

Changing procedures

Unless your lab is pioneering research, such as experimenting with germ enlargers and banana sharpeners,* there's a good chance it can reduce the hazardous waste it generates.



Catherine Zimmer, MnTAP health care and laboratory specialist, observed as MnTAP intern Elizabeth Quan demonstrated a lab procedure.

Standard lab processes, such as gas chromatography and atomic absorption, generate lab waste when solvents are used to extract compounds for analysis. Clinical, commercial and environmental laboratories that repeatedly use common analytical procedures might discover that with diligence they can reduce their hazardous waste.

Finding the time to run test experiments and validate the results, likely running duplicate tests, can be difficult with busy testing schedules. Labs can make equipment and process changes that reduce waste. Here are two examples.

Minnesota Department of Agriculture

By changing a laboratory procedure, the Environmental Analysis Section of the Minnesota Department of Agriculture (MDA) Laboratory Services Division eliminated 99 gallons of methylene chloride waste annually. The procedure that extracted pesticides for water analysis required a liquid-to-liquid extractor (LLE) that used methylene chloride to extract pesticides from samples.

MDA wanted to improve worker safety and keep the hazardous chemical out of the environment. The lengthy procedure time—18 to 24 hours—was another incentive to find an alternate method.

MDA had reviewed other pesticide extraction options. But with time constraints, lab staff requested a MnTAP intern to organize literature on waste reduction and on several alternative extraction methods using specific vendor equipment.

"The intern provided the manpower to explore the options available for reducing methylene chloride," noted Phil Hansen, MDA environmental analysis unit supervisor. "It was good to have a dedicated person instead of many people contributing small amounts of time to the project."

Under MDA guidance, the intern evaluated alternatives to LLE and determined that solid phase extraction (SPE) cartridges were the best option. Through discussions with vendors and peers, as well as trial-and-error experience, MDA learned that SPE filter media had changed and

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(Changing procedures, continued from cover)

now some types could trap analytes that would not adhere to filter media in the past.

By using SPE, the lab reduced methylene chloride use by 85 to 90 percent, saving \$3,300 in purchase and disposal costs. Reducing extraction and evaporation time saved \$36,600 per year.

Los Alamos National Laboratory

Los Alamos National Laboratory, operated by the University of California for the National Nuclear Security Administration of the U.S. Department of Energy (DOE), eliminated the chemical formamide—a hazardous chemical—from its process to determine the nucleotide sequence of DNA. Formamide traditionally is used to re-suspend DNA after denaturing.

* See video clips of the experiments of Muppets Dr. Bunsen Honeydew and his assistant Beaker <www.ladyofthecake.com/muppets>.

Lab staff discovered that substituting a waterbased solution gave better sequencing results with none of the potential hazards of formamide. By eliminating formamide, genetic sequencing waste became completely nonhazardous.

This change also substantially reduced the amount of paperwork involved with operations. Reduced waste disposal, procurement costs and labor saved approximately \$78,000 annually.

More information on laboratory pollution prevention is available through the online *Source*. The complete MDA intern project summary is available at <mntap.umn.edu/intern/projects/MDA.pdf>. ■

Prevention in the lab

You can take one of two approaches to prioritize pollution prevention opportunities: 1) look for chemicals with significant health risks and exposure, or ones with high costs, or 2) look for easy changes that can be made quickly.

Material substitution

- Use non-mercury based preservatives.
- Substitute sodium hypochlorite for sodium dichromate.
- Substitute alcohols for benzene.
- Use non-mercury thermometers.
- Use biodegradable detergents or other nonchromium-containing cleaners for glassware.

Purchasing/inventory control

The American Chemical Society estimates that 40 percent of waste generated in research labs consists of unused chemicals.

- Reduce the chance of duplicate orders by centralizing chemical purchasing in your lab.
- Use a computer system to track chemicals.



- Review chemical inventory annually to avoid purchase of materials already on hand and to gain a better understanding of actual use.
- Consider disposal cost at the time of purchase. Disposal cost may be 20 to 50 times the purchase price when you account for regulatory costs and time managing the waste.

Reuse

- Use spent solvent for the initial glassware rinse and fresh solvent for the final rinse.
- Use chilled water loops instead of continuously running water for cooling. ■

where's your waste?

