Pollution Prevention

Illinois Industry Success Stories
Pollution Prevention: Illinois Industry Success Stories

compiled by
Illinois
Hazardous Waste Research and Information Center

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Reprinted February 1995
INTRODUCTION

Many companies have found that reducing the generation of waste—pollution prevention—makes good economic sense, good environmental sense, and increasingly, good business sense. The management and disposal of waste costs Illinois companies hundreds of millions of dollars each year. By reducing the generation of wastes, companies have reduced waste management costs, increased production efficiency by turning the same amount of raw materials into more product, attained regulatory compliance, avoided long-term liability for hazardous wastes, and reduced or eliminated releases to the environment.

Pollution prevention involves a basic shift in the way business managers perceive waste generation. The traditional view considers waste as the inevitable by-product of standard facility operations. A pollution prevention approach considers waste generation as a consequence of inefficient process operations resulting in raw material loss and lost company revenue.

Rather than applying end-of-the-pipe controls to handle waste, a pollution prevention strategy involves looking at where and why waste is being generated in the first place. Instead of managing waste produced, the ultimate goal of pollution prevention is to totally eliminate or greatly reduce waste generation. Doing this involves all employees of a facility, and becomes a way of doing business—not just a waste management strategy. Through implementing techniques such as source reduction, in-process recycling, and off-site recycling, companies are discovering how pollution prevention can work for them.

This booklet highlights pollution prevention success stories from companies throughout Illinois. Section One includes information on some 46 facilities who are saving over $10 million a year due to pollution prevention and recycling projects. However, this estimate is conservative because most companies do not calculate the true cost of their waste, which includes more than just avoided disposal costs. Thus, they do not have good figures on savings generated by specific pollution prevention projects. Avoided disposal costs may be only 20 percent of the total cost of the waste generated, with the largest loss being the value of lost raw materials.

Of the companies in this booklet that reported waste reduction quantities, almost 2 million pounds of air emissions and 4.4 million gallons plus over 20 million pounds of liquid and solid waste have been eliminated per year. Several companies reported reductions in terms of percentages over a baseline year rather than gallons or pounds.

Another 20 facilities included in Section Two and Three, provide information on results achieved in pollution prevention through working with the Hazardous Waste Research and Information Center, but do not include cost savings information.
With over 200,000 businesses in Illinois, 18,000 of which are manufacturers, it is safe to say that reductions reported in this booklet are only a small percentage of savings realized to date. It also represents only a small percentage of companies who could take advantage of potential cost savings and environmental benefits due to implementing a pollution prevention program.

The Hazardous Waste Research and Information Center (HWRIC), a non-regulatory division of the Illinois Department of Energy and Natural Resources, provides free pollution prevention technical assistance and other services targeted to help companies with their waste management needs (see Section 4 for available services). Publication of these successful examples is intended to motivate others to adopt pollution prevention strategies. This booklet will be updated on a periodic basis, and we invite companies to submit additional examples of their achievements in pollution prevention. Section 4 includes a form for this use. We are pleased to present this success stories booklet demonstrating how pollution prevention is working for Illinois businesses and industries.
SECTION ONE
Pollution Prevention at Work in Illinois

The following success stories from Illinois companies represent those that have reported specific volumes of waste reduced or costs avoided through their pollution prevention and waste minimization programs. In some cases companies have reported the development of a facility-wide pollution prevention program that will enable them to identify where and why wastes are generated, to identify specific pollution prevention projects that might be done, and to prioritize, conduct, and evaluate these projects. Many of these success stories have come from entries for the Illinois Governor's Pollution Prevention Awards Program administered by HWRIC. In those cases where HWRIC has provided specific assistance to these companies, we have indicated the nature of these efforts.

These brief descriptions are meant to give an overview of some of the successes that Illinois companies are having through their pollution prevention efforts to reduce the amount and toxicity of their waste generation. These success stories are intended to encourage other companies to explore pollution prevention options at their facilities.

