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Minnesota Technical Assistance Program

University of Minnesota spring 2003

smart water use

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Raising rinsing efficiency

In Minnesota, our natural waters seem free flowing. Once that water flows to your operation it's hardly free. Companies need to be smart about their water use.

Water use at Technical Plating increased from 40,500 to 54,000 gallons per day (gpd) between 1998 and 2001. The small metal finisher in Brooklyn Park specializes in applying tin, tin-lead and electroless nickel coatings on parts for electronics, medical and general manufacturing industries. Technical Plating was facing a one-time $56,000 service availability charge (SAC) from the Metropolitan Council Environmental Services (MCES) for its increased water use.

"We needed to reduce our water use to avoid the SAC fee," said president Bryan Thomas. **MnTAP intern** Eric Tsai, a chemical engineering student at the University of Minnesota, worked with the company to cut water use.

"Having Eric around made it easier for us to reduce water use. He had the time to research applications and regulations. I wouldn't have had the time to do that," said Thomas.

Rinsing efficiency

The intern measured flow rates for many of the rinses to estimate the effect of reduction efforts. He saw that the flows varied between plating lines and different days on the same line—with some flows being three times higher than others. Part volume and quality specifications did not explain this variability.

The intern noticed that for most of the company's two-stage, cascaded rinses, the conductivity of the second rinse dropped to the freshwater level very early in the cycle instead of gradually—indicating water overuse.

The variability was due in part to the use of ball valves to control flow. Although commonly used, ball valves do not regulate flow well and are best used as on/off controls. Operators set flow rates by adjusting the position of the ball valve handle, without measuring or seeing the actual flow. Water entered the rinse tanks near the bottom where the flow was not visible. Optimal flows had not been set for the rinse operations, and operators lacked incentive to avoid overuse.

Technical Plating installed three flow meters on one line's rinses and operators were given instructions to limit flows.

Effluent reuse

The intern tested reuse of effluent—wastewater from rinses and batch dumps of exhausted chemical baths that is treated to meet sewer limits—in rinses on Technical Plating's matte-tin and bright-tin lines. Parts from the matte-tin trials met all specifications for adhesion, solderability and appearance. Parts in the bright-tin

(continued)

(Technical Plating, continued from cover)

trials also met adhesion and solderability specifications, but had a cloudy appearance. Using a 50/50 effluent/fresh water rinse improved appearance to equal a 100 percent fresh water rinse.

The intern also investigated the effects of effluent reuse on the levels of sulfate, chloride and total dissolved solids (TDS) that might build up over time.

Overall results

"At one point we were up to 80,000 gpd of water use, now we are down to 35,000 gpd," said Thomas.

Installing the three flow meters on one line's rinses cost $450. The meters and flow limit instructions to operators cut water use by 5,000 gpd, saving the company $4,000 in water and sewer costs and $21,000 in one-time SAC fees.

Effluent reuse at Technical Plating cut water demand by 2.62 million gallons per year (gpy), saving the company $7,100 per year plus $44,100 in one-time SAC fees. The changes cost the company $5,200 to implement.

Attention to water costs resulted in greater care by the operators. This reduced water use by an additional 2,600 gpd, totally eliminating the SAC fee.

More information

The full intern summary is available online at <mntap.umn.edu/intern/projects/techplating.htm>. ■

Interceding for St. Jude

Facing a one-time SAC fee of $85,000 for increased water use may seem like a desperate situation—but not for St. Jude.

St. Jude Medical's Maplewood facility manufactures heart valve components. An important step in its manufacturing process is pyrolytic carbon coating of the components. In this process, cooling capabilities are critical to ensure product quality. Through 2001, coating reactor cooling was accomplished with an average use of 20,000 gpd of city water. Most of this water was then used to clean screens in the associated scrubber. Changes in city water temperature and pressure required operators at St. Jude to monitor reactor temperatures closely and adjust water flows frequently.

