



Minnesota Office of Environmental Assistance

2004 Pollution Prevention Evaluation Report

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Pollution Prevention Evaluation Report

Pollution Prevention reduces the amount of toxic chemicals used, thereby reducing the amount entering our environment and our bodies. The Minnesota Office of Environmental Assistance (OEA) forms partnerships with facilities, industries, and communities to implement pollution prevention (P2). These efforts support results that show a steady reduction in the amount of toxic chemicals used and released to air, water, and land. P2 is a non-regulatory approach to environmental improvement, and the economic benefits derived from it are a predominate reason for implementation. The OEA keeps abreast of emerging P2 technologies, as well as economic and environmental drivers. This information is used in partnerships with businesses and their communities to obtain the economic and environmental benefits available through P2.

In accordance with the Pollution Prevention Act (Minn. Stat. § 115D.10), the OEA submits a report on progress being made achieving the objectives of the Act to the Legislature every two years. This report uses data available for 2001 and 2002 reporting years from the Toxic Release Inventory (TRI) to evaluate industry and P2 program results.

Benefits of pollution prevention

Pollution prevention is a “front-end” method to decrease costs, risks, and environmental concerns. In contrast to managing pollution after it is created, pollution prevention reduces or eliminates waste at its source. Once practices are in place, savings from pollution prevention continue year after year.



Pollution prevention is a multi-media approach to decrease risk to human health and the environment.

Pollution prevention (P2) is a multimedia approach to solve environmental problems, and does not focus on pollution in a single medium (air, water, or land). Since pollution is eliminated rather than controlled, there is no risk of transfer of pollutants from one medium to another. In addition to decreasing risk to environmental and public health, pollution prevention is a benefit to public safety. Reducing the quantity and toxicity of the waste, air emissions, and water discharges that are produced through making products, decreases the potential for harm in the event of an accidental or intentional release.

The quantities of chemicals in today’s environment are of concern. The U.S. Centers for Disease Control and Prevention (CDC) is conducting research to determine concentrations of chemicals in a wide cross section of the U. S. population. The most

recent data show the presence of each of the 116 toxic chemicals sampled in the population, but at concentrations typically below those known to cause disease. Chemicals tested include metals such as mercury, uranium, cadmium, thallium, and uranium; DDT; carbamate insecticides; organophosphate pesticides; phytoestrogens; phthalates; and polycyclic aromatic hydrocarbons. Other research shows that chemicals such as polybrominated diphenyl ethers, polychlorinated biphenyls, and some pesticides are routinely found in mothers' milk.^{1, 2, 3} With the exception of lead and mercury, also present due to human activity, these chemicals would not have been found in people 60 years ago. The presence of these chemicals today indicates that there are opportunities for pollution prevention.

Assessing pollution prevention

The most significant problem when evaluating progress in pollution prevention is lack of data. Out of the more than 87,000 chemicals in commerce in the United States, 600 are included under the federal Toxic Release Inventory (TRI) Community Right-to-Know legislation. Because of their associated risk, this legislation requires facilities that manufacture, process, or otherwise use above-threshold amounts of these chemicals to report the amounts they manage and release to the air, water, and land. In Minnesota, the Emergency Response Commission maintains TRI data, which for the 2002 reporting year, provides information on the management of 120 different chemicals reported upon by 425 facilities in Minnesota.

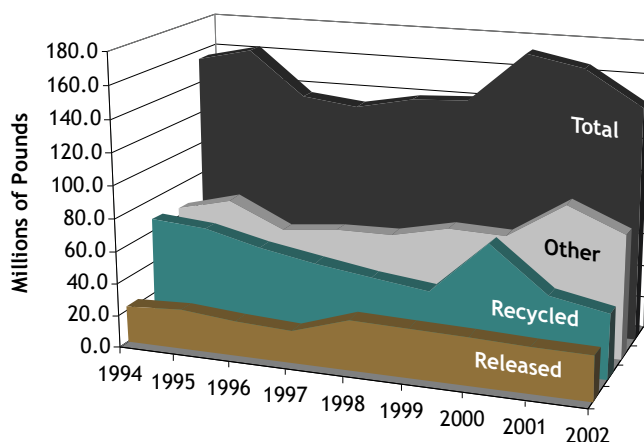
Statewide trends for reporting industries

OEA evaluates data supplied by reporting facilities to the Minnesota Emergency Response Commission (ERC) and the U.S. EPA to determine trends in quantities of chemicals managed and released. Although exceptions exist, the 2002 data from Minnesota's 425 reporting facilities indicates that progress in pollution prevention has occurred. Since the data supplied does not show whether the reduction in amounts of reported chemicals are due to ceasing the manufacture of the product responsible for past generation, moving the manufacturing processes to other states or nations⁴, or implementation of P2 at the facility, it is currently not possible to know the cause of these reductions with certainty.