We have relatively little data on pollution prevention projects that may have failed, or that might have been a more expensive alternative for a company as compared to their present waste management practices. Due to the nature and diversity of manufacturing processes, businesses must determine whether pollution prevention measures are technically and economically feasible for their operations. Fortunately, those businesses discussed below have been able to develop successful pollution prevention programs. Through the formation of pollution prevention teams, the businesses were able to explore and implement pollution prevention projects that reduced waste, saved money, and in some cases, provided the company with a competitive edge which allowed them to expand and increase their work force. In many cases, the projects resulted not only in less waste but also in improved product quality. The cases discussed below demonstrate the importance of providing detailed pollution prevention information, to enable companies to make informed decisions as to which pollution prevention measures are appropriate for their operations. When such measures prove to be economically and technically feasible, implementation results in a win-win situation for the company and for the environment.

Advanced Filtration Systems, Inc. (AFSI) manufactures liquid filtration products using fully automated, computer integrated manufacturing (CIM) techniques. Manufacturing liquid filtration products involves a urethane process which, in the past, generated a large volume of waste. AFSI has redesigned their process for dispensing polyurethane and also the process for handling bulk constituent chemicals and ultraviolet (UV) resin. Consequently, AFSI has eliminated 100 percent of the 144,000 gallons per year of polyurethane/solvent flush waste; 100
AGI Incorporated manufactures and prints compact disc packages and cosmetic folding cartons. AGI utilizes both sheet-fed and web offset printing presses, each of which generate waste fountain solution. AGI is successfully redistilling the fountain solution to recover the isopropyl alcohol component for reuse. Through this technology, AGI will reduce the amount of waste generated by 90 percent or 10,400 gallons annually. Up to 9,400 gallons will be returned to the presses for reuse. With the initial outlay for equipment and testing, AGI's payback period is 12 months. The cost savings is at least $30,000 per year. Although distillation technology is not new, AGI's particular application is considered new to the printing industry. AGI has a large capital investment in switching to ultraviolet and electronic beam inks to reduce the use of solvents and emission of volatile organic compounds. The company also aggressively recycles paperboard waste and markets recycled paperboard products to its customers.

Arens Controls manufactures mechanical and electrical controls. Through pollution prevention activities, Arens has realized an estimated cost savings of $270,000 per year. They replaced a mineral spirits parts washing operation with an aqueous-based system equipped with an oil-water separator. This reduced waste generation from 350 gallons of spent mineral spirits to less than 5 gallons per month of non-hazardous oil skimmed from the system, saving over $9,000 per month in disposal and labor costs. To reduce the amount of cutting oil disposed of off-site, an oil filtering system was installed to prolong the life of the coolant, resulting in a reduction of 2,400 gallons and $14,000 per year in disposal costs. Arens has also upgraded two water-cooled air compressors to air-cooled compressors and installed a recirculating system for cooling water, thus reducing the total water usage at the facility by 75 percent, or 9 million gallons.

Baxter Healthcare Corporation has a corporate-wide commitment to pollution prevention and has established several goals to reduce air toxic releases, chlorofluorocarbon (CFC) use, hazardous waste, and solid waste generation. As a vendor, they also have a goal to reduce the average weight of packaging for all self-manufactured products by 15 percent. They have established a Quality Leadership Program which uses several Total Quality Management (TQM) principles. They have implemented several pollution prevention projects at their facilities nationwide which have resulted in significant savings.

The Round Lake facility has established an environmental team to address pollution prevention opportunities throughout the plant. Following the corporate goal to reduce packaging weight, they have redesigned packages to reduce material, designed multi-component medical kits to reduce packaging that
would have been required for individual components, and substituted reusable shipping containers for single-use containers.

The Mundelein facility has established a recycling and waste minimization team—TRI-Cycle—to identify source reduction and recycling opportunities throughout the facility. In 1992, they reduced their solid waste stream by 80 percent. All plastic scrap and films are recycled. Reusable shipping containers are used wherever possible. Slip sheets made of recycled chip board are used instead of wooden pallets, resulting in a cost savings of $33,000 per year. Film cores are returned to the supplier for reuse.

