Water Conservation in Printed Circuit Board Manufacturing

Company: Advanced Circuits, Inc., Roseville, Minnesota
Product: Multilayer printed circuit boards for pagers, cellular phones and personal computers.
Process: Used 470,000 gallons of water daily.
Change: Installed flow gauges to monitor water flow; reduced flow rate; optimized photosensors; and improved operating and maintenance procedures.
Costs: $8,000 in equipment and installation.
Savings: Reduced water flow by 30,000 gallons daily, or 10,950,000 gallons annually, saving $38,000 annually. Kept water use at 1991 levels, eliminating a onetime service availability charge (SAC) of $225,000.

Process Background

Advance Circuits, Incorporated (ACI) manufactures printed circuit boards at facilities in Minnetonka, Hopkins and Roseville, Minnesota. The Roseville facility manufactures multilayer circuit boards for products such as pagers, cellular phones and personal computers.

The multilayered circuit boards are made of alternating layers of conducting and insulating material that are bonded together. The layers are connected with plated-through holes.

Circuit boards undergo numerous production steps during the manufacturing process, including: creating circuitry for individual inner layers; optically inspecting circuits; laminating inner layers together into hardboards; drilling, deburring, desmearing and electroless copper plating the holes in the hardboards; pattern plating the outer sides of the hardboards; soldermasking; soldering; testing the circuitry for electrical integrity; and visually inspecting final products before shipping.

ACI Roseville used approximately 470,000 gallons of water daily. Water is used in process chemical baths and for removing soils and residues from boards in both immersion baths and enclosed spray cabinets. Soils and residues include: pumice and alkaline cleaners; copper etchants; catalysts; plating solutions; sensitizers; and wet- and dry-film photoresists, solvents, developers and strippers.

Incentives for Change

The primary reasons for ACI to conserve water are to reduce associated costs and ensure supply. ACI is expanding its operations, which significantly increases its demand for more water. This need for water may exceed the capacity available from the City of Roseville. Sewer accessibility charges (SAC) have also increased from the 1991 charge of $800 per SAC unit (274 gallons per day) to $850 per SAC unit. SAC assessments are made every three years to fund wastewater capital improvement projects in the sewer district. (Note: 1995 costs to use and sewer the city water were $3.46 per 1,000 gallons.)

Measuring Water Use

A MnTAP intern helped ACI assess how it used water by observing production processes; measuring (ACI, continued on page 3)

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Low-Tech Ideas

Work with Vendors to Reduce Waste

A large amount of a company's waste comes from incoming materials received from suppliers. These materials, such as packaging and toxic components, add to a company's waste burden. Working with your suppliers can help you reduce waste and save money.

Here are some practical tips for reducing waste:

- Talk with your supplier about the waste problem. Since waste adds to the cost of a product, most suppliers will work with you to reduce waste and the toxicity of their materials.

- Ask suppliers to take back unused portions of materials. Many will do this as part of the service they provide, but they don't generally volunteer this service—it must be requested. Try to include this in purchasing agreements with suppliers.

- Ask suppliers for alternatives. When asked, many suppliers will find nonhazardous or less wasteful alternatives, such as substitutes for hazardous solvents used in cleaning operations.

- Start with a clearly defined project, such as reduced packaging. Determine the disposal costs of excess packaging, and any labor costs to remove products from packaging. Show this figure to your supplier and ask them to find a low or no cost alternative, such as reusable transport packaging.

- Add incentive clauses, such as bonuses, when negotiating purchasing agreements to encourage suppliers to use reduced packaging and nontoxic components. Or add a penalty clause stating that you will pay less if the supplier uses a material that you're trying to avoid. These incentive clauses can also cover damaged or unusable materials.

- Train your employees to think about waste generated by the products that they purchase, design and use, and how these wastes could be reduced or avoided. For example: 1) teach employees to ask suppliers about waste that comes with a product; 2) create purchasing criteria based on the company's goals to reduce waste; 3) tell product designers about company goals to reduce toxic components, since switching to less toxic materials generally requires changes in design; and 4) tell employees to send damaged materials back to suppliers rather than discarding them.

- Invite suppliers to visit your facility. Suppliers can give advice on proper storage of their materials to extend its useful life, and offer suggestions for using their products.

- View working with your suppliers as a win-win situation, rather than as a way to pass disposal costs onto them. Convince them that it is worth their while to find nonhazardous and less wasteful materials, since their other customers also face similar disposal costs.

Many suppliers will help you find nonhazardous and/or less wasteful alternatives.