Facilities that report TRI releases are also required to file "Pollution Prevention Progress Reports" with the ERC. The most current available data from the 2002 reporting year show that 67 percent of the progress reports filed state that the facilities' own P2 objectives were met, and 33% indicated that objectives were not met or it was not possible to determine if they were met. The two most common barriers to pollution prevention listed were technical limitations and concerns that product quality might decline.

While there has been some increase in releases and total chemicals generated in the past few years, some of this is due to expanded reporting requirements since 1998. That year, the U.S. EPA expanded the reporting requirements to include electric utilities,

Figure 1: Statewide trend for reported TRI chemicals (excluding recyclers) from 1993 to 2002, in millions of pounds



*Other managed is defined as the sum of wastes burned for energy recovery and treated for disposal, both on- and off-site.

chemical wholesalers, and solvent recyclers. This expansion has added an average of around 18 million pounds of chemicals generated per year. The data indicates that, in aggregate, facilities made progress in pollution prevention from 1995 to 2000. The sharp increase in the amount of chemicals generated in 2000 was primarily due to increases in amounts of sulfuric acid and ammonia reported from Flint Hills facilities, when data from Flint Hills is removed, 2000 through 2002 reporting year shows a leveling off in progress for the remaining facilities.

OEA pollution prevention activities

Under the Toxic Pollution Prevention Act (Minn. Stat. § 115D), the OEA is responsible for providing technical, educational, and financial assistance; recognition; collecting P2 fees; and evaluating progress in pollution prevention. Participation with OEA's P2 technical assistance is completely voluntary. One size does not fit all for P2 technologies. Variations in processes and product requirements, even within the same facility, make tailored P2 assessments a must. Assistance staff provides candid discussions with facility managers concerning emerging technologies, product design, process line efficiencies, viability of chemical substitutions, and return on investment to help facilities move forward.

Technical assistance

Providing P2 technical assistance is a proven means to achieve successful implementation. The OEA provides technical assistance to Minnesota businesses in a number of ways.

Design for Environment (DfE)

The product design stage offers a unique, powerful opportunity to eliminate or reduce the use of hazardous materials. This is when decisions about which materials will be used to manufacture a product are made. Environmental considerations also facilitate efficient use of energy and materials, which can generate significant cost savings. A number of Minnesota manufacturers, IBM (Rochester), Medtronic, Tennant Company, United Defense, and 3M recognize these benefits and have integrated DfE into product design processes.

OEA technical assistance and DfE grant results include:

- A \$60,000 DfE grant, awarded by OEA to General Mills Bakeries and Food Service—Chanhassen plant in 2003 is already showing significant results. General Mills expects to reduce materials waste on one production line by 33 percent or 895 tons annually. This will result in cost savings resulting from this one production line of \$400,488 per year.



General Mills' Chanhassen facility achieved a 40% reduction in water usage (3,674,000 gallons annually) in the evaporative cooling towers, decreasing both incoming water use and sewer systems discharge.

Similar waste reduction methods are expected to be duplicated on all 16 product production lines in the plant. The potential annual solid waste disposal cost savings for the entire facility are expected to be at least \$1,600,000 once the DfE project is fully implemented.

- Through a \$60,000 grant, the Cardiac Surgery Business of Medtronic, Inc was able to achieve significant waste reduction and related cost savings. A 75 to 85% reduction in chemical use and wastewater loading for a coating process resulted in an annual savings of \$2.1 million dollars. A planned 30 to 35% reduction in material use and a 90 percent reduction in industrial solid waste generation for a battery manufacturing process, with a potential annual savings of over \$200,000.

The visibility of this grant project, which won a Minnesota Environmental Initiatives award and an internal Medtronic Star of Excellence



Medtronic, Inc. optimized the coating process during the design stage of this oxygenator, resulting in significant cost savings and environmental benefits.

award, has also influenced the development of a number of additional related waste reduction projects at Medtronic.

