed focus on reduction and reuse, including byproduct synergy, among businesses in the metro area.

## 2016 Exchanges

Over 3,000 pounds of waste was diverted from landfills via exchanges, with the most weight in sporting goods, followed by paint, coatings and stain, as shown in the chart below.




View or list items for exchange at www.mnexchange.org


## Baby Kits Find Second Life Through MN Materials Exchange

Second Stork, an organization built upon reuse and public service, takes surplus newborn registry kits from retail stores and re-purposes them into donations for newborns in need at hospitals throughout Minnesota. The volunteer organization does its best to make use of the items in the surplus registry kits, but consistently has items that hospitals are unable to use.

Two such items are reusable bags and pouches that hold some of the items that come in the kits. Using the Minnesota Materials Exchange, Second Stork was able to connect with an organization that took approximately **500 pouches** that would otherwise have been thrown away.

# General Outreach & Communications

## 2016 Outputs

6 MnTAP e-newsletters to 1,440 subscribers

1 printed *Source* newsletter to 2,800 subscribers

1 *Solutions* intern program magazine

14 articles or promotions placed externally

1 tri-fold MnTAP brochure

24 presentations

3 booth events

3 training events

2 award nominations

## 2016 Goal

Develop and disseminate technical information for Minnesota businesses to help them implement pollution prevention and energy efficiency practices and technologies. Promote MnTAP services and results through publications and presentations.

## 2016 Accomplishments

Communication methods included electronic newsletters, targeted email campaigns, project-specific printed materials and intern program videos. Highlights include:

- Publishing an article on industrial water conservation in the online sustainability best practices magazine GreenBiz.com
- Training on healthcare hazardous waste with a cohort of dentists in Duluth
- Developing a *Source* newsletter focusing on the air quality improvement successes of the Safer Products that Work degreasing project
- Having MnTAP staff and services highlighted in 7 external publications
- Creating 5 videos featuring interns and their projects, and 1 video promoting the intern program to potential students and partners.

## 2016 Online Audience

- The MnTAP website had 39,302 new visitors, most arriving via an organic search for technical assistance.
- Most visits to the MnTAP website were from users in the U.S. (27,228), followed by India (4,848) and the U.K. (2,170). The site also received visitors from Canada, the Philippines, Malaysia, Australia, South Africa, Singapore and Pakistan.
- MnTAP is building a new website in the WordPress platform, which will allow more frequent content additions and provide a more dynamic user experience for visitors. The site is expected to launch in mid-2017.


## Videos Highlight 5 Intern Projects and Intern Program Partnerships

Five interns and their site supervisors were featured in videos about their projects. The videos are aimed at prospective MnTAP interns and depict what happens in a typical day and what the interns learned through their experiences.

- Rachel Kosse (environmental science policy and management) highlighted the self-guided aspect of her internship at HCMC and how water is used in healthcare.
- Christine Lucky (chemical engineering) got industrial experience at Xcel Energy that she says was not available in the classroom. She recommends interns get their hands dirty to learn the most during their internships.
- Roopesh Pushpala (industrial and systems engineering) was glad for the opportunity to develop manufacturing processes, a skill he will carry into his career, which will begin where his internship ended – at Nordic Ware.
- Katie Venne (chemical engineering) says she learned more about environmental engineering through her experience with G&K Services, while also improving her professional skills.
- Brent Vizanko (chemical engineering), who identified fresh water conservation opportunities at 12 Cemstone sites, recommends a MnTAP internship to anyone who wants a deeper understanding of how industry works.

A sixth video was created to promote the program to potential funding partners. Search Minnesota Technical Assistance Program to watch the videos on YouTube.