Examples from Industry

A company purchased hydraulic hoses that were individually packaged in cardboard and plastic. Employees had to remove and dispose of individual packaging from each hose, which filled one Dumpster a month and cost $220 in disposal costs monthly. The company negotiated with the supplier to ship the hoses without the packaging. The hoses are now sent in reusable garbage cans, with 30 hoses packed into each can. Empty cans are sent back to the supplier and refilled.

A supplier sold a foaming agent (catalyst) for insulated doors that contained two chemicals listed on the Toxic Release Inventory (TRI). One of their customers requested that they make a new catalyst that did not contain the TRI-listed chemicals. Although the supplier had not considered this previously, it quickly realized the marketing potential of a less hazardous catalyst and developed one for its customers.

For More Information

There are many simple low-tech, low-cost ways to reduce waste and save money. Minnesota companies can receive nonregulatory technical assistance or more information about waste-
reducing opportunities from MnTAP by calling 612/627-4646 or 800/247-0015.

This article is based on and includes material from, “Working with Suppliers to Reduce Waste,” Ginger Griffin and Isabelle Cohen, Editors, Environmental Manager, Vol. 7, No. 2, Copyright 1995 John Wiley and Sons, Inc. Reprinted by permission of John Wiley and Sons, Inc.

(ACI, continued from page 1)

or estimating water use and pressure; and inspecting tanks, enclosed cabinet chambers, pumps, pipes, spray nozzles, sumps and photo sensors for operating deficiencies. Water flow rates and pressures for each process were recorded over a period of eight weeks to get quantitative averages.

After measuring flow rates, the intern researched and determined how to optimize processes and equipment to reduce water use. These methods are outlined below.

**Methods for Reducing Water Use**

**Flow Rates.** Use the lowest water flow rate measured that produces acceptable results for parallel process lines (produce identical products using identical processes). Baseline measurements of water flow rates showed that several parallel process lines had different rates of water flow. If the process lines using less water produced boards of acceptable quality, then the lines using more water could also use the lower flow rate with no adverse effect on quality.

**Flow Gauges.** Install flow gauges to monitor water flow in additional locations throughout the plant. Knowing the flow rates of water-supply lines for each process allows for quantifying flow rate reductions and calculating water and cost savings.

**Photosensors.** Maintain and optimize the use of photosensors. ACI uses photosensors to restrict water flow rate. A photosensor is an electronic “eye” that can “see” a board as it passes by, which activates a timing device connected to a solenoid valve that turns water on and off (either flow or spray). Optimize photosensor use by:
- repairing or replacing defective photosensors;
- performing routine maintenance (clean and readjust) to keep photosensors in good working order.
- decreasing the duration of the rinse time to limit the amount of water used to only what is necessary for rinsing; and
- installing photosensors in spray-rinse chambers where they do not exist.

**Plumbing.** Maintain and optimize plumbing and other equipment used for directing water flow through the facility.
- eliminate hoses that supplement supply water to spray rinses;
- hard plumb all water-bearing supply pipes;
- improve the movement of water use in spray cabinet sumps and immersion baths to maximize the rinsing capabilities of the water; and
- recirculate freshwater rinse to an earlier rinsing stage using a counterflow method, or reuse it as makeup water for process bath or spray solutions.

**Cleanliness Standards.** Develop a cleanliness standard for boards at every stage of the process. A cleanliness standard determines the minimum amount of water required to achieve the standard.

**Conclusions**

ACI implemented most of the intern’s suggestions for optimizing equipment and reducing flow rate, which significantly reduced water use. Capital costs for purchasing and installing equipment to make changes totaled approximately $8,000. As of October 1995, ACI has reduced water use by 30,000 gallons per day. Once all the suggested changes have been implemented, water use could be reduced by another 22,000 gallons. The estimated total reduction in water use would then total over 52,000 gallons per day, or 18.3 million gallons annually, resulting in an estimated cost savings of $63,000 per year. If the SAC is included in the savings estimate, the total cost savings would be approximately $225,000 the first year. ACI is currently incorporating a water reuse system into its expansion plan to further reduce water consumption.

**For More Information**

For more information about reducing water use, call MnTAP at 612/627-4646 or 800/247-0015 if calling from greater Minnesota. If you would like information about the MnTAP intern program, call Deb McKinley at 612/627-4645.
Clean Air Act Update:
Final Emission Standards for Wood Furniture Manufacturing

On December 7, 1995, the U.S. Environmental Protection Agency (EPA) published in the Federal Register the final national emission standards for hazardous air pollutants (NESHAP) for new and existing wood furniture manufacturing operations. The final rule applies to manufacturers that are major sources of hazardous air pollutants (HAP) and sets emission limits for finishing materials, adhesives and strippable spray-booth coatings. Major sources are those companies that emit or have the potential to emit 10 tons of a single HAP or 25 tons of a combination of HAPs annually. Facilities with the following SIC codes may be subject to this rule: 2434, 2511, 2512, 2517, 2519, 2521, 2531, 2541, 2599 and 5712.