**Bulk Molding Compounds—St. Charles**

Bulk Molding Compounds (BMC) is a plastic components manufacturer. They have installed a thermoset mold and a molding press to mold waste plastic material such as spill-over resins and discolored material into reusable shipping containers. These containers were made available to their customers. Not only did this reduce BMC’s waste by 90 percent, or 135,000 pounds per year, but it also eliminated cardboard waste for their customers who now use the reusable totes. As an additional incentive, BMC offers its customers a 1 cent per pound discount on resin purchases if their customers use the reusable shipping containers.

**Caterpillar, Inc.—East Peoria**

Caterpillar’s East Peoria facility has established a plant-wide Environmental and Pollution Prevention Team that meets on a monthly basis to determine ways to make pollution prevention a plant objective. The team has been successful in systematically reducing the following wastes: ammonia, aluminum oxide, chlorinated/fluorinated solvents, waste oil, and dunnage. Ammonia was selected for reduction because of the SARA 313 reporting requirements. The flowrate of ammonia emissions from heat treat nitriding operations was reduced by 19 percent with a cost savings of $3,750. Aluminum oxide waste is generated from metal seal lapping compounds and is the second largest volume of waste at the facility. This was reduced to half the amount previously generated through the installation of peristaltic pumps. These pumps adjust the flowrate of the lapping compound, not only conserving resources and reducing wastes, but also improving product quality. The company estimates an annual cost savings of over $530,000. Caterpillar has also eliminated three of the six vapor degreasers used at the facility with a cost savings of over $16,000. A recycling program has been established to recycle weld wire spools, cardboard, wooden pallets and office paper. Waste oil has been recycled and reused at the rate of 52,000 gallons in a 6-month period saving $118,000.

To address the concern of waste paint sludge disposal from the East Peoria painting operation, Caterpillar formed a waste paint sludge minimization team. Using supplies from two paint manufacturers and waste paint sludge from their own paint booth, the team reconstituted the pigment/resin material into a quality paint which could pass accelerated corrosion tests. In late 1990, Caterpillar demonstrated this success to Moline Paint Manufacturing Company, and they
agreed to work with Caterpillar to develop the best possible coating. Caterpillar is now the primary consumer of its own paint sludge, and the uses for this paint are expanding from simple line markings to include paint for tub and tote bins and interior walls. Prior to the development of this process, Caterpillar’s East Peoria facility was sending out 32,000 gallons of waste sludge for disposal. They no longer dispose of any material from their water wash paint booths.

HWRIC has worked for a number of years with Caterpillar’s corporate environmental group and with a number of its Illinois facilities to promote the development of a pollution prevention program.

**CCL Custom Manufacturing—Danville**

CCL is a contract packager of aerosols and liquids; they handle a variety of household, personal care, food, over-the-counter pharmaceutical, and institutional products. CCL has already implemented some exemplary pollution prevention strategies such as a Continuous Improvement Program which involves assembling teams of employees from all departments to address specific areas of potential waste reduction. To date, CCL has saved over $300,000 in scrap reduction alone and over $600,000 in waste reduction plant-wide. HWRIC staff have worked with CCL to further expand their overall pollution prevention program and to provide assistance with specific problems such as recycling markets and regulatory issues. CCL has also provided information to HWRIC on how the employee teams work within the company so that this information can be made available to other facilities. CCL credits HWRIC with assisting them with the advancement of their pollution prevention program.

**Chicago Whitemetal Casting—Bensenville**

Chicago Whitemetal Casting is an aluminum, magnesium, and zinc die caster. To reduce energy consumption, they installed a heat co-generation system at a cost of $70,000, to recover heat from the aluminum remelting furnace. This heat is distributed throughout the zinc and aluminum die casting departments. Over a ten year period, this system has saved the company over $180,000 in energy bills and has reduced natural gas consumption by 20 percent. A gas generator was also installed to reduce electricity consumption. Although the generator cost $400,000, it resulted in a net energy savings of $16,000 per month. During the first four years of operation, Chicago Whitemetal Casting estimates they have saved $768,000. A water filtering system was installed to recover the water used in quench pits. Originally, this water was hauled away weekly at a cost of $62,000 per year. By recovering and reusing the water, the company has saved $744,000 in disposal costs over 12 years plus an additional $72,000 in reduced water costs.