Karl DeWahl, MnTAP engineer, visited the St. Jude facility to help maximize efficiency. "Karl was very detailed. He recommended changes to help us reduce water use and save money," said Mike Jackson, coating engineer at the Maplewood facility.

Gaining control

The big change Jackson wanted was implementing a recirculating cooling-loop system he designed to gain better control of the coating process. This system consisted of three 5,000-gallon storage tanks with pumps, piping and temperature controls to circulate the water through the reactors and back to the tanks. The volume of water in the tanks is sufficient to cool one day's production with no outside cooling needed. It also provides a backup supply so that repairs could be made without shutting down the coating process.

Installed, the new cooling system cost $120,000 and reuses about 10,000 gpd of water from the coating reactor cooling for makeup to the scrubber.

Avoiding a SAC

When Jackson recommended his recirculating cooling-loop system, St. Jude was faced with a one-time SAC fee of $85,000 for increased water use. Avoiding the SAC fee was a big incentive for the facility to implement Jackson's design. The facility also saves $20,000 annually on water use. The new system design had a projected payback of two years.

According to Jackson, "Five million gallons of water per year in the coating process has been reduced. [This is an] 80 percent reduction in the department's water demand and about a 50 percent reduction for the entire facility."

"Implementing this system reduced long term operating costs and gave us a stable and reliable cooling water system and also resulted in improved production yields," concluded Jackson. ■

where's your waste?

Use it, or lose it

Removing obsolete equipment saves Lifecore $58,000 in reduced water use.

When the nine kids in my family were living at home, my parents had a second refrigerator in the back of the garage to ensure that the mob could always be fed. As we all started moving out, the demand for excess capacity lessened. But, mom and dad always kept an "emergency" case of pop in that back fridge. After a time they replaced their kitchen fridge. Technology had expanded the internal size without increasing the outer dimension. The new fridge could easily fit emergency pop in the kitchen. My parents basically forgot about the obsolete fridge in the back. It sat for several years guzzling energy.

When processes are updated and improved take care not to overlook steps or parts that are no longer needed. Although forgotten, they may consume resources such as energy or water. Removing them may save you money.

$25 goes a long way

MnTAP intern Leslie Koesler was working with Lifecore Biomedical, Chaska, to reduce water use when an obsolete condensing coil on a steam generator was found. The coil used sterile, purified water to condense sterile steam. Originally used for quality control testing, it became obsolete when clean steam started to be tested at points of use.

The intern recommended that Lifecore remove the coil from the steam generator. "Removing the coil made sense. It was no longer a point of use," said Bill Decker, facility manager at Lifecore. "Removing it saved on water use."

Parts and equipment needed for the removal were available on site for negligible cost. The removal took less than one hour to complete, costing Lifecore about $25 for labor.

Removing the coil reduced pure water use by 660,000 gpy and domestic water by 540,000 gpy. Lifecore saves $58,000 annually, plus it saw a one-time SAC savings of $49,000.

"Even though manufacturing has gone up since the coil was removed, our water cost has not risen," said Decker.

The intern made additional recommendations to reduce Lifecore's water use, including repairing and retrofitting control valves and two autoclaves. She also implemented a procedure for tracking evaporation losses from a cooling tower, giving the company credit for water that was not being sent down the sewer.

Overall, Lifecore has reduced total water use by 4.35 million gpy, saving at least $69,000 per year in purified water, city water and sewer costs, and $208,000 in one-time SAC and city fees.

A careful examination of your process when making improvements may identify obsolete steps or parts—saving you money.

More information

The full intern summary is available online at <mntap.umn.edu/intern/projects/lifecore.htm>. ■

site visit

Cooling down with water

With summer on the way it won't be long before we are cooling off on a hot day by jumping into a lake or taking a dip in a swimming pool. As more people use the pool to beat the heat, using water to keep people cool becomes more economical.