This rule exempts sources using less than 250 gallons per month or 3,000 gallons per 12 months of any listed coating, gluing, cleaning or washoff materials. These sources must maintain material use records on site for five years. Also exempted are incidental furniture manufacturers.

As a result of this final rule, national emissions of air toxics, such as toluene, xylene, methanol and formaldehyde will be reduced by 33,000 tons annually. This is a 60 percent reduction from current levels. Exposure to these and other air toxics associated with wood furniture manufacturing can cause adverse health effects, including: eye, nose, throat and skin irritation; damage to the heart, liver and kidneys; and reproductive effects.

Compliance

This final rule is based on two requirements: emissions limits and work practice standards. Emission limits are for finishing and cleaning operations and contact adhesives.

Work practice standards focus on quality control issues and include: keeping containers closed; training operators; repairing leaking equipment; using efficient spray equipment; and tracking solvent amounts used for cleaning and washoff.

Also included in the final rule are limits in the amount of HAPs that can be in coatings used for finishing, gluing and cleaning operations. Emission limits can be met by using coatings that contain lower quantities of HAPs.

The compliance date for existing affected sources that emit 50 tons or more of hazardous air pollutants in 1996 is November 21, 1997. Sources that emit less than 50 tons in 1996 have until December 7, 1998, to comply. Newly affected sources must comply immediately upon startup. New area sources that become major sources must comply immediately upon becoming a major source.

For More Information

The final rule may be downloaded from the EPA’s electronic bulletin board system (BBS) Technology Transfer Network by calling 919/541-5742. It is stored under "Recently Signed Rules," filename: prereg.wpf. For help accessing the BBS, call 919/541-5384.

Minnesota companies can receive help with understanding and complying with this new rule from the Minnesota Pollution Control Agency’s Small Business Assistance Program. To request assistance, call Barb Loida at 612/282-2604.

Companies interested in improving transfer efficiency, finding alternative coatings and adhesives, or in reducing HAP releases can receive free, nonregulatory help from MnTAP. To request assistance, call Paul Page1 at 612/627-1901 or 800/247-0015.

- Sources: Final Air Toxics Regulation for Wood Furniture Manufacturing Operations Fact Sheet, 11/15/95; 40 CFR part 63, pp. 62927-62962, 12/7/95.

Waste Reduction Tip: Transfer Efficiency

Transfer efficiency is the percentage of paint that goes from the paint can to the surface being painted. High rates of transfer efficiency mean more paint reaches the surface, thereby reducing the amount of paint wasted. You can increase transfer efficiency by: 1) evaluating equipment performance using each coating material; 2) selecting equipment that reduces overspray and waste; 3) applying coatings at the thickness rate specified—not too thin or thick; 4) adjusting paint viscosity, when needed, using heat instead of solvents; 5) maintaining equipment to operate at peak performance; and 6) training operators to reduce waste.

New Used Oil Rules

As of September 1995, The Minnesota Pollution Control Agency (MPCA) has new rules for managing used oil. These rules affect all generators of used oil, used oil filters and oily wastes (sorbents). New rules include the following major changes:

1. Licensing, Reporting and Record Keeping:
   * Licensing and reporting are no longer required in greater Minnesota. In the seven metropolitan counties, licensing and reporting are still required by county hazardous waste programs.
   * Records of shipping used oil, used oil filters and oily wastes must be kept at each business (required throughout the state).

2. Storage Requirements:
   * Tanks and containers used to store used oil and related wastes (filters) must be in good condition, kept closed and labeled “Used Oil,” “Used Oil Filters,” or “Used Oil Sorbent.”
   * Containers must be stored on a surface that used oil cannot soak into (such as concrete or asphalt).
   * Storage tanks that hold 110 gallons or more must be registered with the MPCA’s Above Ground Storage Tank Program (call 612/297-8618 for more information).
   * Storage tanks that are 1,100 gallons or larger, or that are within 500 feet of surface water must have secondary containment.

3. Sorbent Management:
   * Used oil spill cleanup waste (or sorbents) in any amount cannot be disposed of as solid waste unless it is evaluated and shown to be nonhazardous.
   * Used oil sorbents can be laundered (at a commercial laundry) or burned for energy recovery. Sorbent material must have a minimum value of 5,000 BTUs per pound.

