

Health care facilities: to clean or to disinfect?

Inside...

- Fairview surgeon greets his operating room
- Focus on energy in health care facilities to cut costs
- Cut back on lab wastes by making changes
- Go green while becoming Lean with Lean 2.0

Patients, staff, and visitors entering health care facilities carry with them bacteria, viruses, and other microbes. Therefore, cleaning and disinfecting are some of the most important steps in preventing the acquisition and spread of infectious disease in health care facilities.

Cleaning and disinfecting products and procedures vary within health care facilities and, when not monitored appropriately, can result in the overuse of toxic chemicals, increased exposure to patients and staff, and increased costs. Therefore, it is important for health care facilities to have systems in place for selecting and purchasing cleaning chemicals. To develop such systems, facilities should understand what level of cleanliness is needed for each area and surface.

Levels of Cleanliness and Disinfection

Health care facilities have a variety of surfaces and areas, which require differing levels of cleanliness. For example, waiting areas often need cleaning only; patient rooms need cleaning and low-level disinfecting, while surgical suites require high-level disinfection and sterilization of instruments. Due to the complexity of health care facilities and the variety of cleaning and disinfecting regimens, staff members may become confused, which can lead to them using multiple disinfectants or unnecessarily disinfecting surfaces. This can result in staff members overusing cleaning chemicals and disinfectants, which are pesticides. Additionally, this practice can increase the potential for antimicrobial resistance.

Hospital and cleaning guidelines, a new reference list developed by MnTAP, can help health care facilities determine what level of cleanliness is needed and help guide them in their purchasing practices. The list classifies a variety of commonly used items found throughout patient care areas of health care facilities according to Spaulding's Classification (CDC, 2003) and by degree of cleanliness or disinfection needed. Spaulding's

levels, non-critical, semi-critical, and critical, are based on the potential for infectious disease spread via furniture, equipment, and instruments as well as the level of sterility normally required for the body part coming in contact with it. Levels of disinfection that correlate with Spaulding's classification are low, intermediate, high, and sterilization. For example, a chair located in a patient room is a non-critical item requiring cleaning whereas in the surgical area, a scalpel is considered a critical item and requires sterilization.

Moving Forward

Developing a system for selecting and purchasing cleaning chemicals can reduce the amount of chemicals a facility has on-site. As an example, a hospital may have five different products on the shelf for each cleaning or disinfecting application. Using multiple chemical products is not only costly, but can make it difficult to manage inventory in terms of safety, proper training, hazard communications, security, and waste management. After evaluating the level of cleaning required, health care facilities can improve their processes and procedures, lessen their environmental footprint, and provide a safer workplace for staff members and patients.



For More Information

To learn more about cleaning and disinfecting in health care facilities, view the MnTAP reference list, *Hospital and cleaning guidelines*, at <www.mntap.umn.edu>.

Additional resources available on the MnTAP Web site include the *Disinfection best management practices* fact sheet, <www.mntap.umn.edu/health/73-DisinfectionBMP.htm>, and an intern summary about improving cleaning processes from a project at Olmsted Medical Center, <www.mntap.umn.edu/health/129IS.OMC.2007.pdf>. ■

Route:

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

Fairview surgeon greens his operating room

In a given year, America's hospitals produce over 2 million tons of waste, which is 1% of the entire waste generated in the United States. Even a small surgical procedure can result in the disposal of multiple pounds of medical gowns, gloves, sterile wrap, and equipment. This problem has not gone unnoticed, and one surgeon at the University of Minnesota Medical Center-Fairview (UMMC) is doing his best to reduce the amount of waste used in his operating room.

Reducing Surgical Waste

Dr. Rafael Andrade has made it his mission to reduce hospital waste resulting from surgeries. One surgery can require many pieces of disposable equipment, and with over 20,000 annual surgeries performed at UMMC, there is a significant amount of waste discarded. Dr. Andrade took the initiative to begin cutting waste for one of his routine operating room procedures, a vascular access port placement. This procedure is completed over 200 times per year at UMMC; it allows doctors to have easy access to a patient's vein for blood draws, medication, and CT scan contrast injections.

Dr. Andrade noticed that the protocol for the vascular access port placement contained some redundant and unnecessary equipment. By working with his staff and operating room

nurses, he was able to reduce waste without compromising the safety and success of the operation.

