

## Reducing raw material wastes

Raw material losses at one Princeton, Minnesota, bottler sparked interest in determining ways to reduce waste. The MnTAP intern project led to more than just waste reduction; the company also realized cost savings and improved their production process.

When United States Distilled Products (USDP) discovered that raw material losses were running higher than the average, the company determined it needed to change. However, the leading contract bottler and producer of alcoholic beverages was unsure where the losses were occurring during the bottling process.

USDP purchases beverage components that they mix and bottle per customers' formula specifications. There are six bottling lines at USDP; each line performs seven steps: load, align, clean, fill, gap, label, and package (see Figure 1). While the process is the same for each line, they have differing degrees of automation.

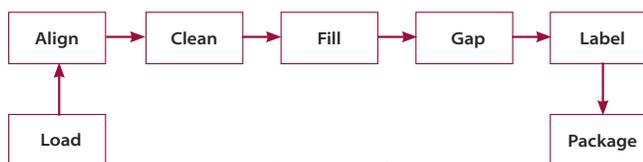


Figure 1: Bottling Process Flow Diagram

### Waste Reduction Project

At USDP, raw materials include empty plastic and glass bottles and liquid product. Losses of bottles result in higher raw material costs, while losses of liquid product cost money and increase wastewater treatment costs. To determine where the loss was occurring, USDP developed



MnTAP intern Mark McGuire worked to decrease waste generated during the labeling process at USDP.

a MnTAP intern project to identify the loss location and determine how to prevent it.

The MnTAP intern observed the bottling lines at USDP and determined that most of the raw material losses (52%) occurred in the labeling operation, while cleaning, filling, and loading operations each experienced 11 percent of the losses.

Once the causes were determined, waste reduction opportunities were identified and implemented in the labeling, loading, and cleaning steps.

### Labeling

Waste is generated during the labeling process when bottles either are not aligned correctly or when machine adjustments are incorrect. The MnTAP intern suggested relocating a troubling molding on the bottle and working with a labeling specialist to train operators to identify and solve future labeling issues.

(continued)

(Raw material waste, continued from cover)

### Loading

The loading line was often overwhelmed, causing excess bottles to spill onto the floor and making them unsanitary and considered waste. The MnTAP intern determined that a larger catch bin would give the line enough time to use the bottles in the loading area before they were pushed onto the floor. A larger catch bin was designed, fabricated, and installed; it now saves 425 pounds of raw materials (glass and plastic bottles) annually.

### Cleaning

Wastewater is generated at USDP when the tanks are rinsed. Previous rinsing methods used more than 67 gallons of water per minute. The MnTAP intern recommended that USDP use a whirling nozzle to rinse the tank walls, which uses only 20 gpm.

### Project Results

As a result of this project, USDP reduced annual raw material waste by over 1,100 pounds and water use by over 43,000 gallons. The total cost savings per year is over \$25,000. ■

### USDP waste reduction strategies

Percent of Total Waste	Process	Strategies
52%	Labeling	<ul style="list-style-type: none"> <li>- Moved "1.75 LITRES" molding to another location on the bottle to ensure proper alignment</li> <li>- Hired labeling specialist to conduct staff training on identifying and solving labeling errors</li> <li>- Developed training manual and operating procedures for labeling process</li> </ul>
11%	Loading	<ul style="list-style-type: none"> <li>- Designed, fabricated and installed a larger catch bin for excess bottles</li> </ul>
11%	Cleaning	<ul style="list-style-type: none"> <li>- Replaced static sprayers with whirling nozzle to reduce wastewater</li> </ul>

## MnTAP staff makes changes

MnTAP has seen a few changes recently. In addition to adding new staff members, the MnTAP offices will be relocating from the McNamara Gateway Center to the West Bank of the University of Minnesota campus. Staff changes include:

- **Krysta Larson** was hired as the Intern Program and Communications Manager
- **Sarah Haas** joined as the Materials Exchange and Communications Coordinator
- **Kyle Bartholomew**, Chemical Engineer, has taken another position in the University system as of December 16, 2007.