4. Burning Used Oil On Site:
   * Used oil may be burned on site for heating a building if the oil is: 1) generated on site or from another location owned or operated by the same business, 2) from the general public, or 3) from farmers who generate less than 25 gallons per month.
   * Only furnaces designed to burn used oil and rated at less than 500,000 BTUs per hour may be used.
   * Used oil from other businesses must first be tested at least once per source before it can be burned. (There are additional EPA requirements for this provision).

5. Self Transport
   * Up to 55 gallons may be transported by generators in their own vehicles without being subject to used oil transporter requirements.
   * Any volume of used oil filters (that do not contain free-flowing oil) may be transported by generators, but they must ensure that no spills occur during transport.

6. Used Oil Filter Collectors
   * Starting January 1, 1996, used-oil filter collectors must be licensed by the MPCA. Generators are responsible for ensuring that they are using licensed filter collectors.

7. Mixing Hazardous Waste with Used Oil
   * Very small quantity generators (VSQGs) (produce less than 220 pounds of hazardous waste per month) may still mix up to 10 percent of the final mixture’s total volume of unlisted, ignitable hazardous waste (generally solvents) with used oil. This mixture must be managed as used oil.
   * Additional requirements apply to larger generators who mix unlisted, ignitable hazardous waste with used oil, and to VSQGs who mix other hazardous wastes with used oil.
   * Generators must keep records of any mixed hazardous waste and used oil.

8. Final Clean Up
   * Generators must either remove or clean used-oil storage equipment and contamination when equipment is taken out of service or when operations cease.

For More Information

For regulatory help regarding this new rule, call Paula O’Keefe at the MPCA at 612/297-8330. The MPCA also has published a new fact sheet, “Used Oil and Related Oil Waste Management for Generators,” that provides more detail about the rule changes. Copies are available from MnTAP by calling 612/627-4646 or 800/247-0015.

Minnesota companies can receive free, nonregulatory technical assistance from MnTAP to help them manage and reduce used oil waste. To request assistance or more information, call Mick Jost at MnTAP at 612/627-4640 or 800/247-0015.

This article contains material from, “Used-oil Rules Go Into Effect in Late September 1995,” by Glenn Skuto, published in Generator News Vol. 9, No. 2, and is reprinted with permission. This rule is published in Minnesota Hazardous Waste Rules, Chapter 7045.0790.
Internal Environmental Auditing
Part V: Everybody is Different
- by Bob Lundquist

In previous articles in this auditing series, we have examined the “why,” “what” and “when” of auditing. This article will look at some of the “hows” of audits. This is the most difficult area to define because each company’s situation is unique. There are all kinds of books and articles about how to do self-audits, and plenty of generic forms and checklists to follow. But in the end, each company must customize its auditing process to make it effective for its individual situation.

Who Will Do It?

First, determine who has overall responsibility for performing the self-audit. This person obviously must have the time and interest to do the audit. And, they should be a neutral party, if possible, to avoid conflict-of-interest issues and favoritism. If someone is hired to do the audit, expect them to spend a large amount of time getting familiar with your facility. The auditor may need some help, depending on the size of the facility. Internal teams under the direction of the primary auditor can help speed up the process by auditing specific areas within a facility.

What Can Be Done?

The next task is to find out what resources are available to do the audit: how much time and money is your company willing to commit, and is it enough to do the job right? Then, prioritize the areas to be audited based on the time and money available. Areas that generate hazardous wastes or large quantities of air or water emissions should have top priority. Areas of lower priority may be office areas that only generate paper wastes. When determining priority, follow the money. Areas that spend a lot of money on waste disposal or environmentally related fees and licenses need to be audited.

What Paperwork Is Needed?

Documenting the audit is critical to its success. Records of the audit results will justify the recommendations for change. These results may include: amounts of waste generated; disposal costs; and raw material use, waste and cost. The most critical element of this process is the forms used to record data. Organizations that address auditing issues recognize this importance and have developed forms, checklists, and surveys for doing self-audits. These generic forms are good models or examples for a specific facility to work from. However, companies should use these generic forms only as a guide for developing their own checklists or forms that address their specific issues and/or needs. Avoid using generic forms in order to save time—they may overlook significant sources of waste and potential cost savings at your facility.

Form Follows Function

All information gathered and documented during a self-audit for a specific facility must be relevant to the company’s overall audit goals to be effective. For example, if your goal is to find out how much waste comes from a specific production process, design a form that will record the amount of waste generated at each step of that process, not the total amount of waste generated overall.