Water is also a great way to keep things cool in your operation. And just like the swimming pool, the more times the same water is used and reused to keep things cool, the more economical it will be.

Cooling water increases

Alpha Ceramics, Minneapolis, produces specialized ceramics for sonar and medical diagnostic ultrasound applications.

To make the product, ceramic materials are mixed then cycled through high temperature and pressure in a kiln. Water is used to keep critical parts of the kiln cool during its high-temperature operation. Cooling the company's six kilns separately used about nine million gallons of water per year, making it one of the facility's main uses of water.

Alpha Ceramics was facing a SAC fee of $8,000 because of increased water use. The facility's other water costs included water purchase and sewer fees of over $5,400 per month.

The company planned to install six more kilns to help meet production demand. But, it needed to cut water use before installing more kilns.

MnTAP engineers, Randy Cook and Karl DeWahl visited Alpha Ceramics to help. "They gave us some good suggestions about where to reduce water use. Their ideas helped expand our thinking and gave us a new perspective," said owner Jim Sloane.

Same results, less water

The company tested reuse of the cooling water. Cooling water passed from the first kiln to the second then a third before becoming too warm.

After seeing the results, the remaining three kilns were plumbed together in a series. Reusing cooling water will reduce water use to one-third of its original demand.

Cost and savings

The changes were handled inhouse at marginal expense in labor and materials. Once in place, the plant reduced wastewater from 29,000 to 11,000 gpd. This helped avoid the SAC fee. Yearly water use at Alpha Ceramics was reduced by 6.57 million gallons. The company saves $40,200 annually in water use and sewer fees.

"We have probably gone below our permit restriction and when the new six machines are added it won't increase our water use [beyond the permit]," said Sloane.

Get customized suggestions for your operation. Request a site visit from a MnTAP engineer or scientist. Call 612/624-1300 or 800/247-0015 from greater Minnesota. ■

15 seconds of fame

Kicking the canister

On the television series *ER,* you get a glimpse into operating rooms: the highly trained staff of doctors and nurses; the life saving technologies. Among the monitors and machines you'll find an aspirator—a mere extra on the set, but vital in the modern operating room. The aspirator sucks away body fluids and saline solution, allowing for a "clean" surgery.

HealthEast Midway Outpatient Center in St. Paul used three to five suction canisters per surgery case for containing fluids aspirated, or suctioned, during procedures. After each procedure, the contents of the canisters were dumped down the sewer as infectious waste and the canisters were thrown away.

"Typically we do five or six cases per week, sometimes more," said Michelle Draxton, operating room supervisor. "That adds up to a lot of canisters over time."

Working with an equipment supplier the facility installed a canister-free vacuum system as a trial. "When the trial period was over we didn't want to give it up, so we bought it," said Draxton.

Employee safety was a big benefit. Staff no longer need to dump the canisters, which were heavy and posed a splashing danger. The new vacuum system is hard plumbed into the operating room, eliminating the use of canisters.

According to Draxton, the canister-free vacuum system has cut the amount of solid waste at the facility. "If you use the [Steris] SafeCycle on every case you don't have to use the old disposable canisters. Over time there will definitely be a savings."

While working on her project with HealthEast, **MnTAP intern** Stephanie Maling saw the SafeCycle in use at Midway and introduced the new technology to Catherine Zimmer, MnTAP health care specialist.

"These innovative canister-free and reusable canister vacuum systems provide a great opportunity for preventing pollution and improving occupational safety at health care facilities," said Catherine.

For information about canister-free systems and reusable canisters, see MnTAP's fact sheet *Suction Canister Waste Reduction* [#91], available online at <mntap.umn.edu/health/91-canister.htm>. Or, call Catherine at MnTAP for more information, 612/624-4635. ■

Energy assessments

The Iowa State University (ISU) Industrial Assessment Center (IAC) is available to help southern Minnesota companies conserve energy. ISU engineering faculty, graduate and undergraduate students conduct in-plant surveys to identify all energy-using systems in the plant, including combustion, compressed air, electrical supply, HVAC and steam. Following the visit, IAC provides the plant with a detailed report outlining the plant's present energy use and presenting specific energy conservation opportunities with technical and economic justification.