- As a result of a tutorial developed through an OEA grant, all University of Minnesota mechanical engineering students learn DfE concepts before graduating. Through Senior Capstone Design Projects, mechanical engineering student teams at the university also work directly with manufacturers to integrate environmental attributes into the design of a product.

The OEA DfE Toolkit, Guide, and supporting materials which are continually updated had more than 55,000 requests for downloads from the web in 2002 and 2003.

Minnesota Technical Assistance Program

The OEA's Minnesota Technical Assistance Program (MnTAP) provides pollution prevention technical assistance to manufacturers and service industries throughout Minnesota. On-site and telephone assistance is provided by engineering staff with numerous years of technical expertise across a wide array of industries. These specialists help to determine efficiency gains for manufacturing processes, and material or chemical substitutions, which result in lower costs and risks. Over the last two years (2002-2003), facilities receiving MnTAP assistance have saved over \$4.3 million dollars, prevented 12.5 million pounds of waste, and conserved 24.7 million gallons of water. Forty percent of MnTAP's site visits were in the metro region, with the 60 percent balance taking place in greater Minnesota.

Minnesota Technical Assistance Program (MnTAP) works with industries to adopt pollution prevention and conservation practices that reduce costs while also protecting the environment.



Student interns

Companies not able to research pollution prevention projects due to lack of time or money are encouraged to apply for a MnTAP student intern for help. By developing effective, specific, waste reducing solutions, interns help save operating costs, reduce regulatory compliance burden, and decrease a company's environmental impact. Over the last two years, the intern program eliminated 392,107 pounds of pollutants, conserved 20.5 million gallons of water, and saved partner facilities more than \$722,337.

Materials exchange

The Minnesota Materials Exchange Alliance, coordinated through MnTAP, is a service that connects businesses that use one company's waste as another company's raw material. The materials exchange online listings and personal assistance helps facilities find low- or no-cost materials, save money on disposal costs, and find new markets for surplus materials. In 2002-03, more than 4.9 million pounds of one facility's waste was converted to another facility's raw materials, saving more than \$1.96 million.



The connection between Productive Alternatives and Sylva Corporation--made through the Minnesota Materials Exchange--has allowed 500,000 pounds of wood scrap per year to be reused.

P2 energy efficiency

U.S. Department of Energy, Energy Efficiency and Renewable Energy, and the National Pollution Prevention Roundtable (of which OEA co-chairs the P2 Energy Workgroup) have formed an Allied Partner Agreement to integrate P2 assistance with DOE energy efficiency assistance tools. MnTAP is integrating use of these additional tools into existing on-site assistance options (resource efficiency, toxics and waste prevention, and water conservation) to maximize the benefit of site visits. Internet, a diecaster of aluminum parts, evaluated energy conservation opportunities using a MnTAP intern in 2003. The company has the potential to save 437,400 kWh by reducing electricity use of its compressors and motors.

Water Conservation

MnTAP has coordinated with manufacturers and Publicly Owned Treatment Waterworks (POTW) facilities to identify sources of problem pollutants, track the source of these pollutants, and provide assistance to generators to decrease emissions as well as conserve water. In 2002-03, this assistance eliminated discharge of 3.3 million pounds of pollutants into water and conserved more than 24.7 million gallons of water.



The documented dollars alone show that MnTAP saves businesses more than \$2 for every \$1 spent on the program. Medium and small-sized businesses, which cannot afford their own P2 staff, receive much of the assistance. Although savings in dollars may not be as large as occurs with a large facility, smaller businesses typically save a significant portion of their operating costs.

Starting in 2003, the MnTAP budget was decreased by over 15% from \$950,000 to \$800,000. The budget reduction required several services to be cut, including reducing the number of student interns from 8 to 6, and reducing the number of MnTAP staff from 15 to 12. MnTAP has put forth significant effort to obtain project specific grants from other sources, and has had some success. Since MnTAP does not receive cost

of living and rent increases, additional interns and approximately one staff position a year will need to be eliminated if increased funding is not available.

Retired Engineers Technical Assistance Program

OEA's Retired Engineers Technical Assistance Program (RETAP) focuses on waste reduction assistance to non-manufacturing commercial and service facilities not covered by MnTAP. The assistance is provided by retired engineers, each with many years experience in waste reduction. For 2002 and 2003, the program performed 75 on-site assessments which provided a total of \$93,700 in savings to facilities: \$6,500 from reducing solid waste, \$20,200 from reducing electricity consumption, \$6,500 from increased thermal efficiency and \$60,000 from water conservation. For 2004, the program will be housed with MnTAP to decrease operational costs, as well as leverage staff expertise and resources.