# MnTAP's 2016 Special Projects

| Project & *Funding Source* | Highlighted Activities | Page |
|---|---|---|
| Area Source VOC Reduction: Degreasing<br><br>*U.S. Environmental Protection Agency Region 5* | Demonstrate efficiency of low-VOC, low-hazard degreasing materials in industrial maintenance and service businesses. | 12 |
| Compressed Air Tool Study<br><br>*Minnesota Department of Commerce, Division of Energy Resources* | Determine the statewide energy savings opportunity, cost, and greenhouse gas impacts of replacing compressed air-driven power tools with electric or battery-driven alternatives in industrial settings. | 13 |
| E3 in FRP: Fiber Reinforced Plastics<br><br>*MN Pollution Control Agency; U.S. EPA Region 5* | Conduct four Economy, Energy and Environment (E3) assessments of fiber reinforced plastics manufacturers to implement time, energy and materials savings opportunities to improve business productivity and profitability. | 14 |
| E3 in Painting and Coating Project Launch<br><br>*MN Pollution Control Agency; U.S. EPA Region 5* | Conduct three Economy, Energy and Environment (E3) assessments to improve productivity and reduce air emissions and energy use in industries with significant painting and coating operations. | 15 |
| Energy Reduction in Wastewater Treatment Plants<br><br>*Minnesota Department of Commerce, Division of Energy Resources; U.S. Department of Energy* | Provide energy benchmarking and assessments at wastewater treatment plants throughout Minnesota and identify sites where combined heat and power could be a future option for energy generation. | 16 |
| Industrial Water Conservation<br><br>*Metropolitan Council with funding from the Clean Water, Land, and Legacy Amendment and others* | A summary of water efficiency projects. | 17 |
| School Food Waste Reduction<br><br>*U.S. Environmental Protection Agency Region 5* | Prevent or reduce food waste in K-12 public schools by observing processes, sharing best practices, and measuring the impact of implementation of new reduction strategies. | 18 |
| Small Embedded Data Centers<br><br>*Minnesota Department of Commerce, Division of Energy Resources* | Develop protocol to measure energy use in server rooms smaller than 1,000 sq. ft., then apply the protocol to assess energy conservation opportunities for small data centers. | 19 |
| Improving Community Air Quality<br><br>*U.S. Environmental Protection Agency Region 5* | Support site assessments and intern projects at businesses to reduce hazardous air emissions in the Phillips communities of Minneapolis. | 20 |
| Non-Residential Water Efficiency<br><br>*Washington County Public Health and Environment* | Conduct three site assessments and one intern project to identify water efficiency opportunities at Washington County businesses. | 20 |
| Reducing Waste in Food Processing<br><br>*MN Pollution Control Agency; U.S. EPA Region 5* | Provide no-cost waste reduction assessments for Minnesota food processors focused on hazardous material reduction, as well as support intern projects focused on in-depth waste reduction strategies. | 20 |

# *Area-Source VOC Reduction: Degreasing*

## 2016 Outputs

3 fact sheets

1 flier

3 product info postcards

4 written case studies

4 videos developed from case studies

1 webinar

## 2016 Outcomes

5 companies participated

4 companies implemented 6 recommendations

1 award nomination

## Total Project Outcomes

23 pilots initiated

14 companies implemented 26 recommendations

3,800 lbs/yr VOC/HAP reduced

$7,641/yr saved

## Sponsor

U.S. EPA Region 5

## Project Overview

The "Safer Products that Work" project, which began in 2014 and ended in March 2016, enlisted a total of 39 companies to receive recommendations to switch to less hazardous degreasing solvents. Many of these companies have made changes in the products they use, resulting in a reduction of nearly 4,000 lbs of hazardous air emissions per year. Over the course of this work, MnTAP developed a protocol to conduct comparative risk assessments of incumbent and alternative products, as well as procedures for assessing technical performance.

## Project Activities

- MnTAP conducted a survey of 16 industrial and 10 automotive facilities, mostly located in the 7-county metro area, to determine degreasing product use and volume. Results from the survey indicate that the most common degreasing mechanism is aerosol sprays. The most common degreasing chemicals were D-Limonene and tetrachloroethylene in industrial facilities, and water-based solutions and mineral spirits in auto repair shops. The most common methods of disposal are evaporation/none and recycling.
- Monitoring worker exposure to measure baseline levels of emissions before and after switching to a new product aligned with expected emissions reductions.
- Four videos and one webinar were produced based on case studies from the project. Twenty-six participants attended the live webinar, with 54 more views on YouTube through the end of 2016.
- The project was nominated as one of three finalists for Environmental Initiative's annual award in the Energy and Climate category.