**Chrysler Corporation—Belvidere**

Chrysler has increased the use of galvanized sheet metal in car bodies thus eliminating the need for zinc-rich primer. This eliminated volatile organic compounds (VOCs) and saved $7,000 in disposal costs of the primer materials. By
reworking the application system and educating employees on pollution prevention, they reduced their waste from underbody cleaner application by 85 percent. For this project an initial investment of $40,000 has resulted in savings of $115,000 per year. The use of vinyl glue was also eliminated by using new headliner pads with a pre-applied pressure sensitive adhesive. This also eliminated the waste disposal and VOC emissions associated with the glue. Paint booth wastes and emissions were greatly reduced by switching to water washable coatings and strippers, as well as employee education resulting in a savings of $21,000 per year.

When Chrysler switched model production to Dodge and Plymouth Neons, additional pollution prevention projects were started during the re-fitting of the plant. These projects included: using waterborne paints for vehicle topcoats to reduce solvent use by 20 percent; using waterborne underbody deadener to eliminate .12 pounds per car of solvent hazardous waste; replacing Freon 12 with HFC-134(a) in vehicle air conditioners; substituting materials in the precipitation step of wastewater treatment to reduce sludge generation by 90 cubic yards per month; reformulating sealers to reduce phalate usage by 98 percent; and coal to gas boiler conversions to increase utility efficiency to 85 percent. Through implementing these and other projects, Chrysler has reduced its air emissions by 735 tons per year and reduced waste disposal by over 17 tons per year. The economic benefit of these programs is well over $350,000 per year. Chrysler's pollution prevention program is composed of management and employee teams. The company provides pollution prevention training to all employees.

**Crosfield Catalysts—Chicago**

Crosfield produces catalysts to remove sulfur, nitrogen, and other contaminants from petrochemicals. A key component in the manufacturing process is the production and use of sodium aluminate. Prior to 1991, this material was filtered before intermediate storage to remove particulates and reduce precipitation. This generated a significant waste stream of collected solids and filter media. After studying the process, it was determined that the majority of the waste was filter media and calcium aluminate, a by-product of sodium aluminate production. The calcium source was found to be from the process water, so Crosfield began using soft water in their process. The filtration step was thus eliminated as the calcium solids were no longer present. This process modification resulted in the elimination of 311 drums of water per year and avoided disposal costs of $40,000 per year.

**DAP, Inc.—Rosemont**

DAP manufactures adhesives and caulk. Previously, they generated quantities of waste from mixer cleaning between batches—specifically, chlorinated solvent waste from cleaning mixers after solvent-based recipes were made. DAP now cleans the mixer after the batch is completed using the same vehicle solvent (water, toluene, or chlorinated solvent) as was used in the batch. The cleaning material is then drummed and saved until the next batch of the same product is run. This is then used as the vehicle solvent. Initiating the system involved some schedule rearranging but resulted in a savings of more than $40,000 in
avoided disposal and raw material replacement costs. DAP also has other recycling activities involving drums, pallets, paper and cardboard, waste oil and pails.

### Diamond Star Motors—Normal

Diamond Star Motors' automobile assembly plant in Normal has worked with its suppliers to obtain automotive sealer in lined drums. This allows Diamond Star to recover the 12 percent of the sealer product that was previously disposed of with the drum. This method also allows the drums to remain clean so that they may be reused. The overall savings associated with using drum liners is approximately $158,000 per year.