OEA and MnTAP Best P2 Practices

Both OEA and MnTAP research emerging P2 technologies which can help make Minnesota businesses more cost competitive with less risk to public health and the environment. The OEA and MnTAP use an extensive network of peer-to-peer relationships with P2 staff in other states to provide information on best P2 practices for more than 35 industry groups. This information, as well as what is derived from projects within the state, are used to produce fact sheets, case studies, and web-based links to the most up-to-date P2 information available.



PBT reduction

The OEA is partnering to reduce quantities of persistent, bioaccumulative, toxic chemicals (PBTs) mercury, lead and dioxin (in Minnesota's environment). PBTs do not break down readily in the environment, and build up in the food chain by accumulating in plant and animal tissue.

Mercury

Over the past two years, OEA partnered with Ramsey County, North Star Steel, and 12 auto salvage yards to improve recovery of mercury switches from vehicles, collecting approximately 8,800 switches and removing more than 20 pounds of mercury from the environment. In cooperation with INFORM, Inc, MPCA, and Dept. of Administration, OEA developed a mercury component disclosure requirement for the state vehicle bid. In the Hospitals



for a Healthy Environment (H2E) Initiative, the OEA is partnering with the U.S. EPA, the American Hospital Association, the American Nurses Association and the non-profit Health Care Without Harm to improve environmental performance of the health care industry. A goal of H2E is to eliminate mercury-containing waste from health care by 2005.

Lead

Through an education campaign, the OEA partnered with the Minnesota Department of Natural Resources to reduce the amount of lead deposited into Minnesota waterways by informing the public about alternatives to lead fishing sinkers and jigs. During the spring and summer of 2003, a public education and fishing tackle exchange effort collected more than 1,000 pounds of lead fishing tackle and replaced it with lead-free ones.



Lead-free tackle made from bismuth and tin

Through providing technical and financial assistance to Benchmark Electronics in Winona, an effort is underway to test and demonstrate feasibility of lead-free soldering technologies with the goal of accelerating the adoption rate of the lead-free technology in the state.

Dioxin

Dioxin compounds are regarded as some of the most toxic substances known.

They are not intentionally manufactured, but are created as a by-product of some manufacturing processes and through low-temperature burning of chlorine-containing materials. Once formed, dioxin molecules persist in the environment for decades and continuously move through air, water, soil and sediment, plants and animals alike.



Although past sources continue to move and accumulate in the environment, due to a combination of pollution control devices and increase in non-chlorine containing products, industrial sources of dioxin have decreased 80 percent since the 1980s. The OEA partners with industry and consumers to promote and increase use of non-chlorine containing products. Industry has provided an array of chlorine-free paper and plastics products, but products made with traditional chlorinated processes are typically less expensive to purchase. Presently, a lack of market demand is a primary reason for limited industry investment in chlorine-free products.

Reducing Toxics in Homes and Buildings

The OEA provides information, resources, and technical assistance on sustainable building technologies and practices to local governments, businesses and consumers. Sustainable buildings conserve resources (including energy, water, raw materials, and land) and minimize the generation of toxic emissions, materials, and waste, from the initial



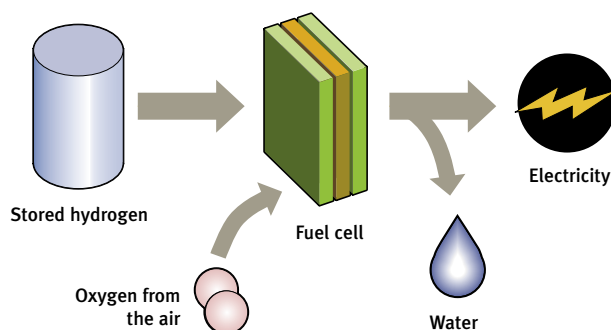
siting and construction phases through operations and maintenance. Case studies of sustainably designed buildings routinely show a 30 percent or better improvement in energy efficiency over code, improved indoor air quality due to improved ventilation and decreased product emissions, decreased water consumption due to water efficiency and landscaping design, and improved quality of life and productivity for occupants. On average, sustainably designed, high-performing buildings may have 1 to 2 percent higher front-end costs, but yield savings of over 10 times the initial investment within the building's first 20 years⁵, or a return on investment after two years of operation.