## Summary of Proposed and Implemented Reduction (lbs/yr)

| Year | | VOC | HAP | Solid Waste | Savings |
|---|---|---|---|---|---|
| 2014 | Proposed | 17,274 | 5,078 | 3,750 | $5,604 |
| | Implemented | 70 | 0 | 0 | $70 |
| 2015 | Proposed | 6,136 | 509 | 645 | $7,714 |
| | Implemented | 2,818 | 468 | 645 | $7,571 |
| 2016 | Proposed | 351 | 293 | 0 | 0 |
| | Implemented | 142 | 293 | 0 | 0 |
| Total | Proposed | 23,761 | 5,880 | 4,395 | $13,318 |
| | Implemented | 3,031 | 761 | 645 | $7,641 |


## Putting the Brakes on Hazardous Brake Cleaner in Duluth

MnTAP recently reached out to the Duluth-area automotive repair industry to encourage shops to switch to brake cleaners with lower VOCs and zero HAPs. The project team first secured commitments from three major local retailers to carry the safer products. They then visited 50 auto repair shops, where the team discussed the hazards of degreasing products. The team left free samples of brake cleaners that were safer than those currently in use at the shops, along with a voucher for another free case. Thirty shops agreed to test the alternatives in their operations and 16 have redeemed the vouchers to date. If all the shops that received samples continued to use them, **toxic air emissions into the surrounding community could be reduced by up to 5,000 lbs.**

# *Compressed Air Tools: Energy Efficiency Study*

## 2016 Outputs

64 manufacturers interviewed

11 compressed air and tool experts interviewed

43 industries identified to have savings potential

## Sponsor

Department of Commerce, Division of Energy Resources

## Project Overview

2016 was the first year of 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 in industrial settings. Through literature review and outreach to industrial experts, MnTAP is identifying industrial markets with significant power tool usage. Interviews with manufacturing representatives will be used to confirm actual use in facilities, identify barriers to tool switching, and generate customized estimates for savings potential.

The findings of this study will be used to generate a guide for facilities to use when considering a transition from compressed air to electric tools and a cost and energy calculator to provide facilities with estimates for their unique energy-saving opportunity. Lastly, guidance will be provided to the state's utilities on how they can standardize estimates of energy conservation potential on a per-site basis, with the aim of influencing new prescriptive incentives under their conservation improvement programs.

## 2016 Goals

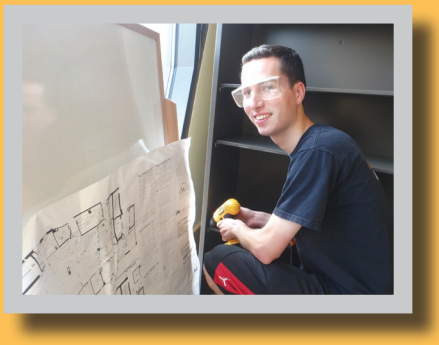
- Identify industries with significant power tool use through literature review and interviews
- Interview technical experts and manufacturing facilities to confirm real-world use
- Compare performance, cost, life, and energy use of pneumatic and electric power tools
- Compile guide for facilities as they consider a transition from pneumatic to electric tools
- Generate industry-specific savings potential estimates for tool replacement.

## 2016 Accomplishments

While the project will continue through the end of 2017, MnTAP has made significant progress toward grant completion during 2016. Extensive literature review and interviews have been conducted, identification of tool-intensive industries is complete, and preliminary statewide savings potentials have been generated.

## 2017 Plan

Develop energy and cost savings calculator for use by tool users.



## Student Workers Expand MnTAP's Research Capability

In the past several years, MnTAP has tapped into of the deep pool of engineering students at the University of Minnesota to accomplish its own research goals. Electrical engineering student Brandon Noel was enlisted in 2016 to survey, analyze and develop model estimates of compressed air tool use and the potential for improved energy efficiency by switching to electric-driven tools. "Work like Brandon's allows MnTAP to take on projects with deeper analysis than we'd otherwise have time for," says Noel's supervisor, MnTAP engineer A.J. Van den Berghe.

Of course, the benefits of this type of research reach beyond MnTAP and its clients. "This project relates to my interest in energy and energy conservation," says Noel, 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 until now, such as interviewing people. Plus, it will look good on my resume."