### Dow North America—Joliet

At their Joliet facility, Dow manufactures polystyrene resins, insulation board, and vinyl ester resins. The Joliet Marine Terminal (JMT) receives chemicals by barge and rail car for storage and distribution by truck to customers. The JMT loads approximately 800 trucks/1,500 compartments per month. As each compartment of each truck is loaded, samples are taken to assure the chemical meets the required specifications. These samples are kept for 6 months (3 years for food grade products) before disposal. A team of JMT employees was formed to develop ways to reduce waste. By reviewing the analytical requirements for these samples, the team determined that the minimum sample size should be 8 ounces, instead of 16 ounces. This reduced the generation of laboratory waste from 20 drums per month to 10 drums per month and resulted in a cost savings of $17,500 per year with no capital investment required.

### Eagle Wings Industries—Rantoul

Eagle Wings is a company that supplies high quality steel component parts to the automotive industry. Eagle Wings implemented a project to eliminate a zinc phosphate waste stream generated in the surface treatment of components prior to electrodeposition painting by recycling it in process. The phosphate sludge collected from the zinc phosphate dip tank is dewatered in a filter press prior to disposal. The filtrate was previously pumped to the wastewater treatment system. This filtrate was tested and found to be of sufficient quality to be returned to the zinc phosphate dip tank as make-up. This not only reduced treatment costs at the wastewater treatment system but also reduced the raw material costs for replenishing the dip tank. Eagle Wings estimated they save $7,000 per year in raw material and avoided treatment costs.

The company has also established small teams of employees who meet regularly to improve production and discuss pollution prevention opportunities. Results include switching to a new type of paint with 40 percent lower volatile organic compounds, and reduction in metal scrap production by reducing the size of sheet metal blanks. They also recycle packaging materials and metal scrap.

HWRIC has worked to assist this company with the development of a comprehensive pollution prevention program for their facility. HWRIC has also
provided information on waste handling and regulatory issues on several occasions. Eagle Wings attributes the initial development of their pollution prevention program to assistance and encouragement from Center staff.

**Eaton Corporation—Lincoln**

Eaton manufactures both residential and industrial electrical power distribution equipment. They routinely recycle scrap metal generated in their stamping operations. By improving their scrap metal segregation system they were able to obtain the highest dollar value for this material. The receipts for the metal scrap in 1992 totaled more than $440,000. They also implemented a hydraulic oil recycling program with Rock Valley Oil and Chemical, Rockford. In this full-circle renewal program, their hydraulic oil is filtered, analyzed to determine the amount of additives depleted, replenished with the necessary additives, and returned to Eaton. This recycling saves Eaton approximately $6,000 per year in disposal and new oil costs. Eaton also recycles paper, cardboard, and other materials which resulted in a cost savings of $77,000 in 1992.

The facility has replaced their liquid paint dip system with an electrostatic powder coating system. This reduced waste in several ways. The multi-stage wash and pretreatment was modified since the more durable powder coat eliminated the need for the zinc phosphate and chrome seal pretreatment steps. A new wash system of iron phosphate and non-chrome/deionized water rinse is now used. Excess paint waste, consisting of drip and run-off collected on papers, has been eliminated. There is no overspray waste with powder coating as overspray is reused. Spray booth water waste has been eliminated. Volatile organic compound emissions have also been eliminated and product quality has improved.

**Eichrom Industries, Inc.—Darlen**

Eichrom Industries is a separations technology company that delivers innovative and cost-effective metals separation projects for analytical, process, recycling, and decontamination applications worldwide. They have developed Eichrom’s Spec resins as an alternative method to the three common analytical methods used to determine levels of radioactivity in the environment. The separation process is called extraction chromatography and generates considerably less laboratory waste than the common methods. Based on employee suggestion, the company has revamped its manufacturing process and through process reutilization, distillation, and on-site recycling has reduced its use of methanol by 75 percent and acetone by more than 60 percent. Eichrom's technical services group assists client laboratories in streamlining analytical methods and reducing the wastes that are generated in environmental analyses. Eichrom recognizes the best efforts of its employees to make the company more efficient and environmentally aware through its "Hero of the Month" award.