Using customized forms that fit your process fosters ownership of the auditing process for everyone at a facility. Forms can be used directly and auditors will not have to make on-the-fly adjustments to answers to make them fit a generic form that was not designed for that facility.

Analyze the Audit

Analyze the information collected and look for trends, inconsistent operations, mysterious answers, unknown reasons for doing things or other obvious problems. Remember the purpose of the audit is to improve the bottom line, not to place blame. You may need to re-audit some areas to clarify answers or observations. And, to get definitive data, you may need to collect data over a period of time, such as three months, in order to note fluctuations and obtain averages. This is especially true for measuring water use.

Recommend Change

This is the most creative part of the audit process. Coming up with alternatives or changes to current practices requires creative thinking, resourcefulness and time to accomplish. Any changes recommended must fit with the overall goals of a facility and must be possible. Prepare a final report that analyzes the audit and lists recommendations for change.
Just Do It

Any company can do an internal environmental audit, but an audit cannot be effective if it follows only generic guidelines or checklists. Therefore, the above recommendations are simply some general guidelines to help you develop your own audit plan. Determine goals, create a plan, collect and analyze the data, recommend change and make the changes.

For More Information

MnTAP does not do environmental audits; however, we can provide you with the following: information on how to do self audits; a list of environmental consultants that offer audit services; and technical assistance on waste and pollution prevention opportunities to address environmental concerns found during an audit. Minnesota companies that would like assistance or more information on internal environmental audits may call Bob Lundquist at 612/627-4557 or 800/247-0015.

Air Quality Help Available for Small Businesses

by Barbara Conti, SBAP

Many small businesses in Minnesota are affected by air quality regulations. Common operations, such as coating, solvent degreasing or fuel combustion, can trigger air emission permit requirements. Knowing what to do to comply with these regulations can be a difficult task, particularly for small businesses. Fortunately, help in understanding and complying with these regulations is available from the Small Business Assistance Program (SBAP) at the Minnesota Pollution Control Agency. The SBAP is a free, nonregulatory service available to Minnesota companies with 100 or fewer employees.

SBAP staff can answer your questions about air quality rules, permits or calculations over the phone (call 612/282-6143 or 800/657-3938), or at your facility. While visiting your facility, SBAP staff can evaluate your equipment and identify options that will help you meet air quality compliance requirements.

The Small Business Ombudsman is another service available to help small Minnesota businesses with air quality concerns. The Ombudsman can interpret air quality regulations and find sources of financial assistance when capital improvements are required to ensure compliance. For more information or to request assistance, call the Ombudsman at 612/297-8615 or 800/985-4247.

New Amendment to Solid Waste Disclosure Law

Effective August 1, 1995, a newly amended law will provide Minnesota businesses with new information from their solid waste haulers about future cleanup liability. The original 1993 Solid Waste Deposit Disclosure Notice law required haulers to tell their customers where their waste may have been disposed of. The 1995 amendment to that law now requires haulers to give more specific information to their customers about: 1) what disposal facility was actually used, and 2) customer liability for potential cleanup costs in the future if that disposal facility has inadequate environmental safeguards. Haulers must provide this information to their customers either orally or in writing once a year between January 1 and March 31.

Written disclosures must include this statement: “You may be responsible for any liability that results from contamination at a facility where your waste has been deposited. Minnesota believes that its waste management system provides substantially more financial and environmental protection than depositing waste in landfills in other states. Managing your waste in Minnesota may minimize your potential liability.”

For more information or to receive a fact sheet about this newly amended law, contact Bill Dunn at the MPCA at 612/282-2663 or 800/657-3864.

P2 and Waste Management Reduces Risk

The best way to reduce the risk of future cleanup cost liability is to reduce what your company throws away. Free, nonregulatory technical assistance is available from MnTAP to help Minnesota companies reduce solid waste and improve waste management practices. To request assistance or more information, call MnTAP at 612/627-4646 or 800/247-0015.
Just Ask MnTAP...

Q: I have one 55-gallon drum of an obsolete solvent-based adhesive that I have to dispose of as hazardous waste. How much is it going to cost me?