Summer of solutions

Seven Minnesota companies are taking advantage of MnTAP's intern program this summer. MnTAP is sponsoring one student to work full time at each of the following facilities to research solutions to its specific waste-related challenges.

Douglas Machine, Alexandria, electroplater and anodizer wants to reduce wastewater and wastewater treatment chemicals in its facility.

Federal Cartridge Company, Anoka, manufacturer of small arms ammunition wants to reduce wastewater.

Hennepin County Medical Center, Minneapolis, the pharmacy of this large urban hospital wants to reduce pharmaceutical waste from patient care and clinical trials.

Metropolitan Council Environmental Services, St. Paul, wastewater treatment for the Twin Cities metropolitan area wants to improve the energy efficiency of its secondary treatment aeration system.

QX Inc., Hamel, aluminium and zinc die casting and machining operation wants to reduce energy use in the melt furnace operation and recover heat from the evaporator system.

Tennant Company, Golden Valley, manufacturer of floor cleaning equipment and chemicals wants to reduce water and chemical use in painting pretreatment and improve overall energy efficiency.



MnTAP intern coordinator Deb McKinley met with Mike Reznicek, paint process engineer at Tennant Company, to discuss the company's intern project.

Tri-County Hospital, Wadena, a small rural hospital wants to reduce pharmaceutical waste.

Join Us!

The interns will present the findings from their projects on Wednesday, August 23, from 1:30 to 4:00 p.m. at the University of Minnesota, McNamara Alumni Center in Minneapolis. Call 612/624-1300 to reserve your seat.

Plan Ahead

Have an intern—hired by MnTAP—work on reducing your waste in the summer of 2007. If you don't have enough time or enough money to hire someone to work on solving waste-related problems (air, energy, water, solid or hazardous waste), contact Deb McKinley, intern program coordinator, at 612/624-4697 and ask about the student intern program. Information is also online at <mntap.umn.edu/intern>. ■

Top compressed air energy saving options

Metal casters, pulp and paper mills, and mines all identified compressed air as a common, high-energy use in their facilities. Compressed air, often called the fourth utility, is inefficient—as much as 80 to 90 percent of the electrical energy used by an air compressor is lost as heat.

MnTAP recently arranged for compressed air assessments at two paper mills and two metal casters in Minnesota. Frank Moskowitz, a consultant with Draw Professional Services and a certified U.S. DOE trainer who conducted the assessments, provided each company with a list of recommended actions to reduce energy use related to compressed air. All of the facilities had these three recommendations in common: add storage, add sequencing and remove all inappropriate uses. How does your facility compare?

Add storage

Use horsepower for base load and storage to meet peak demand. If a compressed air system is sized for peaks then the compressors are idle most of the time—which means they are operating inefficiently and inflating energy demand.

If you've got a BAU (a not-so-technical acronym for big air user, equipment that demands a lot of compressed air) determine whether it should have a point-of-use receiver to store compressed air and eliminate the peak demands that drop overall system pressure. A drop in system pressure can make air tools function less efficiently, adversely affecting production.

Make sure your primary storage is adequate. You want to be sure your system is designed with three to five gallons of storage per cubic feet per minute (cfm) flow.