# E3 in Fiberglass Reinforced Plastics

MnTAP E3 in FRP Project
University of Minnesota

## 2016 Outputs

3 pilot projects at 3 companies

3 P2 and E2 assessments

3 lean assessments

2 value stream mapping events

2 kaizen events

5 full day lean training workshops

## 2016 Outcomes

223,000 lbs solid waste

19,000 lbs hazardous waste

34,000 lbs resin

4,200 lbs air emissions (styrene)

$126,000 savings

127,000 kWh

## Sponsor

Minnesota Pollution Control Agency

U.S. EPA Region 5

## Project Overview

In 2014, MnTAP launched the E3 in FRP project, bringing together resources from multiple agencies to benefit the Economy, Energy, and Environment (E3) in the fiber reinforced plastics industry. The first year was focused on identifying and recruiting companies, with a series of newsletters and a best practices training. 2015 saw the completion of the first pilot project. In 2016, MnTAP completed pilot projects at an additional 3 companies. MnTAP partnered on this project with lean providers, electrical utilities, and the Minnesota Small Business Development Center, part of the MN Department of Employment and Economic Development.

## 2016 Activities

At each of the three pilot companies, MnTAP performed pollution prevention and energy efficiency assessments to identify opportunities to reduce waste, hazardous chemicals and energy use. Each company also participated in a lean assessment by one of our partners, Enterprise Minnesota or Manufacturers Alliance, to identify waste reduction and material flow improvements that would not be found with P2 and E2 alone. Highlights include:

- Reducing styrene resin use by 33,000 lbs, air emissions by 1,400 lbs, and solid waste by 223,000 lbs though use of more efficient spray guns with reduced overspray
- Optimizing product formulation to reduce required gel coat thickness, saving 870 lbs of gel coat, 260 lbs in styrene emissions, and $9,800 in labor costs
- Saving 8,000 kWh per year through lighting improvements
- Improving compressed air systems for a 42,000 kWh reduction in energy use and annual savings of $4,000
- Increasing throughput so that two shifts could be combined into one while maintaining the same production, saving 77,000 kWh and $3,600 in energy for heating and lighting
- Implementing standard work and improving material flow, leading to a 16% increase in production capacity
- Replacing custom fixtures with a new reconfigurable fixture, saving $60,000 per year in new fixture costs and 480 sq ft per year in storage space
- Recycling acetone to eliminate hazardous waste and save on acetone purchases (see below).

### Lean Principles Spread Benefits Throughout Sunrise Fiberglass

Sunrise Fiberglass in Wyoming, Minnesota used Manufactures 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 Fiberglass put a core lean tool, 5S – sort, set, shine, standardize, and sustain – 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%, allowing new products to be brought in using the more environmentally-friendly closed molding process, with 90% 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**.

# *E3 in Painting and Coating*

MnTAP E3 in Painting
University of Minnesota

## 2016 Outputs

20 companies contacted via E-news, website, and calls

3 P2 and E2 assessments

3 companies received training in lean principles

2 value stream mapping events

2 kaizen events

## 2016 Outcomes

9,000,000 gallons water

28 tons salt

30 tons solid waste

2,400 therms

$250,000 labor, material and productivity

## Sponsors

Minnesota Pollution Control Agency

U.S. EPA Region 5

## Project Overview

MnTAP began a one-year project in late 2015 to bring the Economy, Energy and Environment program to paint and coating operations, and partnered with lean training providers Enterprise Minnesota and Manufacturers Alliance to either perform value stream mapping (VSM) and kaizen events, or to provide lean training for both management and operators. MnTAP also performed an energy and waste assessment for each site, providing specific recommendations on strategies that would lead to energy efficiency and pollution prevention outcomes.

## 2016 Activities

MnTAP helped three Minnesota manufacturing companies implement lean principles:

- A manufacturer of metal cookware, cutlery, and flatware: Manufacturers Alliance trained managers and operators on lean techniques such as visual management, 5S, setup reduction, standard work, VSM, and mistake proofing. The company used lean techniques to better manage their tools around the shop, improved new management practices and standard operating procedures (SOPs) to simplify plant operations, and hosted a summer intern.
- A metal container manufacturer: The company received a site assessment, VSM, and a kaizen event with MnTAP and Enterprise Minnesota. They set SOPs, minimized product and employee motion, improved product staging/pull supermarket and improved welding quality management. Production was increased by approximately 20% using existing labor and space. Lower temperature cure powder coating was successful and will improve product throughput. Labor savings are estimated to be greater than $25,000.
- A manufacturer of precision sheet metal: The facility completed an assessment, VSM, and a kaizen event with MnTAP and Enterprise Minnesota. They improved production timing, inventory management, and raw material orders, and installed SOPs in the paint department. The improved production throughput is estimated to increase profitability by over $100,000.