A: More than you may think. The typical disposal cost for this type of material is $102 per drum. However, disposal is just one small component of the total cost of using hazardous chemicals. Understanding total costs can be a powerful incentive for minimizing chemical use and making extra efforts to avoid having obsolete or surplus chemicals that do not yield any productive benefit. The following is a list of some of the likely costs that you may incur from one 55-gallon drum of hazardous material from purchasing to disposal.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cost of raw material: one 55-gallon drum at $10/gallon</td>
<td>$550</td>
</tr>
<tr>
<td>2. Materials handling: 2 hours @ $15/hour</td>
<td>30</td>
</tr>
<tr>
<td>3. Emergency phone service fees for large quantity generator (LQG) reporter</td>
<td>100</td>
</tr>
<tr>
<td>4. Hazardous Waste Generator Fee</td>
<td>23</td>
</tr>
<tr>
<td>5. Statewide Program Fee (MPCA)</td>
<td>12</td>
</tr>
<tr>
<td>6. Minnesota Hazardous Materials Incident Response Act Fee</td>
<td>40</td>
</tr>
<tr>
<td>7. Emission release annual fee ($20/ton)</td>
<td>3</td>
</tr>
<tr>
<td>8. Record keeping, regulatory reporting and permitting: Labor: 30 minutes at $20 per hour</td>
<td>10</td>
</tr>
<tr>
<td>9. Lab analysis: TCLP</td>
<td>950</td>
</tr>
<tr>
<td>10. Shipping documents (manifest, etc.): 30 minutes @ $20/hour</td>
<td>10</td>
</tr>
<tr>
<td>11. Freight charge for transportation to disposal site</td>
<td>30</td>
</tr>
<tr>
<td>12. Disposal cost</td>
<td>102</td>
</tr>
<tr>
<td>13. Future liability, using a 10 to 1 factor ($102.40 x 10)</td>
<td>1,024</td>
</tr>
<tr>
<td><strong>Total cost of one drum of hazardous material:</strong></td>
<td><strong>$2,884</strong></td>
</tr>
</tbody>
</table>

There are many ways to avoid these costs. These include: improving inventory management; finding alternatives to disposal, such as listing the chemical in a materials exchange; using nonhazardous chemicals; and changing processes to eliminate the need for hazardous chemicals. If you would like help with reducing the costs of using hazardous chemicals, call MnTAP at 612/627-4646 or 800/247-0015.

*Chemicals under large quantity generator (LQG) rules and that require Toxic Release Inventory (TRI) reporting may be subject to additional permitting requirements and fees.

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MnTAP Interns Can Turn Audit Problems into Cost Savings

by Deb McKinley

Internal environmental audits can show that your company is on track with its environmental and business goals. Audits also can uncover problems in your operation. Rather than tossing negative audit results in the recycling bin, use that information to plan for improvements.

Take your audit results and make a list of problem areas. Does the list show high chemical use, or high maintenance or hazardous waste management costs? Solutions to these problems are often found by focusing time and effort on how these wastes and costs can be reduced. A MnTAP intern can devote three months of work to help you move from the audit process to process improvement.

MnTAP interns have helped many Minnesota companies reduce their wastes and save money. Interns are juniors or seniors in chemical engineering (or other appropriate majors) from the University of Minnesota or other state colleges. Interns are available at no charge to Minnesota companies. If your company has a waste reduction project that an intern could help you research and implement, call Deb McKinley, MnTAP intern coordinator, at 612/627-4645 or 800/247-0015.

*Plan to work on process improvements this summer! Summer intern project proposals are due by May 1, 1995.
Dry Cleaning Equipment Operation and Maintenance
- by Cindy McComas

The best way to ensure equipment life, reduce material loss and minimize waste and emissions is through proper equipment operation and preventive maintenance. This is especially true in the dry cleaning industry to minimize loss of perchloroethylene (perc) from both transfer or dry-to-dry systems. Old seals and gaskets, holes in piping and poorly operating equipment can result in a significant loss of perc that could otherwise be recovered and reused.

Preventive Maintenance

Over time, seals and gaskets become brittle due to the combination of perc contact and high temperatures. Brittle seals and gaskets no longer provide an adequate seal to keep perc from escaping. Following a routine maintenance schedule for regularly replacing seals and gaskets can catch many leaks before they happen.

Ductwork, hose connections, and pipe fittings or sleeves also may develop holes or leaks that result in perc loss. Routine checks made by sight, touch or smell, or by using a halogen detector can detect perc leaks.