In the IAC's most recent 135 assessments the average savings for each plant's total energy use was 14.7 percent, an average cost savings of 22 percent, based on the previous year's verified energy costs.

For more information about ISU IAC's energy assessments visit <www.me.iastate.edu/iac> or call 515/294-3080. ■

Phosphorus resources

The Minnesota Pollution Control Agency (MPCA) is working to establish effluent phosphorus limits and phosphorus monitoring requirements for municipal wastewater treatment facilities. These facilities are asking their industrial users to reduce phosphorus in discharges to the treatment plant.

Minnesota's waters must be clean and healthy in order to sustain aquatic life and provide recreational use. Although phosphorus is a nutrient for plant growth, excess phosphorus can speed up the aging process of lakes and streams by stimulating algae growth. This creates high biochemical oxygen demand (BOD) as algae decomposes and uses up available oxygen supplies, sometimes threatening the survival of fish and other aquatic organisms.

MnTAP has recently revised and developed new resources to help businesses reduce the amount of phosphorus released to wastewater treatment facilities.

- Metal Phosphatizing Operations [#64]
- Phosphorus: Reducing Releases from Industrial Cleaning and Sanitizing Operations [#116]
- Phosphorus: Reducing Releases from Meat Packing Plants [#118]
- Phosphorus: Reducing Releases from Poultry Processing Plants [#71]
- Water Use Tips [#119]

These and the Phosphorus Management Planning Resources are available online at <mntap.umn.edu>, or call MnTAP. ■

Health care can keep Minnesota looney

Keeping mercury—a toxin associated with human nervous system disorders—out of the water may help keep Minnesota full of loons. Often used in health care and laboratory settings, mercury has a neurotoxic effect on loons. A study found that loons with high levels of mercury—two to three parts per million—in their brains reproduced less successfully than normal. And, high levels of mercury could also hinder their ability to catch prey and avoid predators.

Don't use the drain

Mercury that goes down the drain at your facility may become stuck in pipes

or traps. This mercury will accumulate over time and could result in expensive hazardous waste disposal cost to you. Mercury that does not get stuck will enter the sewer system, quickly reaching the environment.

Look for mercury-free alternatives to the products you are using. If no acceptable alternatives are available, collect all waste products that may contain any amount of mercury and dispose of them according to hazardous waste rules.

Keep Minnesota looney, don't let mercury go down the drain. For information about eliminating the use of mercury in health care facilities, see this article in the online *Source* at <mntap.umn.edu/source.htm> or call MnTAP at 612/624-1300 or 800/247-0015 from greater Minnesota. ■

materials exchange

A materials exchange program lists one company's unwanted material and makes it available for use by another company. The lists below are examples from the Minnesota Materials Exchange.

For more information, call MnTAP at 612/624-1300 or 800/247-0015. Or, visit **<www.mnexchange.org>.**

Materials available

Alcohol, ethyl: 50 gallons. 190 proof. In a 55-gallon drum. Free. Mound. [MT:A01 13991]

Aluminum sulfate: 50. 50-pound bags. Fee charged. New Brighton. [MT:A12 13844]

Conveyor belts: Multiple rolls. Black rubber, reinforced with nylon. Various widths and thicknesses. Hibbing. [MT:A12 13870]

Light fixtures: 944. 2 x 2 feet. 277 volts. Includes U-shaped T-12 bulbs. Interlocked system. Unused. Fee charged. Minneapolis. [MT:A13 13993]

Lime, hydrated: 50. 50-pound bags. Fee charged. New Brighton. [MT:A12 13845]