**Excelsior Foundry—Belleville**

Excelsior, a gray and ductile iron foundry, has implemented some source reduction and in-process recycling techniques at their facility. Approximately 90 percent of the green sand used in the casting process is reused after shake out of
the molds. Fiber drums are reused for shipping parts to customers. Water-based paints and primers are used on those castings requiring a finish. Materials, such as molding sand and metal additives, are purchased in bulk or in returnable drums. Programmatic activities implemented include top management support to establish a pollution prevention program, utilizing a team concept, and tracking of materials into and out of the facility.

**Four Star Tool, Inc. — Rosemont**

Four Star Tool, a metal fabricating firm, replaced 1,1,1-trichloroethane for degreasing operations with D-Limonene, a citrus-based product. This changeover resulted in 1,350 gallons less waste and a cost savings of $5,805 per year. The substitution also eliminated most of the worker exposure to hazardous chemicals.

**G.E. Plastics—Ottawa**

G.E. Plastics, a manufacturer of thermoplastic resins, has established a Waste Minimization Team consisting of an employee representative from each of the seven major operating areas. Through the efforts of this team, G.E. Plastics implemented several projects to reduce waste. After years of experimentation, the process used to manufacture thermoplastic resin was modified. This reduced the amount of trace unreacted chemicals in the product and drastically reduced emissions of volatile organic compounds by 90 percent, or more than 1 million pounds per year. G.E. also installed a separation system to break the waste water/organic compound emulsion resulting from the resin manufacturing process. By reducing the waste volume sent off-site by 70 percent, G.E. realized an annual savings of over $70,000. G.E. also modified product packaging by reducing the number of containers and saved $92,000 per year in materials purchase. The company has also implemented a bulk storage/transfer system for chemicals that were previously purchased in drums, thus eliminating disposal of over 700 drums per year.

**General Tire, Inc. — Mt. Vernon**

General Tire manufactures rubber tires and has begun a scrap tire recycling program. Non-metal containing portions of the tire are ground for playground chip. There is no cost associated with this program that generates a savings of $17,400 per year in avoided disposal costs. Waste rubber dust is also recycled for use in the manufacture of railroad crossing pads, landscape stepping stones, and downspout deflectors. Approximately 528,700 pounds per year of waste rubber dust has been removed from landfill disposal. Recycling this material also costs General Tire nothing and has reduced their disposal costs by 45 cents per pound. General Tire has educated their employees in the area of waste segregation and housekeeping. Spills and dust from the dry chemical compound weighing were previously collected in one bin and disposed of as hazardous waste. By following new waste segregation procedures, most of this waste is no longer hazardous. This resulted in a savings of $243,000 per year in disposal costs.
Electroplating operations generate rinsewater wastes that are classified as hazardous due to the presence of heavy metals. Disposal of rinsewater waste without prior treatment is cost prohibitive and environmentally unacceptable. In this project, HWRIC engineers pilot tested low temperature evaporation and reverse osmosis systems to process rinsewater collected from a nickel electroplating operation for recycling directly back into the process.

Both systems offer advantages under specific conditions. The low temperature evaporation system appears to be best suited to processing solutions with relatively high nickel concentrations. The reverse osmosis system is best adapted to conditions where the feed solution is of relatively low nickel concentration. Utilizing these systems in tandem provided the optimum solution for this facility from both waste reduction and economic standpoints. Waste volume reduction of over 2,600 gallons per year associated with lower sludge volume generation would be expected with this system. Additionally, water consumption would be reduced by about 1.5 million gallons per year. The estimated payback period associated with utilizing these systems in tandem is approximately 2.8 years.

Griffin Wheel Company—West Chicago

Griffin Wheel Company, a manufacturer of railroad brake shoes, has begun the “Solvent Free Project” to reduce solvent waste and emissions associated with production of composition brake shoes. Previously, the solvent toluene was used to lower the viscosity of the resin for mixing and to soften the rubber in the binder matrix. To eliminate solvent use, Griffin worked with the supplier to reformulate the resin so solvents were unnecessary. A high shear mixer was purchased which uses mechanical force rather than chemical processes to mix the components of the matrix. Griffin eliminated the need for nearly 2 million pounds of toluene per year. They also went from being DuPage County’s largest single source of toluene air emissions (200,000 to 400,000 pounds per year emitted) to zero toluene emissions due to this change.