Completed in 2002, the 8,700-square-foot Department of Natural Resources office building and 12,800-square-foot heated/unheated maintenance facility in Windom, Minnesota, are designed to perform 25 percent better than state energy code. This will result in an estimated reduction in air pollution (particulates, NOX, and SOX) of 10 million pounds over 30 years.

Pollution prevention for energy production and use

Minnesota power plants utilizing coal produce 75 percent of the electricity consumed in the state, and are substantial contributors to ozone, nitrogen oxides, sulfur dioxide particulate matter, and greenhouse gases. 2002 Toxic Release Inventory data show that among reporting manufacturers, electric utilities are responsible for 86 percent of the mercury, 38 percent of the barium, 100 percent of the vanadium, 99 percent of the hydrogen fluoride, and 65 percent of the hydrochloric acid released to air. As a part of industry efforts to reduce these emissions, the OEA provides an array of P2 assistance. The OEA:

- Coordinates with industry, Minnesota Department of Commerce, and U.S. Department of Energy to integrate energy efficiency into MnTAP site visits. Internet, a diecaster of aluminum parts, evaluated energy conservation opportunities using a MnTAP intern and could save 437,400 kWh by reducing electricity use to the compressors and motors.
- Provided two grants to demonstrate P2 energy



By combining stored hydrogen and oxygen from the air, fuel cells generate electricity and release only pure water as a by-product.

technologies. In partnership with Xcel Energy, the OEA is funding a “pollution-free” solar/electrolysis/hydrogen storage/fuel cell system at the University of Minnesota. In partnership with Center Point Minnegasco, the OEA is providing funding for a natural gas fuel cell at a Hennepin County library. Demonstration and education of these technologies are important elements of the projects.

- Is a member of the steering committee of the Minnesota Renewable Hydrogen Initiative, a partnership of industry, electric utility, university, government, and non-government organizations, supporting the state's effort to grow and promote Minnesota's renewable hydrogen industry. The initiative's long-term objective is to create jobs, encourage economic development, and foster new industries in Minnesota, while decreasing risk to public health, the environment, and energy security. Significant economic and environmental benefits are emerging for renewable hydrogen production, particularly for use of biomass from agriculture, forest products, food processing and wind energy industries.

Biomass from corn and other crops has potential as a clean source of renewable hydrogen.



Governor's Awards for Excellence in Pollution Prevention

The OEA's Governor's Awards for Excellence Pollution Prevention promotes public and private organizations that demonstrate superior leadership and the economic and environmental benefits of P2. All leaders are encouraged to apply for this prestigious award so they can receive recognition for their success. The 2002 winners were:

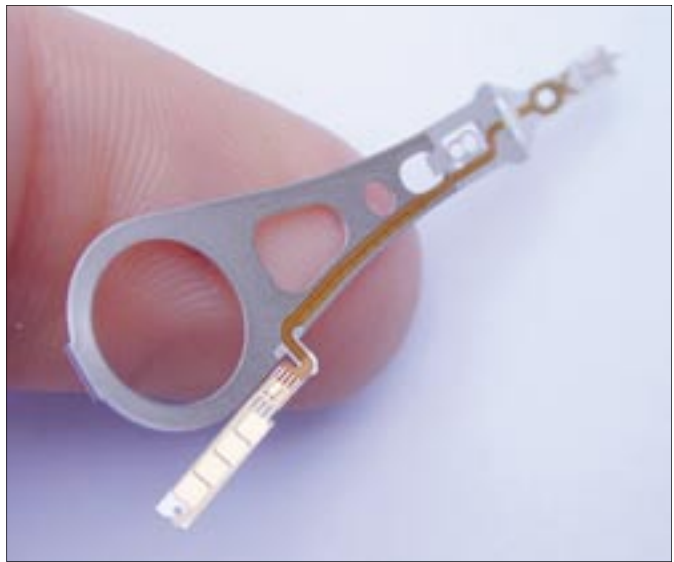
- Downtown Minneapolis Transportation Management Organization (TMO)
- Minnesotans for an Energy-Efficient Economy
- Metro Commuter Services
- Metro Transit, Saint Paul TMO
- General Mills, Inc. Chanhassen Facility
- Restore Products Company
- University of Minnesota: Parking and Transportation Services
- The Church of St. Joan of Arc

The 2003 winners were:

- Center for Energy and Environment
- City of St. Cloud
- Dakota County and Independent School District 196
- Hutchinson Technology Incorporated



Mass transit and gasoline-electric hybrid vehicles reduce significant amounts of pollution.