Office cubicle systems: 100s. Steelcase. 9 x 9 foot cubicles with work surface, overhead bin, file cabinet and chair. Some secretary stations. Must disassemble and transport. Must take 100 minimum. Free. Roseville. [MT:A14 13885]

Stretch wrap: 20 rolls. 6,000 feet long, 30 feet wide. 80 gauge. Blue tint. Must take all. Fee charged. Scandia. [MT:A03 13831]

Sulfur flowers: 500 grams. Powdered sulfur. Free. Mound. [MT:A01 13992]

Materials wanted

Bags, plastic: Any amount. Up to 15 x 20 inches. Rochester. [SE:W08 13883]

Buckets, plastic: 50. Five-gallon. Food grade. Prefer lids. Clean. Ponsford. [MT:W08 13900]

Chairs, stackable: 100 minimum. Must be matching. Prefer padded. For church sanctuary. Prefer donation. Forest Lake. [MT:W09 13888]

Magnetic material: Any amount. Sheets. Any color. Printing OK. Cloquet. [MT:W14 13861]

Pallet racking/shelving: Any amount. Maplewood. [MT:W08 13890]

Plastic: Minimum two Gaylord boxes. Post industrial scrap. Brooklyn Center. [MT:W08 13928]

Plastic sheets: 26. 4 x 4 feet, 1/8 inch thick. Up to three-inch holes OK. For packaging and shipping product. Merrifield. [NC:W03 13901]

Successful exchanges

- An aerospace company donated over 1,000 pounds of three-ring binders to two local businesses.
- An architectural firm received a Dumpster from a direct marketing company and 50 five-gallon buckets from a recycler.
- A distribution warehouse took 50 lighting fixtures from a financial services company.
- A hospital gave medical equipment worth $3,000 to two health care organizations.
- A public safety office received a photocopier from a concessions company. ■

2003 Governor's Awards

Is your business or organization working to create a better environment through preventing pollution, reducing waste or increasing resource efficiency? If yes, get credit for it.

Applications for the 2003 Minnesota Governor's Awards for Excellence in Waste and Pollution Prevention are being accepted through June 13, 2003. Any Minnesota public or private organization or business is welcome to apply. Entry forms are available at the Minnesota Office of Environmental Assistance (OEA) Web site <www.moea.state.mn.us>, or call the OEA at 651/296-3417 or 800/657-3843 for more information. Awards will be presented at a special ceremony in the fall. ■

helping businesses implement industry-tailored solutions that maximize resource efficiency

mntap

The **Minnesota Technical Assistance Program** helps businesses and industries maximize resource efficiency, prevent pollution and reduce waste—which saves time and money. Located 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.

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calendar

Environmental Compliance and Pollution Prevention for Automotive Mechanical and Collision Repair *April 29, Austin, MN.* Sponsored by the Southeast Minnesota Water Resources Board, 507/457-6483.

Lean Manufacturing *May 6, Eden Prairie, MN.* Sponsored by Manufacturers Alliance, 763/533-8239.

2003 Environmental Initiative Awards *May 7, Minneapolis, MN.* Sponsored by Minnesota Environmental Initiative, 612/334-3388.

Minnesota Safety and Health Conference *May 7-9, Minneapolis, MN.* Sponsored by Minnesota Safety Council, 651/291-9150 or 800/444-9150.

Toxic Release Inventory (TRI) Reporting and Pollution Prevention Planning Workshop *May 8, Shoreview, MN.* Sponsored by the Minnesota Emergency Response Commission and MnTAP, 651/282-5396.

Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313/ TRI Training *May 20, Minnetonka, MN.* Sponsored by the U.S. Environmental Protection Agency, 312/886-4348.

Value Stream Mapping *August 12, location to be announced.* Sponsored by Manufacturers Alliance, 763/533-8239.

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

Editors/writers: Jessica Henry and Deb McKinley. Articles published in *Source* may be reprinted only with permission from MnTAP. This newsletter is available in alternative formats upon request. Online at <mntap.umn.edu/source.htm>.

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