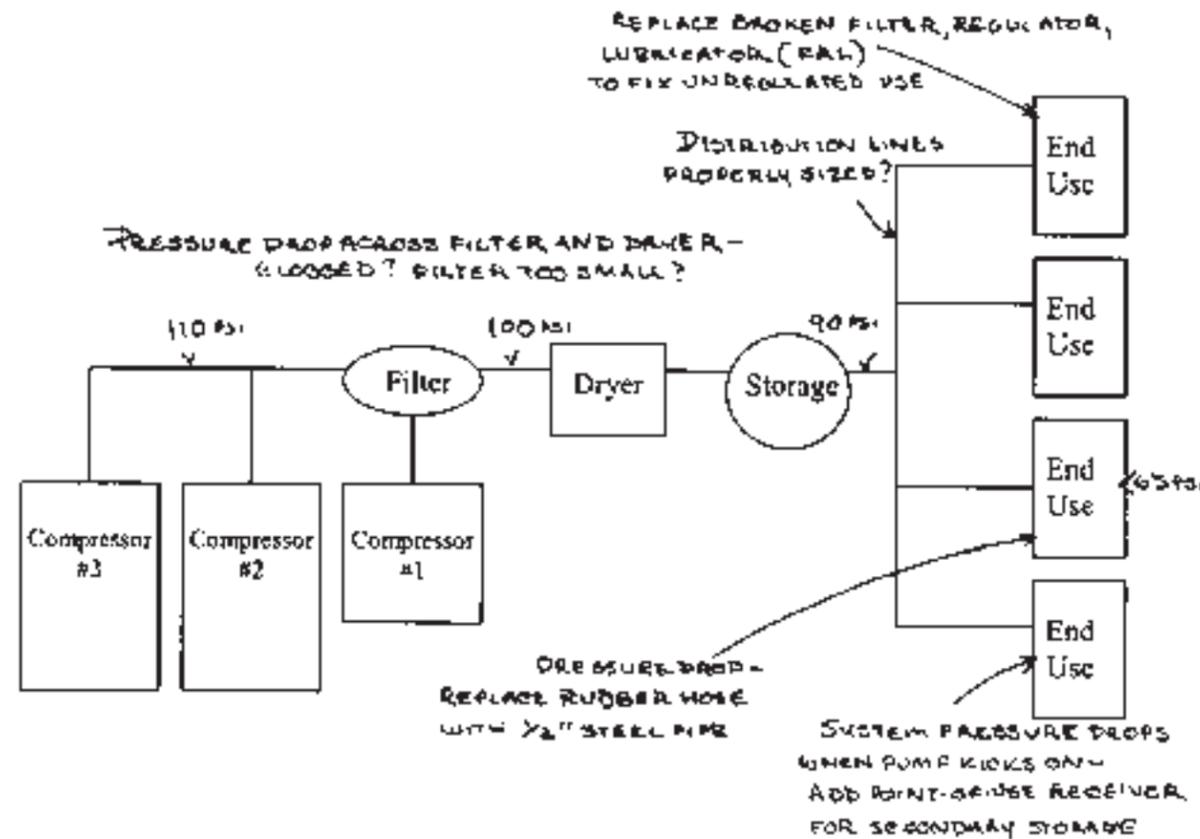
Add sequencing

If you have a multiple compressor system, are all of your compressors working hard or hardly working? Compressors are most efficient when they operate

You save one percent of compressor energy use for each two PSI drop at the compressor.

fully loaded. Every online compressor should be at full load except one that runs partly loaded to match supply with demand (trimming). A variable speed drive is ideal for trimming because it actually changes the motor's speed, which will reduce energy use.

According to Moskowitz, a modulating compressor operating at 40 percent output could still be consuming 80 percent of its power. If possible, use network controls so that the compressors communicate, working together to minimize energy use.



To start evaluating your compressed air system, find engineering blue prints of the system or draw up a simple block diagram to show both the supply and demand sides of your system. The block diagram above notes some common opportunities to improve efficiency.

Remove all inappropriate uses

Remove all inappropriate uses of compressed air and substitute another energy source. Check your facility's uses of compressed air against this sample list of inappropriate uses and best alternatives.

- Atomizing. For example, use high-volume low-pressure air guns.
- Cooling personnel or electrical cabinets. Use air conditioning or fans.
- Parts drying. Use blowers, heat or microwaves.

- Open blowing. Use blowers instead. Or, if compressed air must be used, install engineered low-volume high-velocity nozzles with eductors to amplify air flow.
- Sparging or mixing. Use blowers instead.
- Vacuum generation. Use a vacuum pump.

Stora Enso

Stora Enso, a paper mill in Duluth, was one of the companies to receive an audit. The company had a good sense for where the inefficiencies were in its compressed air system, but the audit showed staff how to present the data to best assess cost-benefits.

"The audit was a good opportunity to have an outside, third-party auditor come on site to assess potential losses and energy-saving opportunities," said Karen Turnboom, fiber/materials/energy manager at Stora Enso.