Equipment Operation

Properly maintained refrigerated condensers and carbon adsorption units recover the most perc. To keep equipment operating efficiently be sure to do the following:

- Regularly clean lint from screens, strainers and condensing coils.
- Change filters based on equipment indicators, such as a pressure increase or pounds of clothes cleaned.
- Monitor the temperatures of condensing coil inlet and exhaust streams daily to ensure that they are working properly.
- If carbon adsorbers are used, they should be desorbed daily. Make weekly measurements of perc concentrations in the exhaust air from carbon adsorbers to ensure that they are operating properly.
- Closed transfer systems replenish perc from a holding tank to the dry cleaning machine. Using closed transfer systems instead of bucket transfers reduces perc loss and prevents employee exposure to perc fumes.
- Make sure that the perc/water separator is properly adjusted to prevent perc from going down the drain. Use a perc sponge or other device to adsorb any remaining perc from the separated water. Place the saturated perc sponge into a dryer for additional perc recovery.

Technical Assistance and Information

Two publications are available from MnTAP that provide more information on waste reduction ideas for dry cleaners. To request a copy of Waste and Emission Reduction Alternatives for Dry Cleaners [#54], and/or New Dry Cleaning Equipment Reduces Perc Use [#92], call MnTAP at 612/627-4646 or 800/247-0015.

Free, nonregulatory technical assistance is available from MnTAP to help Minnesota dry cleaners reduce their perc emissions. To request assistance or more information, call Cindy McComas at MnTAP at 612/627-4556 or 800/247-0015.

Sixth Annual Hazardous Waste Conference in March
- by Kristi Arndt

The Minnesota Pollution Control Agency’s (MPCA) 6th Annual Hazardous Waste Conference is set for March 14-15, 1996, at the Thunderbird Hotel and Convention Center in Bloomington.

Concurrent sessions on March 14 and 15 will include sessions to help Minnesota generators comply with the state’s hazardous waste rules. A vendor show on March 14 will feature environmental consultants, hazardous waste equipment manufacturers and others involved in hazardous waste management. For those new to hazardous waste regulations and management, a generator compliance workshop will be held on March 13, the day before the conference.

For registration or other information, contact Diane Wetzstein at the MPCA at (612) 297-8467.
Paint and Powder Coating Expo ’96 in March

Businesses that want to learn about improving finishing operation efficiency while maximizing investment returns will want to attend the Minnesota Paint and Powder Coating Expo ’96. Highlights of the Expo include:

- a vendor show that features the latest technology available from over 60 vendors;
- hands-on demonstrations of the latest coatings and equipment; and
- technical seminars and industry case studies that cover the latest information on powder coatings, application equipment, cleaning systems and curing systems.

Attendees of the Expo will learn about improving transfer efficiency and finishing quality; emerging paint-related technologies; increasing cost savings through new equipment; and complying with environmental regulations.

The Expo will be held on March 7, 1996, at the Dakota County Technical College in Rosemount, Minnesota. Cost for the Expo is $10 per person and includes lunch. Sponsors of the Expo include the Chemical Coaters Association International (CCAI); Minnesota Technology, Inc.; Minnesota Technical Assistance Program; Minnesota Office of Environmental Assistance and Northern States Power Company.

In conjunction with the Expo, the Twin Cities Chapter of the CCAI will host its annual symposium on March 6, 1996, at the Expo location. Roger Talbert, technical director for CCAI, will present a day-long course on the design of coating systems. Registration fee is $100, which includes admittance to the Expo and lunch for both days. For registration information, call MnTAP at 612/627-4646 or 800/247-0015.

New Publications

- **Waste Reduction at a Vehicle Maintenance Facility.** This new MnTAP intern project summary provides an extensive review of waste reduction options for companies involved in vehicle maintenance. To request a copy, call MnTAP at 612/627-4646.

- **Evaluating the Use of Mercury Manometers in the Dairy Industry.** A new MnTAP intern project summary that studies the problem of managing mercury found in manometers used by dairy farms. It also provides suggestions for properly managing waste mercury and lists types of alternative nonmercury containing equipment. To request a copy, call MnTAP at 612/627-4646.

- **Overview of Waste and Emission Reduction Alternatives for Dry Cleaners.** A resource factsheet for dry cleaners, this new MnTAP publication reviews various best management practices and options for reducing perc emissions and minimizing waste produced by dry cleaners. To request a copy, call MnTAP at 612/627-4646.

- The following MnTAP publications were recently revised and are now available: Small Silver Recovery Units [13]; Minnesota Air Permit Consulting Firms [41]; Nonferrous-Metal Processing Facilities [21]; and Solid Waste Management and Reduction in the Restaurant Industry [86]. To order a copy of any of these publications or a copy of MnTAP’s Checklist of Printed Resources, which lists all publications available from MnTAP, call 612/627-4646 or 800/247-0015.