As of March 1, 2008, MnTAP and the Materials Exchange program will be relocated. The new address was unavailable at press time; however a notification will be sent as the relocation is finalized.

Until notified otherwise, you may contact MnTAP at either 612.624.1300 or 800.247.0015. ■

# Improving cleaning processes

Cleaning and disinfecting are some of the most important steps in preventing the acquisition and spread of infectious diseases. In hospitals, different levels of clean are needed based on the use and potential patient exposure. General cleaning involves dirt and dust removal similar to that of an office building. Disinfection, a higher standard of clean, is generally defined as reducing the number of microbes on a surface to very low levels. This requires the use of chemicals, which are technically considered pesticides and vary in degree of toxicity based on the level of disinfection required.

Olmsted Medical Center (OMC) realized it was using 60 different housekeeping chemicals throughout the hospital. These products were not located or purchased centrally and the cleaning process was not clearly defined. In addition to using too many chemicals, OMC was concerned about hazardous waste compliance and disposal costs and wanted to implement pollution prevention practices that would improve their environmental performance.

## Pollution Prevention Project

OMC worked with a **MnTAP intern** in the summer of 2007 to eliminate redundant and hazardous chemicals, establish standardization, implement green cleaning and best cleaning practices, improve safety, and demonstrate cost savings.

To reach the goals of the project, **the MnTAP intern** reviewed all the cleaning chemicals being used and stored on the shelves. Then, using the Center for Disease Control's (CDC) "Guidelines for Environmental Infection Control in Health Care Facilities", surfaces were evaluated and it was determined if they required cleaning or disinfecting. Once that determination had been made, the number and type of chemicals needed to clean and disinfect were identified. Replacement cleaners, if needed, were chosen based on pH, flashpoint, smell, cost, and if it had green cleaning certification. Green Seal cleaners are now being used at OMC.

A new procedure was created for the environmental services staff using resources such as the CDC guidelines and 3M SMART training program. This new procedure reduced cleaning time by seven minutes per room. Additionally, **the MnTAP intern** reduced chemical use including disinfectants. This can not only increase the quality of the work environment for staff, patients, and visitors, but can also decrease the risk of potential injury caused by splashes and spills.

Ultimately, the number of surfaces to be disinfected was reduced by 63%, which translated into a cost savings of approximately \$10,000 annually. Potential annual cost sav-



MnTAP sponsored an intern project at Olmsted Medical Center to reduce hazardous chemical use in cleaning.

ings by reducing unnecessary chemicals and using green cleaners is approximately \$6,400, while implementing the new procedures saves cleaning time that equates to \$6,700 in labor costs. Using concentrated cleaners in reusable bottles will save OMC an additional \$1,870 annually.

Overall, **the MnTAP intern** assisted OMC in reducing unnecessary chemicals through improved processes achieved by standardizing cleaning and disinfecting procedures, and in eliminating redundant chemical use. ■

## Green cleaners

Green cleaners are generally defined as those that have less environmental and health impacts. "Green Seal" has developed criteria and a certification program for green cleaners. Green Seal certified cleaners are not considered aquatic toxins, have minimal phosphorous, do not contain smog-producing chemicals, and must be readily biodegradable. See <[www.greenseal.com](http://www.greenseal.com)> for more information. ■



# Increasing the efficiency of heating water

In April 2007, the Kraft New Ulm plant began using Complete Thermal Exchange (CTE) technology and now conserves energy while heating water, reducing costs at the same time.

CTE water heating technology boasts energy efficiencies near 100 percent and long service lives, two factors that are missing from traditional steam boilers like those the plant formerly used for its hot water needs. This technology utilizes a gas-fired burner and an enclosed chamber for combustion. This chamber allows for the vapor produced during heating to be condensed, thereby eliminating lost heat.