Hutchinson Technology Incorporated designed a pollution prevention project for coating thin metal surfaces to reduce surface contamination of their metal suspension assemblies and reduce chemical use through an innovative coating and chemical stripping process.

- Ramsey County Property Management
- Ridgeview Medical Center

These facilities:

- eliminated use of 870,000 pounds of toxic chemicals
- eliminated use of 313,000 gallons of toxic chemicals
- avoided 3 million pounds of solid waste
- conserved 3.7 million gallons of water
- prevented 25 million gallons of sludge
- eliminated 38 million pounds of hazardous air emissions
- avoided 0.8 million kWh of energy use
- saved \$16 million

The environmental and economic savings due to pollution prevention continue aggregating each year the preventative actions continue to be in place. Success stories are a proven way to inspire more people to implement and publicize pollution prevention.

Assistance to other state agencies

The OEA is partnering with a number of other state agencies to leverage use of resources and increase outreach for P2. Partners include:

- The Department of Administration to increase the availability of low- or non-toxic cleaning products available through the state purchasing system.
- The Pollution Control Agency to reduce permit applications by decreasing a facility's emission levels to below air, water, and waste permit threshold; and to assist with integrating P2 into PCA activities.
- The Department of Natural Resources through jointly developing printed and web-based resources to educate consumers on hazards and alternatives to lead fishing tackle.
- The Emergency Response Commission to optimize use of Toxic Release Inventory data and reporting facility P2 plans.
- The Department of Agriculture to leverage use of Integrated Pest Management efforts for schools.
- The Department of Employment and Economic Development (DEED) to coordinate research and information on a requirement in 2003 legislation of DEED to establish a program to attract hydrogen and fuel cell related business to Minnesota.
- The Department of Commerce to develop information and outreach regarding P2 Energy technologies, including those for fuel cells and Minnesota renewable hydrogen.

Interagency Pollution Prevention Advisory Team

The OEA coordinates the Interagency Pollution Prevention Advisory Team (IPPAT), a group of participating state agencies including the Departments of Administration, Commerce, Corrections, Human Services, Military Affairs, and Transportation; the Metropolitan Airports Commission, Mosquito Control District and Council, Pollution Control Agency, four Minnesota state colleges, and the University of Minnesota. These agencies meet quarterly to share results of implementing P2 activities within their respective organizations. Activities have decreased

generation of toxic chemicals and waste through use of less toxic adhesives, antifreeze, fuels, automotive maintenance practices, batteries, cleaning supplies, transportation options, electronics, lighting, ice control, laboratory supplies, landscaping, office supplies, lubricants, paints, pesticides, fertilizer, printing, and increased use of materials exchange and remanufactured parts, and water conservation. IPPAT is developing a system of metrics available for all the agencies to use when developing the 2004 *IPPAT Pollution Prevention Summary Report*.

Financial assistance

The cost of demonstration and implementation of P2 technologies must compete against all other needs a business or community has for their budgets. OEA grants and loans, which are matched at least dollar-for-dollar by the recipients, have resulted in businesses manufacturing new products in Minnesota, and has improved manufacturing efficiencies for existing products that would otherwise not have been possible. P2 financial assistance accelerates development and adoption of technologies that make Minnesota a more competitive and environmentally attractive state.

Grants

Each year, the OEA awards grants for projects that focus on environmental projects, including pollution prevention. Grants for pollution prevention support innovation by demonstrating "real world" use of an emerging technology, leveraging local efforts, and by developing educational resources. Projects over the past several years include:

- CHART Technologies developed, tested, and is now manufacturing a new CO₂ dry-cleaning machine, which eliminates the need to use perchloroethylene, a known carcinogen. The new technology provides equivalent cleaning without the use of toxic chemicals.
- The University of Minnesota developed a Design for the Environment (DfE) curriculum which teaches students the benefits of DfE, such as were achieved through another OEA grant project with Medtronic which is saving approximately \$2.5 million a year in manufacturing costs.