For each surgical procedure, the doctor uses a set of instruments and tools called a pick. The pick for a vascular access port placement originally required 44 items, but Dr. Andrade condensed it down to 27. The newly designed pick means that there are fewer syringes, sutures, drapes, and dressings being discarded. Additionally, Dr. Andrade considered other waste reduction measures for his pick. For example, the original pick contained

a 1 liter container of sterile saline; however, the port placement procedure uses less than 500 ml. By substituting 500 ml sterile saline for the 1 liter bottles, 20 lbs of waste could be reduced. Dr. Andrade also evaluated the opportunity to use reusable gowns and linens that can be sterilized and rewashed up to 50 times before being discarded. The cost of washing the reusable gowns is \$1.08 per gown, while the cost of disposable gowns is \$2.39 each.

These measures, along with the reduced number of items in the pick, have the potential to save UMMC \$2,000 in material costs, eliminate 80 lbs of waste, and reduce greenhouse gas emissions by 64 lbs, assuming Dr. Andrade completes 40 vascular access port placement procedures annually.

Additional Efforts at Fairview

On a much larger scale, the entire Fairview system is striving to improve its environmental performance. Fairview Health Services operates seven hospitals in Minnesota and has set goals to reduce energy use, water use, and materials.

For example, Fairview Southdale Hospital has installed motion sensor lighting in non-essential rooms and storage spaces. These sensors will automatically turn the lights off when rooms are not in use. Additionally, the hospital is replacing 19,000 light bulbs with lower wattage ones. The hospital expects the motion sensors alone to save around \$30,000 in the first year. Fairview Southdale is also looking at other ways to reduce waste. In an effort to reduce water use, the hospital is installing low-flow fixtures. Also, biodegradable containers are being implemented into the cafeteria.

UMMC is also hosting a MnTAP intern this summer. She is working within the facility to conduct a life cycle and infection prevention analysis of disposable versus reusable gowns. At the end of her internship, she will make recommendations based upon her analysis that will help UMMC move forward in a more sustainable manner.

For More Information

Dr. Andrade and his efforts were featured on WCCO TV in the Twin Cities. To view the story, visit www.wcco.com/health/hospital.going.green.2.986876.html.

Additionally, MnTAP has a case study available online that provides more information on Dr. Andrade's project www.mntap.umn.edu/health/142.html. ■



Focus on energy in health care facilities to cut costs

Energy represents one of the few cost centers that hospitals have control over. The U.S. Department of Energy (DOE) estimates that nationally health care facilities use twice as much energy as other commercial buildings and emit almost 40 million tons of greenhouse gases. They also spend more than \$5 billion annually on energy, which is estimated to be the equivalent to at least 15% of profits. As energy prices rise, this is likely to increase. Additionally, energy use related to greenhouse gas emissions is becoming a concern in terms of climate change. Increasing energy efficiency can significantly impact a facility's bottom line and environmental footprint.

Enacting energy conservation practices as well as installing new, energy efficient equipment and systems can result in less expensive operations and maintenance and lower energy bills. However, the economic bottom line is not the only area in a health care facility that energy efficiency measures can improve. They can also have a positive impact on indoor and outdoor environments and on patient and community health.

Conservation Opportunities

Facilities of all sizes have energy conservation opportunities available. However, some opportunities could require significant financial or human capital and should be evaluated for feasibility. The following opportunities are suggested by the DOE through their EnergySmart Hospitals program.

Outlet Loads and Water Efficiency

Reducing the load on outlets as well as using water efficiently can have positive impacts on efficiency. Some ideas include:

- Insulating hot water tanks and pipes to reduce energy loss
- Using heat exchangers to capture heat from hot wastewater
- Using ENERGY STAR® rated equipment
- Enabling ENERGY STAR® settings on all equipment
- Installing vending misers on vending machines

HVAC

Heating, ventilating, and air conditioning systems in hospitals can represent a large portion of energy use and costs. Monitoring and maintaining these systems are vital steps toward energy efficiency. Additional ideas for improving the heating and cooling system include:

- Cleaning heat transfer coils on chillers, heat pumps, and air conditioners to ensure high operating efficiency