## Installing new technology

The direct heat system that Kraft installed is 99.7 percent efficient. It is capable of heating potable water within 20 seconds of starting and does not require fuel for warm-up or idle time, further reducing the amount of fuel used. Additionally, while heating the water, it produces very low levels of nitrous oxide and carbon monoxide.

In contrast, the old water heating system used steam from two boilers. This method was estimated at 65 to 75 percent efficient and did not maintain a constant water temperature for the facility. Additionally, the steam/water mixing system created excessive noise from the hammering produced as steam was injected into the cold water supply.

The new direct heat system is NSF certified for food grade water and does not require a lot of space in the plant. Norm Melville, engineering manager at Kraft, reports that the system was easy to install with the plant's current space configuration.

## Positive Results

Since starting the system in April, Kraft has seen a downward trend in natural gas usage for 2007. Overall usage is tracked against previous years using a chart which is reviewed monthly. "We believe we are seeing a natural gas savings from this new system and are pleased with the change," Melville said.

Kraft has not only realized cost and energy savings, but now also achieves a flow of hot water consistently measuring 140 degrees.



courtesy of Armstrong International

This direct contact water heating system is similar to the one installed at Kraft New Ulm in April 2007.

# Benchmarking Minnesota's ethanol industry

MnTAP recently conducted a study of Minnesota dry mill ethanol facilities to develop benchmarks relative to energy use, air emissions, water quality, and water use. [Ethanol Benchmarking and Best Practices](#), a recent study conducted by MnTAP Mechanical Engineer Nancy Kelly, summarizes the variability across Minnesota ethanol plants in terms of resource efficiency.

In this fast growing, resource intensive industry resource reduction options may be available. Therefore, this study was developed to provide examples of best practices that have been implemented, rather rapidly, and have resulted in significant change. The study is intended to provide information regarding the production process, determine the potential for improvements in the use of resources including energy and water, and evaluate the opportunities to reduce environmental impacts. Additionally, the study will serve as an educational tool for others outside the ethanol industry of the challenges faced by dry mill facilities when attempting to conserve resources.

One goal that MnTAP has for the short term is to continue to grow relationships with etha-

mol plants and help them begin achieving their resource reduction goals. MnTAP will rely upon these benchmarks to better provide ethanol facilities with on-going technical pollution prevention assistance. Another goal of MnTAP is to work with an ethanol plant to develop an intern project aimed at resource reduction.

In February, Nancy Kelly will be presenting information regarding her recent ethanol plant research project at the Minnesota Air, Water, and Waste

Environmental Conference. Her presentation, [Identifying Environmental Process Improvements through Benchmarking Minnesota Ethanol Facilities](#), will feature project results along with best practices that reduce air emissions or water consumption, and improve water quality. A fact sheet with more information will be published and made available in early 2008. ■

## Minnesota Air, Water, and Waste Environmental Conference 2008

February 26 - 28, 2008

Sheraton Hotel, Bloomington, MN

For more information visit <http://www.pca.state.mn.us/news/training/mawweconference/>

## Dry Mill Ethanol Plant Benchmarks

Benchmark	Have New Plants Achieved Improvements?	Old Plant Average	New Plant Average
Electrical Energy	Clearly demonstrated improvement	1.02 kWh/gal	0.61 kWh/gal
Thermal Energy	Demonstrated improvement*	36,869 Btu/gal	29,012 Btu/gal
Yield (undenatured)	Demonstrated improvement*	2.68 gal/bu	2.81 gal/bu
Water Efficiency (undenatured)	Demonstrated improvement*	4.6 gal/gal	3.4 gal/gal
Water Quality **	Demonstrated improvement**	-	-
VOC	Not clearly demonstrated***	2.4 ton/MG	1.2 ton/MG

\* Retrofits to old plants also demonstrated improvement

\*\* There was not one numerical benchmark for water quality but data trends indicate improvements

\*\*\* The standard deviation was approximately 1 ton/MG so these numbers are not significantly different