- Restore Products Company developed, tested, and is now manufacturing an automatic machine, which allows grocery shoppers to refill reusable containers with nontoxic, plant-based cleaning products, significantly reducing both solid waste and hazardous materials. On average, each store using this technology prevents six tons of hazardous cleaning product and more than 1,000 pounds of single-use plastic, while teaching “reuse” to the public.
- Ridgeview Medical Center instituted comprehensive pollution prevention practices throughout the facility that reduced water use by 30 percent, eliminated 350 gallons of hazardous chemical waste, 225,900 pounds of solid waste, 700 aerosol cans, and resulted in annual cost savings of \$39,330. Practices and results are being promoted to the healthcare industry.
- P2 energy grants, such as participating with a multi-agency project to demonstrate on-farm methane digestion to produce electricity from cow manure, or with the University of Minnesota and Xcel Energy to demonstrate a renewable hydrogen, solar/electrolysis/hydrogen fuel cell system, are part of efforts underway to pilot and test use of technologies which significantly decrease releases of toxic chemicals such as mercury, hydrogen fluoride, barium, hydrochloric acid, lead, and ammonia due to power generation.
- Technomics, LLC in conjunction with the U.S. DOE and OEA, demonstrated an automated, in-line fluidized sand bed heat treatment system for cast aluminum that results in over 90 percent less processing time, 80 percent energy savings, no toxic chemical releases, and a new manufacturing business in the state.

Loans

In the 2001 session, the Legislature authorized the OEA to set up a revolving account for pollution prevention loans. Such loans are being used with success in five other states to accelerate new investments in “off-the-shelf” P2 technology to improve the performance of the states’ manufacturing sectors. OEA allocated up to \$100,000 of its fiscal year 2003 budget for use as the new financial assistance tool. Reduced-rate loans are matched dollar-for-dollar by lending institutions that administer the loans.

Prioritizing assistance to accomplish OEA strategic goals

Rapid improvements in technology provide continued opportunities to reduce costs and use of toxic chemicals by facilities. To assure that assistance results in maximum pollution prevention, the OEA uses three primary factors to prioritize P2 technical, financial, and educational outreach: 1) opportunity, 2) risk, and 3) strength of partnerships.

Opportunity

A given industrial sector may be responsible for use of significant amounts of toxic chemicals, but if P2 technology is not feasible for that sector, assistance would not likely result in success. Industries which have market-ready P2 technology available are the best candidates for OEA assistance. To aid targeting efforts, the OEA and MnTAP research P2 technologies to determine which industries currently have the greatest opportunity to reduce chemical generation through implementing P2.

Individual facilities within these industries are provided assistance to determine if the technology is applicable to the specific product design, quality and performance, process line, chemical substitution, and return on investment considerations needed so that implementation can move forward.

Risk

Risk to human health and the environment is another critical factor for prioritizing P2 assistance. Out of the approximately 87,000 chemicals registered for use in the United States, the government has some toxicity data on about 1,300 of these, and either chronic or cancer-complete data on 210. Such data exist for only 52 of the 204 chemicals that are reported released to Minnesota air and water.

Potential for risk is established by taking the quantity of a chemical released to the environment and multiplying by its “human toxicity potentials” factor as determined by PCA risk assessment staff. In this way, a chemical which may be released in comparatively small quantities but has a high toxicity factor may be shown to pose a greater risk than a less toxic chemical released in large quantities. The lack of cancer and non-cancer toxicological data for chemicals released to both air and water is the primary

limiting factor for assessing risk.

OEA, MPCA, and Minnesota Department of Health are able to identify chemicals, for which data exist, that pose the highest potential risk for cancer and non-cancer (or chronic) ailments through air and water releases to the state as a whole. Statewide risk may be different than a particular community's risk. This is because the highest risk to a particular community may come from chemicals released within or near that community rather than as aggregated from statewide data.

Strength of partnerships

Assistance must be turned into results. Experience has proven that successful P2 requires strong partnerships. Partnering with trade associations, individuals or organizations that are motivated and have senior management support to find P2 solutions have highest likelihood for success. Participation with OEA assistance is voluntary and may involve candid discussions regarding costs, emerging technologies, product design, process line efficiencies, viability of chemical substitutions and return on investment. Developing strong partnerships based on mutual trust and respect is crucial for achieving P2 results.



Trends in 1998-2002 outreach industries

Figure 2 identifies the industries prioritized for assistance based on use of the opportunities/risk/strength of partnership targeting method since 1998. Significant reductions in both chemical releases and chemical generation have occurred in these industries; as a whole releases were reduced 42% and chemical generation was reduced 15 percent. TRI data show that the industries not targeted for assistance reduced their releases by only 9percent while chemical generation *increased* by 6 percent.