After the audit, the company made minor modifications right away, fixing inappropriate uses and decreasing the volume of air used in the system. One small, easy change was to replace the nozzles of compressed air hoses with low-volume high-velocity nozzles. Additional projects will be submitted for capital funding.

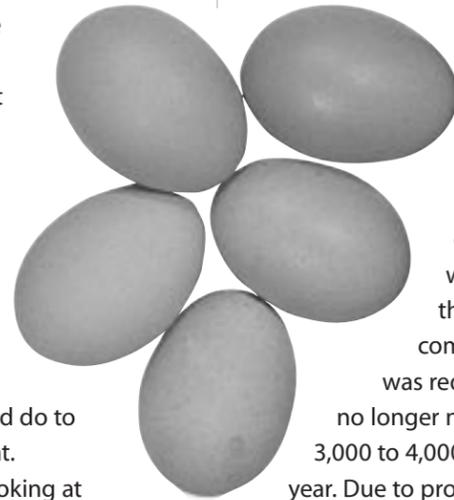
For more information about maximizing the energy efficiency of your air compressor system visit MnTAP's energy Web page <mntap.umn.edu/energy/compair.htm> or call MnTAP for assistance. ■

The compressed air audits were supported by a grant from U.S. DOE through the Minnesota Department of Commerce, State Energy Office. Two mines will be assessed this summer.

Sunny Fresh Foods

The City of Monticello's wastewater treatment plant discharges its treated water into the Mississippi River, which is classified as an impaired water. The publicly owned treatment works (POTW) superintendent knew his plant faced a phosphorus effluent limit when its permit came up for renewal so he ramped up efforts to decrease phosphorus. He approached Sunny Fresh Foods Inc., a food processor that prepares eggs, and asked what the company could do to reduce its phosphorus effluent.

The company began by looking at its cleaning and sanitizing chemicals. "We enlisted our vendor's help and went chemical by chemical, asking if we could eliminate, substitute or reduce the phosphoric acid," said Carrie Heitz,



Sunny Fresh environmental manager. "The vendor was more than willing to work with us."

Over 12 to 18 months, the company changed its cleaning and sanitizing chemicals to low- or no phosphorus products. Some of the cleaners were more expensive, but the company thought the expense was worth it. As a result of the change, phosphorus in the company's wastewater effluent was reduced 80 percent. The POTW no longer needs to manage the extra 3,000 to 4,000 pounds of phosphorus a year. Due to process changes, Sunny Fresh also decreased biochemical oxygen demand (BOD) 14 percent and total suspended solids (TSS) 26 percent in the past year.

Sunny Fresh Foods was one of six companies honored with a Malcolm Baldrige National Quality Award for business performance excellence in April. The company's environmental performance was reviewed as part of the site visit application process.

Sunny Fresh, a Cargill subsidiary, shared its phosphorus reduction efforts within the corporate network. The Sunny Fresh facilities in Iowa and Michigan have duplicated the changes at their own facilities.

The company regrets that it will never be completely phosphorus free. The chickens insist on using phosphorus to build their eggs.

Work with your vendors to reduce phosphorus effluent or contact MnTAP for assistance. ■

Clean Water Legacy Act

This spring the Minnesota Legislature passed the Clean Water Legacy Act mandating the state to identify lakes and streams that fail to meet certain water-quality standards and to make reasonable progress toward improving them. According to the Minnesota Pollution Control Agency, eight percent of Minnesota's streams and fourteen percent of its lakes have been assessed—about 40 percent of those water bodies were deemed impaired.

If your business contributes basic pollutants—such as bacteria, mercury, nutrients or sediment—to a wastewater treatment plant that releases to an impaired water or your facility releases directly into an impaired water, you might be asked to reduce your load contributions. MnTAP can help your business reduce sources of mercury and nutrient loading—BOD, TSS and phosphorus.

For wastewater treatment plants, MnTAP and MPCA have just revised the Phosphorus Management Plan Guide to help POTWs develop their management and reduction plans. The guide outlines steps to work with local businesses. A link to the guide is available through the online *Source*. ■

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.