- Compartmentalizing HVAC systems such as those in surgical suites so they do not operate when a room is unoccupied
- Monitor the chilled water system to determine when it needs to be upgraded or replaced
- Maintaining or repairing boiler steam traps
- Cleaning fouling on boiler tubes and combustion surfaces
- Installing automatic blow down controls on boilers

Lighting

There are a number of new technologies available that can reduce energy use and extend the life of the lighting. Some examples include:

- Upgrading exit signs with light emitting diodes (LED)
- Replacing older T12 fluorescent lamps with "super" T8 lamps and high efficiency electronic ballasts
- Assessing lighting needs to determine if lighting is appropriate for the area
- Eliminating incandescent lamps where feasible and replacing with compact fluorescents (CFL)
- Installing occupancy sensors in frequently unoccupied rooms
- Using daylighting sensors in patient rooms and public spaces with large window areas



Success Story: Ridgeview Medical Center

In 2008, Ridgeview Medical Center (RMC) was faced with increasing energy demands and costs. The increases were driving a proposal to expand the RMC's energy plant, while delaying other projects that directly affected the facility's ability to serve patients. Ridgeview gathered a team of utility master planning experts as well as its own engineering staff to develop an energy conservation plan that would eliminate the need for plant expansion. The team developed a list of items to address, then implemented changes as needed; the majority involved the chiller and chilled water. The project was completed nearly \$3 million under budget and the expansion to the energy plant was not needed, which provided capital for other improvement projects at RMC.

For More Information

The US DOE provides hospitals with a variety of energy conservation tips and ideas. For more information about this, visit the DOE EnergySmart Hospitals Web site <www1.eere.energy.gov/buildings/energysmarthospitals>. ■

Reduce lab wastes by making a few changes



Routine tests and research can create a wide range of wastes for health care laboratories. Reducing waste generated in the lab can result in reduced employee exposure to chemicals, decreased purchase costs, and reduced regulatory compliance burden.

Common wastes can include:

- **Dual waste** such as body fluids and hazardous chemicals
- **Infectious waste** such as tissues, body fluids, and sharps
- **Liquids** such as aqueous solutions, alcohols, oils and solvents
- **Sludge**, which can be both aqueous and non-aqueous
- **Solid materials** such as chemicals, glass, packaging, paper, samples, and equipment

Laboratory waste can be reduced a number of ways including implementing an inventory review system, chemical recovery or reuse policies, energy conservation practices, packaging requirements, or process changes.

Inventory Review System

Reviewing a lab's inventory allows staff members to determine if chemicals are being over-ordered, out-of-date, unnecessary, or running in short supply. Doing so will help ensure that the proper chemicals are stocked and ready for use. In 2006, Allina Medical Laboratories completed a chemical inventory and evaluated all chemicals. As a result, 40,000 lbs of hazardous waste was reduced annually through the elimination of numerous chemicals, dyes, reagents, stains, and kits.

Chemical Recovery/Reuse

Many chemicals used in labs can be reprocessed and reused. As an example, Formalin, a common fixative used to preserve tissue samples in laboratories, often becomes waste. However, this mixture of formaldehyde, methanol, and water can be

recovered and reused if a lab has the correct equipment and procedures. There are two choices for recovering formalin: distillation or filtration. Either can decrease the volume of formalin purchased, improve employee safety, and reduce regulatory compliance burdens.

Energy Conservation

Energy can be a major cost for labs. Fume hoods require significant amounts of energy to exhaust and filter air, which is necessary to protect against hazardous particles and gases. Fume hoods are often not needed 24 hours a day, seven days a week and can provide adequate protection when operated only when needed. Keeping hood doors closed can also reduce energy consumption. Labs may want to replace current fume hoods with energy efficient fume hoods, which use variable air volume motors to drive fans. The fan speed changes depending on the proximity of the user and the degree to which the hood sash is opened.

Packaging Waste

Packaging waste is one of the largest clinical lab waste streams. Boxes, coolers, and ice packs are bulky and labor-intensive to manage. Labs should work with vendors to reduce packaging waste by requesting reusable coolers and less packaging.

Process Changes

By making a few process changes, labs can reduce their costs and wastes. For example, labs can send their used cuvettes and rotors for cleaning and reprocessing rather than purchasing new ones. This can reduce waste and save 40-50% in purchase costs.