## where's your waste?

# Summer interns help reduce waste across the state

Is your company interested in becoming leaner through cutting waste and energy? A **MnTAP student intern** can assist you in the legwork you need to justify changes at your facility. MnTAP sponsors college students to work full time for the summer at Minnesota businesses to research solutions to its specific waste-related challenges, such as:

- Energy use
- Defects
- Raw material use
- Scrap
- Water use
- Wastewater
- Solid or hazardous waste
- Air emissions, VOCs, HAPs

MnTAP hires and pays college juniors or seniors, majoring in science or engineering, to work on finding solutions to inefficiencies and waste issues. By participating in the MnTAP intern program, companies receive:

- A **motivated college student** with technical background and research skills, working full time at your facility for the summer.
- **Technical guidance** from a MnTAP technical specialist who will also help develop the project's scope and oversee the student's work.

- **Human resources management** as MnTAP recruits, hires and pays the student. We cover payroll and workers compensation.

In 2007, MnTAP interns worked with nine companies and helped them save \$129,295 by reducing 4.3 million gallons of water, 2,600 pounds of solid wastes, 627,000 kWh and 2,400 therms per year. Using their MnTAP student intern's research, Great Batch will reduce their air emissions by 8,800 pounds and will save over \$27,000. Advanced Web will reduce their solid waste by 17,360 pounds annually, thereby saving nearly \$200,000.

### To apply

Applications are currently being accepted through February 1, 2008. If you would like a **MnTAP intern** to help solve waste-related problems, call Krysta Larson at 612.624.4697 or 800.247.0015. Additional information is available online at <[www.mntap.umn.edu](http://www.mntap.umn.edu)>. ■

## Chemicals of interest list finalized for chemical facility anti-terrorism standards

The Department of Homeland Security recently released Appendix A of the Chemical Facility Anti-Terrorism Standards (CFATS), a critical element of its chemical security efforts. The appendix contains a list of chemicals ([http://www.dhs.gov/xlibrary/assets/chemsec\\_appendixa-chemicalofinterestlist.pdf](http://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf)) that, if possessed by a facility in a specified quantity, trigger a requirement to complete and submit an easy-to-use, online consequence assessment tool called Top-Screen.

The Department identified these chemicals in the specific amounts for preliminary screening based on their potential to create significant human life or health consequences. Appendix A lists approximately 300 chemicals of interest and includes common industrial chemicals such as chlorine, propane, and anhydrous ammonia, as well as specialty chemicals such as arsine and phosphorus trichloride. Facilities that possess chemicals of interest at or above the listed screening threshold quantities are required to complete the Top-Screen within 60 calendar days of the publication of Appendix A.

For more information on chemical security or to view the Appendix A final rule of CFATS, visit <[www.dhs.gov/chemicalsecurity](http://www.dhs.gov/chemicalsecurity)>. ■

# materials exchange



The Minnesota Materials Exchange program lists one company's unwanted material

and makes it available for use by another company. For more information, call MnTAP at 612.624.1300 or 800.247.0015. Or, visit <[www.mnexchange.org](http://www.mnexchange.org)>.

## Alliance Sites Make Exchanges Local

Minnesota is served by nine exchange programs, eight in greater Minnesota and one in the metro area. These nine sites work together to make up the Minnesota Materials Exchange Alliance. Alliance sites were started to provide local service to a particular area of the state.

### West Central Minnesota: MATCH Program

The Clay County Materials Exchange operates out of the Clay County Landfill, located approximately four miles west and two and a half miles south of Hawley, Minnesota. It serves Clay, Becker, and Wilkin Counties and has two areas for customer access: a lumber pile located next to the main building and a re-use garage, where all of the other items to be exchanged are stored.

County residents may bring their usable items to the exchange during normal landfill hours: weekdays from 8 a.m. to 4:30 p.m. and the first and third Saturday of each month. Other items are salvaged from the landfill by the landfill operators. Most of the lumber comes from the Clay County Construction and Demolition landfill,

located just a few miles from the sanitary landfill.