### Big Benefits within Reach through Process Optimization at Atlas

Atlas Manufacturing, a Minneapolis precision sheet metal fabricator, partnered with MnTAP and Enterprise Minnesota to perform value stream mapping and lean analysis to streamline production and reduce waste and energy use. Process managers met for five days to review the flow of material and orders through the manufacturing facility. The mapping process identified bottlenecks and produced recommendations for improvement.

Increasing order visibility has helped the paint line manager better prioritize orders to reduce changeover times, resulting in a more effectively managed department. Specific paint line improvements include:

- defining an ideal flow rate through the paint department
- organizing paint department production meetings to help the production team develop and share optimal operating techniques
- creating standard procedures for paint line staff, outlining the responsibilities for each position within the department.

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

# *Energy Reduction in Wastewater Treatment Plants*

## 2016 Outputs

2 electronic promotions

1 benchmarking handout

1 benchmarking webpage

1 case study

4 benchmarking partnerships forged with utilities

3 assessment completed, with 2 additional assessments started

1 intern project

1 energy efficiency training session for operators

1 B3 energy benchmarking platform supported

## 2016 Outcomes

495,000 kWh/yr implemented

1,700,000 kWh/yr additional potential savings identified

$39,600 savings

## Sponsors

Minnesota Department of Commerce

U.S. Department of Energy

## Project Overview

The goal of this project is to identify energy efficiency (E2) opportunities for wastewater treatment plants and provide training to operators. Plant energy benchmarks are used to identify plants with E2 opportunities, while onsite assessments help identify changes that have the potential to reduce energy use. MnTAP also identifies appropriate financing mechanisms to accelerate implementation, as well as opportunities for increased biogas utilization.

## 2016 Project Activities

Highlights include:

- Completing assessments at 3 plants and starting assessments at 2 others
- Guiding one intern project in the city of St. Peter (highlighted below)
- Providing expert energy training on wastewater processes at the Minnesota Wastewater Operations Conference (MWOC), hosted by MPCA in March 2016
- Working with MPCA, MN Dept of Commerce, and the Weidt Group to develop a wastewater benchmarking module for the state's B3 building benchmark tool, to be rolled out in early 2017
- Conducting benchmarking at 15 plants served by Southern Minnesota Municipal Power Agency and 6 plants served by Otter Tail Power

## Future Plans

- 3 assessments and an intern project in 2017
- 2 combined heat and power screenings and 1 detailed evaluation in 2017
- A second training event in March 2017 at the Minnesota Wastewater Operations Conference
- Reporting results and progress at the Water and Wastewater Technical Conference (March) and Minnesota Wastewater Operators Association (July)
- A benchmarking technical session for GreenStep Cities members

Learn more about MnTAP's WWTP benchmarking assistance at www.mntap.umn.edu/POTW/wwtp.html

## Benchmarking Reveals Energy-Saving Opportunities in St. Peter

The wastewater treatment plant in St. Peter, Minnesota was identified through benchmarking with Southern Minnesota Municipal Power Agency as likely to have energy-saving opportunities. The plant had above average energy consumption and high levels of dissolved oxygen in their secondary treatment. A MnTAP intern identified a key control setting that was adjusted to use fewer treatment cells under average conditions. Changing this setting **lowered energy consumption by 153,000 kWh/yr ($12,000)** – at no cost to the plant. "Thanks to the data collection of our intern, we have developed a baseline to measure our plant's energy consumption," said plant superintendent Jeff Knutson. Reducing blower speed was successfully tested and, along with a recommended change to the method of biosolids aeration, are projected to **save 1.7 million kWh/yr ($133,000)** if fully implemented.

# *Industrial Water Conservation Initiatives*

## 2016 Outputs

2 promotional fliers

13 water use analyses resulting in 10 intern projects

## 2016 Outcomes

10 facilities engaged in water efficiency

33.5 million gal/yr water conserved

## Sponsors

Metropolitan Council, with funding from the Clean Water, Land, and Legacy Amendment

MPCA

Chemical Coaters Association International-Twin Cities

CenterPoint Energy

Dakota Electric

Minnesota Power

Xcel Energy

## Project Overview

MnTAP continued to emphasize water efficiency assistance in 2016 with support and direction from the Metropolitan Council Environmental Services (MCES) Water Supply Planning Group. After completing a final report detailing sector impacts in the Department of Natural Resources-designated North and East Metro groundwater management area in early February 2016, the MCES awarded a 2016-2017 agreement to support 10 water conservation intern projects. Six MCES-supported intern projects were fulfilled in 2016, with identified opportunities totaling over 58 million gallons, with 20.6 million implemented. Chemical Coaters Association International, CenterPoint Energy, Dakota Electric, Minnesota Power, Xcel and MPCA also sponsored projects that had water efficiency components in 2016.