For More Information

To learn more about reducing wastes and costs in labs, visit the MnTAP Web site <www.mntap.umn.edu/laboratories>. Additional information about the examples used in this story is available at the Minnesota Pollution Control Agency Web site at <www.pca.state.mn.us/>, and the Energy Efficiency Guide for Colorado Businesses <www.coloradoefficiencyguide.com>. ■

Minnesota Business – NGO Work Group Forming on Green Chemistry

The non-profit Institute for Agriculture & Trade Policy and Healthy Legacy, a coalition of 31 groups focused on "safe products made safely," is planning to convene the first meeting of a Minnesota Business-NGO Work Group focused on actions to promote green chemistry practices and policies. This meeting is scheduled for late Fall 2009. Interested businesses may contact Kathleen Schuler at kschuler@iatp.org or 612.870.3468.

Go green while becoming Lean with Lean 2.0

Companies who are interested in engaging in Lean Enterprise and greening activities now have a new tool to accomplish both goals at once: Lean 2.0. This new generation of Lean has been developed and is being touted by Enterprise Minnesota, a non-profit business consulting service that specializes in tailoring solutions for companies pursuing lean business principles, business growth opportunities, and proactive employee training. Lean 2.0 is designed to help businesses streamline daily manufacturing operations using the Lean Enterprise methodology while also helping them incorporate pollution prevention, source reduction, and energy efficiency measures.

Lean 2.0 has given MnTAP the opportunity to collaborate with Enterprise Minnesota on improving manufacturers' processes. Together, the two organizations coordinate material use and energy management assessments for a variety of manufacturing facilities. By working with Enterprise Minnesota, MnTAP is able to identify greening opportunities for each of the eight wastes identified in the Lean process: overproduction; inventory; motion; transportation; defects; overprocessing and testing; waiting; and underutilized knowledge, skills, and abilities. For example, compressed air systems can be optimized by reducing leaks and installing storage (overproduction), by eliminating inappropriate uses (transportation), and by employing new cleaning procedures (overprocessing).

Since joining forces on Lean 2.0, MnTAP and Enterprise Minnesota have worked with a variety of facilities. Typically, MnTAP and Enterprise Minnesota conduct a site visit to learn more about each facility's manufacturing process and potential Lean and green projects. Some facilities have also engaged

in a two-day workshop that best identifies which projects will have significant positive impacts on the manufacturing process and the business as a whole. Both organizations continue to work with the facilities and provide assistance regarding implementation of Lean or green projects. Some of the projects that have been suggested for process and facility improvements at manufacturers who have taken advantage of the partnership include:

- Installing a heat recovery ventilator to capture process heat for facility use
- Reusing rinse water for counter-flow process and material cleaning
- Upgrading compressed air distribution and team-managed inspection programs
- Repairing steam line insulation and installing insulation around heated tanks

In addition to the business and environmental benefits of going green and becoming lean, many of the firms participating in the joint MnTAP/Enterprise Minnesota Lean events can apply to become members of EPA's Green Suppliers Network (GSN). Becoming part of the GSN can give you the increased visibility of being a continuously improving business entity, as well as a framework to achieve Lean and green goals.

For more information

For more information about the GSN, see <www.greensuppliers.gov>. A list of Enterprise Minnesota services can be found at <www.enterpriseminnesota.org>. ■

Shaina Brown joins MnTAP and focuses on energy efficiency

Shaina Brown recently joined MnTAP as an engineer specializing in steam systems and chemical processing. She comes to MnTAP with over five years of experience in manufacturing and developing adhesives, plastics, resins, and specialty chemicals. Currently Shaina is pursuing her Special Engineer License for low-pressure boiler systems.

At MnTAP, Shaina will focus on working with Minnesota businesses and developing tailored solutions for pollution prevention and energy efficiency. Shaina will primarily be working to identify energy efficiency opportunities in a number

of industries. Shaina hopes that her work at MnTAP will allow her to play a part in the global movement towards energy efficiency and reducing the impact of industrial processes on the natural environment.

Questions to Ask Shaina

- How can we increase the efficiency of our steam system?
- What projects can be done to reduce energy consumption?
- Can we save money on energy and improve our processes without spending a lot on capital equipment installations? ■



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MnTAP event showcases 2009 intern projects

Six MnTAP interns are helping Minnesota companies with their pollution prevention and energy efficiency projects. The interns are responsible for developing effective waste reducing solutions to help their facilities save operating costs, reduce regulatory compliance burden, and decrease their environmental impacts. Through this program, the companies

receive recommendations tailored to their operations and the students gain hands-on experience in pollution prevention and energy efficiency.