All items are available on a first come, first serve basis. Some of the items are listed online at <<http://www.co.clay.mn.us/Depts/PlanEnvi/SWMATAv1.htm>>, which is updated at the end of each month. For more information on the MATCH program, contact TJ Schmitt at 218.299.7329. ■

## 2007 Exchange highlights for West Central Minnesota

Total tons of non-wood items exchanged	4.99
Total value of non-wood items exchanged	\$5,090
Total number of non-wood exchanges	89
Total tons of wood exchanged	4.56

## Successful exchanges

- A large financial institution donated 762 pieces of plywood to a local non-profit organization. The financial institution saved approximately \$1,700 in disposal fees and the non-profit was able to avoid purchase costs of approximately \$6,000.
  - A small non-profit group donated a three gallon, 1.5 hp air compressor to another non-profit organization. Purchase costs of \$280 were avoided.
  - A small education organization donated 50 workstations to a local non-profit group. The non-profit group saved approximately \$10,000 in purchase costs and the donating organization avoided several hundreds of dollars in disposal fees.
- Items listed on the Materials Exchange may be sold for a nominal fee—20 percent or less than the value of an item. An item's value must be based on its current condition. ■

# E-Waste Recycling

Electronic technology is continually advancing, which can result in an increase of electronic waste (e-waste) as businesses and consumers replace old with new. However, the waste created by updating electronics can be difficult to handle. Most electronics cannot simply be thrown out as they may contain hazardous materials such as lead and mercury.

Fortunately, there are many options available for appropriately disposing of e-waste.

**Take Back:** MPCA's website offers information about manufacturers taking back electronics for recycling. <<http://www.pca.state.mn.us/oea/index.html>>

**Exchange:** Businesses can use the materials exchange, which regularly has electronics listings. <[www.mnexchange.org](http://www.mnexchange.org)>. Individuals can list or view similar items at <[www.twincitiesfreemarket.org](http://www.twincitiesfreemarket.org)>.

**Recycle:** For recycling options, visit <[www.greenguardian.com](http://www.greenguardian.com)>. ■

helping businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution and reduce costs and energy use

# mntap



The **Minnesota Technical Assistance Program** helps businesses and industries develop and implement industry-tailored solutions that maximize resource efficiency, prevent pollution and reduce costs and energy use to improve public health and the environment. As an outreach program at the University of Minnesota, MnTAP provides free 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 a pass-through grant from the Minnesota Pollution Control Agency's Prevention and Assistance Division to the University of Minnesota, School of Public Health, Division of Environmental Health Sciences.

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## calendar

**Healthcare Environmental Awareness and Resource Recovery Team (HEARRT) Meeting.** January 10, 2008, Minnesota Hospital Association, St. Paul, Minn. Sponsored by MnTAP and MPCA, 651.296.7634.

**McLean Thermal Technology Tour.** January 17, 2008, 11611 Business Park Blvd. N, Champlin, Minn. Sponsored by CCAI, 320.230.6282.

**MnTAP Intern Program Application Deadline.** February 1, 2008. Sponsored by MnTAP, 612.624.1300 or 800.247.0015.

**Becoming a Finishing Detective: Identifying and Correcting Defects and Rejects.** February 21, 2008, Royal Cliff Banquet Facility, Eagan, Minn. Sponsored by CCAI, 320.230.6282.

**Minnesota Air, Water, and Waste Environmental Conference.** February 26-28, 2008, Sheraton Hotel, Bloomington, Minn. Sponsored by MPCA, 651.297.5754.

**24th Annual Water and Wastewater Technical Conference.** March 4-6, 2008, St. Cloud Civic Center, St. Cloud, Minn. Sponsored by MRWA, 218.685.5197.

**Minnesota Safety & Health Conference.** May 14-16, 2008, Minneapolis Convention Center. Sponsored by the Minnesota Safety Council, 800.444.9150.

For more information and links to Web pages for these events, visit MnTAP's online calendar at <[mntap.umn.edu/resources/cal.htm](http://mntap.umn.edu/resources/cal.htm)>.

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