Several other engagements were launched or continued, including problem-solving statewide water reuse, tracking water conservation data, Metro Conservation Districts campus water conservation, and industrial water conservation in Washington County.

## 2016 Project Activities

Highlights from the water project activities through 2016 include:

- Supported 10 internships, 8 in the metro and 2 in Greater Minnesota, which had recommendations to save over 62.5 millions gallons of water; 33.5 million gallons of water-saving solutions have been implemented so far.
- Forged new partnerships to provide technical water conservation assessements, including one with the Metro Conservation District's campus groundwater Project task force.


## Intern Plumbs Water Savings at Cemstone

The Cemstone intern project was one of ten water efficiency projects in 2016. Already an organization with a water reuse mindset, the goal was to improve environmental practices that earn points for the National Ready Mixed Concrete Association's sustainability certification program. Many of the plants Cemstone operates are within five points of the certification, and reducing water use would help them reach that goal. A combination of equipment changes, water reuse, and training could improve water savings at the 12 plants. Recommendations from the internship analysis add up to more than 16 million gallons of water savings. Recommendations included installing or implementing:

- Automatic nozzles = 4,390,000 gallons
- Automated truck wash systems = 2,750,000 gallons
- Reuse weir water = 7,570,000 gallons
- Rainwater collection = 910,000 gallons
- Driver training = 780,000 gallons.

To learn how you can save water at your facility, visit www.mntap.umn.edu/greenbusiness/water/conservation.htm

# *School Food Waste Reduction*

## 2016 Outputs

15 cafeteria waste observations conducted

1 3-lesson school curriculum on food waste developed in partnership with science instructor

1 food waste category protocol for lunchroom observation and measurement

1 final report to school with findings and recommendations

## Sponsors

Minnesota Pollution Control Agency, EPA Region 5

## Project Overview

MnTAP completed a one-year project to build on the progress Minnesota schools have made in waste diversion. Although many schools are composting, donating left-over food or sending food waste to be used as animal feed, MnTAP is encouraging practices that reduce the sources of food waste. Lakeside Elementary School in Chisago City was chosen for a deeper look at source reduction practices. Through this project, MnTAP found that student involvement in choosing menu items, which was already in place at Lakeside through a student "tasting panel," had a positive waste reduction impact. We recommended that the student involvement program be expanded to cover even more of the menu to further reduce food waste in more categories. Additionally, data collected from lunchroom assessments could serve as a resource for modifying how food is presented and portioned by lunchroom staff.

## 2016 Project Activities

- Conducted waste assessments at Lakeside Elementary - 15 assessments were completed in 2016 (3 completed at the end of 2015)
- Worked with a 5th grade science instructor to develop a 3-lesson curriculum plan on food waste and participated in 1 of the 3 lessons
- Attended student taste test panel meetings to learn the process of engaging students in meal choices, which were then compared during lunchroom assessments to obtain the impact on waste generation
- Met with food service and Lakeside school staff at the end of the project to discuss next steps to improve upon their work with food waste prevention.

To learn more about organics recycling, see www.mntap.umn.edu/industries/waste/organics.html

## Lessons in Food Waste Prevention in the Classroom

The next big challenge in food waste prevention is empowering students to reduce food waste at the source.

1. **Relate food waste to other metrics**: Consider using a simple graphic on the life cycle of food. Walk students through an example of how a food item gets to our plate. E.g. Where do the ingredients in our food come from? What is the path they take to arrive on our plate?
2. **Create a simple math problem:** Consider the gasoline used in transporting milk from farm to milk processor to school. Use distance traveled by the truck that delivers milk to school, gasoline used by the truck, milk ordered per year (or milk wasted!) and compare that to how many trips the truck will make in a year. The value of gasoline used can be compared to something like "number of trips to Disney World and back."
3. **Use visual props:** The amount of water used to make a carton of milk is approximately two 5-gallon buckets. Next, ask students how many of these buckets they think it takes to make a hamburger … at least 200 5-gallon buckets!