On August 21, 2009, all six interns will present their

findings and results in an open forum at the University of Minnesota. The presentations will begin at 9 a.m. and each student will speak for 15 minutes. The following projects will be highlighted.

- **Oak Hills Living Center, New Ulm.** The intern at this long-term care facility is investigating the potential for an automatic distribution system for pharmaceuticals, which will help reduce hazardous waste and medication error.

- **Fairview Medical Center, Minneapolis.** As part of her project, the intern is performing a life cycle and infection prevention analysis of reusable and disposable gowns to evaluate the potential for implementing reusable gowns in operating rooms.
- **Roberts Automatic, Chanhassen.** The intern is investigating opportunities to reduce energy use and oil misting in a machine shop.
- **Siemens Water Technologies, Roseville.** At this facility, the intern is researching the water quality and quantity used for production to determine the feasibility of reusing water.
- **Johnson Screens, New Brighton.** The intern at this facility is evaluating the potential for recycling water in the manufacturing process and is also analyzing the energy used for compressed air and HVAC systems.
- **Lou-Rich Inc., Albert Lea.** As part of his project, the intern is investigating ways to eliminate zinc from the wastewater and also researching the efficiency of a new powder coating paint line.

For more information or to RSVP for the intern presentations, contact MnTAP at 612.624.1300. Learn more about the MnTAP intern program at <www.mntap.edu/intern/>. ■

Intern Presentations

August 21, 2009 • 9 a.m. - 12 p.m.
Ski-U-Mah Room • McNamara Alumni Center
University of Minnesota

RSVP today for the intern presentations by contacting John Speckhardt at MnTAP: 612.624.1300 or speck002@umn.edu.

Pilots result in reduced air emissions from auto body shops

In 2008, the Minnesota Environmental Initiative (MEI) worked with auto body shops in the Twin Cities to help them reduce emissions of ozone precursors and air toxics. Through the Auto Body Training and Technology Demonstration Pilot Project, MEI worked with the auto body refinishing industry, which is among the top 15 source areas of volatile organic compounds (VOCs) and among the top 10 sources of hazardous air pollutants (HAPs) in Minnesota. Auto body shop emissions affect air quality near shops, pose health risks to workers, and contribute to climate change.

MEI identified paint thinners/solvents, which are cleaning agents in auto body shops, as a significant source of air toxics. The organization worked with five local shops to conduct pilot trials aimed at replacing solvent products with a non-hazardous alternative or reducing thinner usage through solvent recycling equipment. Three of the participating shops

have permanently adopted practices that result in reduced air emissions from solvent use.

Jerry's Auto Body in Stillwater and Bon Auto Body in Richfield are both using a non-toxic, non-hazardous alternative solvent (Eco-Chem GW1) in place of traditional solvent for a combined annual reduction in air emissions of over 230 lbs.

With assistance from MEI, Maaco - Little Canada purchased a new 5-gallon Always Clean 110 Solvent Recycler through Onsite Recycling Services that will save the shop hundreds of dollars annually and reduce annual air emissions by approximately 730 lbs.

MnTAP worked with MEI on this project and recently posted the final report on our Web site at <www.mntap.umn.edu/MEI/MEIProject.html>. ■



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.

What is Materials Exchange?

The Materials Exchange is a free service that links organizations that have reusable goods they no longer need to those who can use them. This business reuse network helps prevent usable materials from becoming waste and saves users money.

Successful Exchanges

MnTAP was contacted by the City of Bemidji Wastewater Treatment Facility with unused sodium hydroxide that was no longer needed. The chemical had been supplied as original equipment in 1985 when the plant started up, was never used, and was stored in the bulk tank. Approximately 1,900 gallons was available for another company to use.

MnTAP listed the chemical on the Materials Exchange Web site. In addition, MnTAP contacted metal platers, paper mills, and other companies that use sodium hydroxide as part of their manufacturing operation to see if they would be interested in the chemical. Keystone Automotive, a metal plater in Brainerd, accepted the material. As an additional benefit to the City of Bemidji, Keystone even went to Bemidji with totes and pumping equipment to collect the sodium hydroxide.