In addition to targeting by industry, targets are also established for chemicals. Chemicals may be used and released by more than one industry. For example, mercury releases are being addressed through activities to reduce emissions from healthcare, utilities, and through use in automobiles. Activities to reduce phosphorus in the environment are provided to Publicly Owned Treatment Waterworks (POTW) facilities, which release phosphorus, as well as to communities to reduce phosphorus in lawn care. Ethyl benzene and methyl ethyl ketone have been reduced through delivering outreach to industries that apply

Figure 2: Industries receiving focused assistance

SIC	Description	Releases			Total generation		
		(1998)	(2002)	% change	(1998)	(2002)	% change
201	Meat products	75,788	41,893	-45%	185,927	102,349	-45%
202	Dairy products	205,801	200,356	-3%	6,668,197	6,407,263	-4%
243	Cabinetry	760,531	304,193	-60%	947,221	405,954	-57%
275	Commercial printing	25,900	48,137	86%	39,290	94,829	141%
285	Paints, varnishes, and lacquers	62,870	36,235	-42%	505,116	515,717	2%
289	Adhesives and sealants	12,977	7,069	-46%	20,574	28,364	38%
306	Rubber products	9,154	2,430	-74%	11,470	2,666	-77%
308	Plastic products	437,166	340,338	-22%	493,537	410,370	-17%
332	Iron foundries	174,410	58,659	-66%	376,346	130,311	-65%
336	Non-ferrous foundries and die castings	170,075	101,034	-41%	2,550,629	3,373,116	32%
347	Metal plating and coating	329,913	167,083	-49%	2,844,310	947,026	-67%
		2,264,585	1,307,428	-42%	14,642,617	12,417,965	-15%

paint, coatings, or finishes to their products. Providing cross-industry assistance to reduce the use and release of a particular chemical also reduces risk to public health and the environment.

Future prioritization efforts

Experience has demonstrated that all three factors must be considered when sectors are prioritized for outreach, or effective P2 does not result. Future prioritization efforts will rely on this proven method. MnTAP and the OEA will review their focus areas during the upcoming year to determine what changes, if any, need to be made in outreach efforts.

Potential changes to Toxic Releases Inventory Fees

The EPA has proposed changes to federal requirements for Toxic Release Inventory reporting. Proposed changes include developing higher reporting thresholds for certain chemicals and small businesses, creating “no significant change” certificates in lieu of reporting similar numbers each year, and allowing for more use of range estimates rather than specific estimates. These changes have the potential to impact the amount of fees collected and the quality of data available to evaluate progress in P2. Throughout 2004, the OEA and the Emergency Response Commission will continue to monitor the proposed changes, and assess the impact any adopted changes will have on fees currently collected and on P2 assistance activities in Minnesota.

(Endnotes)

¹ Walkowiak, J., J. Wiener, A. Fastabend, B. Heinzow, U. Krämer, E. Schmidt, H. Steingrüber, S. Wundram, and G. Winneke, 2001. “Environmental exposure to polychlorinated biphenyls and quality of the home environment: effects on psychodevelopment in early childhood.” *Lancet* 358: 1602–07.

² U.S. National Institutes of Health, *Environment Health Perspectives*, March 2001. Air borne contaminants most commonly found in breast milk were three pesticides (dieldrin, mirex, and DDE) and two industrial chemicals (polychlorinated biphenyls and hexachlorobenzene).

³ ACS Publications, “Phthalates, Alkylphenols, Pesticides, Polybrominated Diphenyl Ethers, and Other Endocrine-Disrupting Compounds in Indoor Air and Dust,” Ruthann A. Rudel, David E. Camann, John D. Spengler, Leo R. Korn, and Julia G. Brody *Environ. Sci. Technol.*; 2003; 37(20) pp 4543 - 4553; (Article) DOI: 10.1021/es0264596 http://pubs3.acs.org/acs/journals/doi/lookup?in_doi=10.1021/es0264596. Summary available through Environmental Science and Technology, Science News, “Endocrine disrupters ubiquitous in U.S. homes” September 2003. http://pubs.acs.org/subscribe/journals/esthag-w/2003/sep/science/kb_endocrine.html#TOP

⁴ Minnesota Technology, Inc., “Impact of China-based Manufacturing on Greater Minnesota Manufacturing Companies,” March 2003. <http://www.minnesotatechnology.org/publications/reports/documents/ChinaStudy.pdf>

⁵ Greg Kats et al; *The Costs and Financial Benefits of Green Buildings: A Report to California’s Sustainable Building Task Force*; October 2003, p.V.