# *Small Embedded Data Centers*

## 2016 Outputs

3 data center assessments

## 2016 Outcomes

10,000 kWh Implemented Annual Energy Savings

$6000 Cost Savings

## Project Partners

Center for Energy and the Environment

The Foundation

Wisconsin Energy Conservation Corporation

## Sponsor

Minnesota Department of Commerce, Division of Energy Resources

## Project Overview

This project was designed to measure energy use in small embedded data centers, identifying energy efficiency opportunities and developing cost effective strategies to implement energy savings. MnTAP provided each participating industrial facility a no-cost server room energy assessment, creating a footprint of energy use and identifying opportunities to save energy.

## Project Activities

- Outreach: Survey companies to gather information and schedule assessments
- Metering: Meters were installed to measure energy consumption of server room equipment
- Analysis: Energy consumption and utilization information was calculated for various server room components
- Recommendations: Developed and shared strategies to save energy
- Implementation: Follow-up was completed to track impact and help resolve barriers to adopting efficiency measures.

## Key Findings

- Temperature set points: The average server room temperature was 70°F. The ASHRAE-recommended maximum server room temperature is 80.6°F. This study estimates an average energy savings of 5% for server rooms that have their temperature set points raised to 77°F.
- Equipment scheduling: The typical server room has all its equipment turned on around the clock. Setting non-critical equipment to shut-down at night and on weekends is expected to reduce server room energy costs by 25%.
- UPS utilization: The average UPS (Universal Power Supply) utilization for small server rooms was 29%. Increasing UPS utilization to between 40% and 50% will allow sites in this assessment to reduce an average of 1.7 UPS units per site, reducing equipment costs.
- Server utilization: Improving server utilization in small embedded data centers is expected to reduce server room energy consumption by 2%.

To learn more about energy-saving practices, visit www.mntap.umn.edu/greenbusiness/energy.htm

## Nordic Ware Draws Down Energy Use and Costs

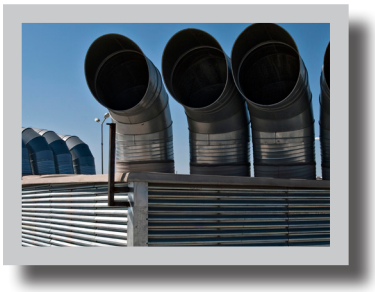
Nordic Ware in St. Louis Park, Minnesota was able to find energy and cost savings by making some simple efficiency changes in their server rooms. Optimizing the loading on their UPSs involved removing two UPS units, resulting in **$2,400 in future cost avoidance** on equipment that will not need to be purchased during server room upgrades. Increasing the temperature setpoint within the 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.

"We appreciate the opportunity to partner with MnTAP on efficiency projects like this one," says Bette Danielson, Safety and Environmental Affairs Manager for Nordic Ware. "The program is a great resource that has helped Nordic Ware cost-effectively identify and implement savings of all kinds in our operations."

# *New Opportunities*

## What's in Store for 2017

MnTAP launched three new projects in late 2016: air quality improvement in Minneapolis' Phillips communities, waste reduction in food processing, and water efficiency in Washington County.



## Air Quality in Phillips

MnTAP will be reaching out to several small and large businesses in the Phillips communities of Minneapolis to encourage the adoption of products and processes that decrease toxic emissions. Staff will conduct site assessments and advise interns to identify solutions at auto repair shops, janitorial services and healthcare facilities, among others. Project partners include Lake Street Council and Hope Community. The project is funded through a grant from the U.S. EPA.

## P2 in Food Processing

Through this two-year project, MnTAP will provide no-cost waste reduction assessments for Minnesota food processors, as well as intern projects focused on waste reduction strategies. These activities will be geared toward reducing chemicals and hazardous waste, conserving water and energy, and lowering strength charges and overall operating costs. The project is funded through the MPCA and U.S. EPA.

## Washington County Water

Starting in October 2016, MnTAP began outreach efforts to non-residential water users in Washington County. Continuing through 2017, the project team will conduct site assessments and advise an intern to identify water conservation opportunities. The project is sponsored by Washington County Public Health and Environment.

# *MnTAP 2016 Engagement Summary (Interns, Team Meetings, and Site Visits)*