Additional successes include:

- A small commercial facility in Southern Minnesota donated **400 pallets** to a medium-sized manufacturing facility in the metro area, saving approximately \$400 in disposal costs. This exchange resulted in **12,000 lbs** of usable material being diverted from the landfill.
- A small commercial organization in Stearns County received **58 pairs** of baseball pants from a Hennepin County company avoiding approximately **\$400** in purchase costs.
- A Minneapolis-based management company called the Materials Exchange office needing to exchange a large office copier same day. After contacting several non-profit organizations, the copier found a home in Ramsey County and **400 lbs** of material was diverted from the landfill.

Current Listings

Available

- **Pigment.** 236 lbs. Rockwood Oxide 1050A. Yellow. Free. [21382]
- **File Folders.** 300. Hanging. Used. Free. [21377]
- **Coolers.** 30. Styrofoam. Clean. Various sizes. Used to ship medical supplies. [21390]
- **Smart Board.** 4. Like new model SB 680. Fee charged \$100. [21399]

Wanted

- **Packing Material.** Any amount. Packing peanuts, bubble wrap and boxes of various sizes. Will travel to acquire. [21370]
- **Vegetable Oil.** Any amount. Used or new. Able to do weekly or monthly pickups for larger quantities. [21362]

Got an Exchange?

Please tell us about your success. We track successes to promote the Minnesota Materials Exchange program to others and to highlight the value of the program. Visit the Web site <www.mnexchange.org> or call 612.624.1300 to report your success. ■

Get plugged in to financial assistance

MnTAP recently conducted a survey of approximately 450 manufacturers and other interested parties in Minnesota. In that survey, respondents indicated that the **lack of available financial resources was the most significant barrier** to implementing pollution prevention and energy efficiency projects.

To help you find financing opportunities, MnTAP has a listing of resources available on our Web site <www.mntap.umn.edu>. Grants, loans, and utility rebates may help your company obtain the financing needed to implement a cost-saving pollution prevention or energy efficiency project. ■



Minnesota Technical Assistance Program

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MINNESOTA TECHNICAL ASSISTANCE PROGRAM

UNIVERSITY OF MINNESOTA

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

The Minnesota Technical Assistance Program (MnTAP) 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 the Minnesota Pollution Control Agency's Prevention and Assistance Division and is located at the University of Minnesota in the School of Public Health, Division of Environmental Health Sciences.

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Calendar

July 16, 2009. **The Minnesota Road Show.** Donaldson Company - Campus West, Bloomington, MN. 7:45 a.m. – 1:00 p.m. This is the first of four informative half-day conferences that will include discussions on current strategies and technologies for reducing emissions, fuel efficiency, conserving resources and saving money. Sponsored by the Minnesota Environmental Initiative and Minnesota WasteWise. Visit www.mn-ei.org/events/upcoming.html for more information.

July 22, 2009. **The Next Generation of Lean.** College of St. Benedict, St. Joseph, MN. Speakers at this event will discuss incorporating green initiatives into Lean Enterprise. They include Cindy McComas, Minnesota Technical Assistance Program; Rick Paulson, Douglas Machine; and Nick Weis, Crystal Cabinet Works. Sponsored by Enterprise Minnesota. \$79. Register online at www.enterpriseminnesota.org/Business-Events/Complete-Schedule.aspx.

July 28-31, 2009. **Minnesota Wastewater Operators Association 33rd Annual Conference.** Timber Lake Lodge Hotel, Grand Rapids, MN. 8:00 a.m. – 5:00 p.m. Sessions concerning biosolids, collection systems, maintenance, new plants and operation and maintenance will be held as well as vendor displays. MWOA members \$225; non-members \$250 (before July 16). Contact Jim Miller at 651.636.4600 for more information.

August 21, 2009. **MnTAP Intern Presentations.** McNamara Alumni Center, University of Minnesota, Minneapolis, MN. 9:00 a.m. – 12:00 p.m. Six MnTAP interns will be presenting findings from their projects held at a variety of health care and manufacturing facilities. RSVP by August 1 by contacting MnTAP at 612.624.1300 or 800.247.0015.

For more information, visit MnTAP's calendar at www.mntap.umn.edu/resources/cal.htm.

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