- **EI Phonebook of Environmental Services.** Over 6,000 environmental service companies are listed in this new electronic phonebook available on the Internet from Environmental Information Ltd. This new service allows users to easily search, free-of-charge, for environmental service companies located anywhere in the United States. The World Wide Web address is: http://www.envirobiz.com. For more information, contact Jeff Smith at 612/831-2473.
### Materials Exchange

The following materials are provided by the company or individual listing the material. MnTAP, by providing this listing is not liable for any information, errors, representation, or makes any warranty, expressed or implied, as to the merchantability of any material offered in this list. If you are interested in any of the materials listed, contact MnTAP staff, Fran Kurk at 612/627-4643 or Barb Nesheim at 612/627-1900 or 800/247-0015.

#### Materials Available:

1. **Wood crates:** Heavy duty, moisture proof, custom-made crates of various sizes. [MT:A08 1888]
2. **Hardwood board rippings:** 1/8-inch to 1/2-inch wide and 6- to 8-feet long; 6- to 8-percent moisture; no glue or chemicals; 5 yards per month. [MT:A05 1887]
3. **Laminated particleboard:** 3/4-inch thick, 8- to 12-inches wide and 2- to 8-feet long; laminated on one or both sides; variety of colors; continuously available. [MT:A01 1743]
4. **Benzia acid:** Technical grade; 100 pounds. [MT:A01 1743]
5. **Ammonium chloride:** Technical grade; 350 pounds. [MT:A01 1744]
6. **Ammonium bicarbonate:** Commercial; 219 grams; adjusts pH; used in cosmetics manufacturing. [MT:A01 1134]
7. **Zinc oxide, USP:** Colorant and skin protectant used in cosmetics manufacturing; 61 kilograms. [MT:A01 1136]

#### Materials Wanted:

1. **Crumb rubber:** From ground tires. [MT:W03 1047]
2. **Polystyrene packing peanuts:** Wanted by industrial shipping service. [MT:W08 0262]
3. **Cable/wire:** Will buy insulated, bare copper or aluminum wire and cable. [MT:W12 0922]
4. **Wood:** Need 1 1/2-inches thick, 4-feet wide x 4-feet long pieces of wood. [MT:W05 0719]

#### Examples of Materials Exchanged:

- 100 gaylord boxes from a fiber processing company were exchanged with an agricultural products company.
- 60 three-ring binders from a law firm were exchanged with a nonprofit business organization.
- 250 pounds of citric acid from a personal-products manufacturer were exchanged with an electronics manufacturer.
- 1,000 pounds of magnetic tapes from a printing company were exchanged with a tape recycling company.
- 385 gallons of white latex paint from a pump manufacturer were exchanged with a nonprofit organization to be used for painting residential low-income housing.
- 8 gaylord boxes on pallets from an electronics company were exchanged with another electronics company.
- 105 gallons of sodium hydroxide from a tank service company were exchanged with a metals processor.

### New Metro Area eXchange (MAX)

- by Barb Nesheim

Would your company like to save money on disposal costs? Are you paying money to store materials that are no longer needed? If your company is located within the Twin Cities metropolitan area, the Metro Area eXchange (MAX) service can help you solve these waste problems. MAX is part of a statewide materials exchange alliance and was established to foster reuse activities within metro-area businesses.

Using MAX is as easy as calling MnTAP. Your available and/or wanted materials will be listed on a database and in a catalog. MnTAP staff will also actively seek out companies and organizations that may be interested in using your material.

MAX services, as well as a catalog of listings, are available free of charge. For more information, call Fran or Barb at MnTAP at 612/627-4646.
Calendar


March 4-6, 1996, Environment '96. Oshkosh, WI. Sponsored by the Federation of Environmental Technologists, 414/251-8163.


About MnTAP

The Minnesota Technical Assistance Program (MnTAP) is a nonregulatory program that assists Minnesota businesses and industries with their environmental protection challenges. MnTAP's assistance focuses on pollution prevention: eliminating or reducing at the source the use, generation or release of toxic pollutants, hazardous substances and hazardous wastes; and waste management: proper labeling, storing, transporting, treating and disposing of industrial waste.

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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, religion, color, sex, national origin, handicap, age, veteran status, or sexual orientation.

MnTAP's SOURCE is published quarterly. Please direct inquiries and opinions to: SOURCE, 1313 5th Street S.E., Suite 207, Minneapolis, MN 55414. To add your name to our mailing list, please call 612/627-4646 or 800/247-0015 (fax: 612/627-4769). Copyright 1996, MnTAP. Articles published in SOURCE may be reprinted only with permission from MnTAP. This newsletter is available in alternative formats upon request.

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