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Materials available

3-ring binders: 35. 1 to 4 inches. Some 2-ring binders fitting 3 x 5 inch paper. Free. Minneapolis. [18506]

Adhesives, industrial: 40. 55-gallon drums. Resin emulsions, rubber latex and structural polymer adhesives for packaging, envelopes and structural applications. Must pay shipping. Minnetonka. [18435]

Anaerobic sealant/lubricant: 1,000 nine to 20 gram sticks. Threadlocker and Anti-seize. Free. Minnetonka. [18436]

Paper cutter: One. 24 x 36 inches, weighs 800 pounds. Free. St Louis Park. [18556]

Sawdust, dry: 120 cubic yards per month. Must provide a trailer. \$250 per semi load. Dayton. [18487]

Vacuum lifter: One. Mounts to a forklift to lift flat metal sheets. Lifts but needs work. \$75. Fridley. [18461]

Wood scrap: 120 cubic yards per month. Kiln dried heat treated lumber cut offs. Must provide a trailer. \$250 per semi load. Dayton. [18489]

Materials wanted

Buckets, plastic: Any amount. 5-gallon. Clean. Prefer free. Winona. [18557]

Cardboard compactor: One. Will pay fee. Rosemount. [18494]

Flat file cabinets: 2 to 4. For storing large photos, maps and posters. Will pay fee. Cambridge. [18474]

Furniture, office: Any amount. Desks, chairs, fax machine and two-drawer lateral file cabinets. In good condition. Prefer free. St Paul. [18515]

Garment steamer, commercial: One. Upright tank. Will pay fee. Edina. [18456]

Ladder, rolling: To reach 10 feet. Prefer free. Cambridge. [18475]

Letter opener, electric: One. Prefer free. Mendota Heights. [18472]

Warehouse items: Any amount. Racking, counter tops and a working forklift. Prefer free. St Paul. [18518]

Whiteboards and bulletin boards: 1 to 5. Any size. Prefer with mounting hardware. Prefer free. Afton. [18445]

Successful exchanges

- A Minneapolis law firm donated 25 office cubical systems and 20 shelving units—over 10,000 pounds—to various local businesses.
- A St. Paul video store going out of business donated video equipment and cassette tapes worth approximately \$800 to local businesses.
- Several south-central Minnesota counties reused 73 drums and 75 buckets donated from local businesses.
- An electronics company donated 600 corrugated cardboard boxes to a Rochester antiques company. ■

Get recognized for your environmental efforts

Governor's Awards for Excellence in Waste and Pollution Prevention

The State of Minnesota is seeking nominations and applications for the 2006 Governor's Award for Excellence in Waste and Pollution Prevention. Businesses, non-profit organizations and private institutions with exemplary waste reduction and pollution prevention projects or programs are encouraged to apply.

Winners of the award will be recognized at the state's annual Air, Water and Waste Environmental Conference in February 2007. Online applications, examples of projects, and entry forms will be available August 1 at www.moea.state.mn.us/p2/govaward.cfm. For more information call 651/215-0242 or 800/657-3864. The application deadline is September 15, 2006.

If MnTAP has assisted you with pollution prevention work that will be included in your application, we'd be glad to review your application before you submit it. ■

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. 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 Assistance Division to the University of Minnesota, School of Public Health, Division of Environmental Health Sciences.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status or sexual orientation.

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calendar

Overcoming Resistance to Change Workshop August 15, Eden Prairie, MN. Sponsored by Manufacturers Alliance, 763/533-8239.

MnTAP Intern Presentations August 23, Minneapolis, MN. Sponsored by MnTAP, 612/624-1300.

Governor's Awards for Excellence in Waste & Pollution Prevention Application Deadline September 15. Sponsored by MPCA, 651/215-0242 or 800/657-3864.

Hennepin County Hazardous Generator Training September 15, Edina, MN, and October 13, Minnetonka, MN. Sponsored by Hennepin County Department of Environmental Services, 612/348-8100.

Lean Maintenance Workshop September 19, Maple Grove, MN. Sponsored by Manufacturers Alliance, 763/533-8239.

Recycling Association of Minnesota/Solid Waste Association of North America Fall Conference & Show September 26-27, St. Paul, MN. 651/641-4560.

North American Hazardous Materials Management Association National Conference October 23-27, Bloomington, MN. 651/297-8357.

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

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