Harris Corporation, Broadcast Division—Quincy

Harris Corporation, a radio and television transmitter manufacturer, implemented several projects to reduce waste volume, waste toxicity, and to improve product quality. To eliminate the need for methyl chloroform (1,1,1-trichloroethane (TCA), an ozone depleting compound) as a cleaning agent for hand-soldered printed circuit boards, Harris evaluated both no-clean and water-clean solders. Water-clean solders were found to be effective and were introduced into the process. The results included a raw materials savings of $4,500 per year and elimination of associated TCA disposal costs. A less toxic solvent was substituted for the methyl ethyl ketone (MEK) used as a paint reducer and cleaning solvent. Paint room employees also evaluated batch paint requirements, modified the mixing process to generate only the required amount, and thus reduced paint waste by up to 75 percent, saving $36,000 per year in disposal costs. By installing a gravity settler in the wastewater treatment system, Harris saved $30,000 per year in sludge disposal and an additional $8,000 per year in
chemical consumption costs. Harris has also installed a solvent distillation unit to recycle the remaining solvents. Employee participation played a key role in the successful implementation of process changes at Harris.

Additionally, Harris is in the process of replacing a vapor degreaser which uses MEK to clean fabricated parts. Harris is working with HWRIC engineers to test water-based cleaning processes to replace the vapor degreaser. Also, HWRIC is helping Harris develop an in-process recycling system utilizing ultrafiltration to extend the useful life of the aqueous cleaners.

**Henry Pratt—Aurora**

Henry Pratt manufactures rubber seated butterfly valves for use in water, wastewater, power, and industrial markets. The disc in the valve which seals against the rubber seat has a sealing edge which must be protected against corrosion. Pratt had previously used a two-step plasma spray process to weld nickel-chromium powder on the disc edges. They found a replacement material, stainless steel powder, which can be applied in one step. The stainless steel powder is not only environmentally safer but also costs less per pound. Pratt estimates they save $75,000 per year in material costs. The change of material has also eliminated the need to purchase a new $450,000 plasma spray system since the second coat step system from the nickel-chromium coating process can be used as the production back-up for the stainless steel coating system.

Another change made by Pratt eliminated vapor degreasing by combining a higher heating temperature with an alternative bonding cement while still achieving acceptable vulcanization criteria. This step has eliminated the major emission source of tetrachloroethylene and has enabled Pratt to withdraw their vapor degreaser operating permit.

**Hevi-Duty Electric—Mount Vernon**

Hevi-Duty Electric, in one of their processes, generates PCB-contaminated debris from the remanufacture and decommissioning of electrical distribution equipment. To address this problem, they formed a waste prevention team known as RWASTE-Reducing Waste At Source 'Til Eliminated. The team was able to reduce the amount of contaminated debris by using a number of approaches including: installing a water/oil filtration system to separate the PCB-contaminated oil; conducting awareness and identification training for PCBs and other wastes; compacting drums; and, modifying containment equipment. They also established a waste tracking system based on the number of units processed through the facility. This system allows them to measure the actual waste reduction achieved during varied processing times and conditions. In 1991, a 50 percent waste reduction was achieved with only a $3,200 investment.

**Imperial Bondware—Shelbyville**

Imperial Bondware manufactures paper and plastic products for the fast food, convenience store, and theater industries. They have implemented a Waste Stream Reduction Process to identify items in their waste stream for reduction
and elimination, to seek opportunities to reduce consumption of materials while maintaining quality, and to increase purchases and use of products made with recycled materials. In 1992 alone, Imperial Bondware saved $443,000 through material reduction and recycling activities, such as reducing the thickness and size of various poly bags, converting to lightweight bottom stock paper, recycling polyethylene trim, reusing shipping containers, purchasing bulk products in reusable totes, and recycling metal scrap.

The company has also established a Total Quality Management process known as The Quest of Excellence Thru People. Several employee task force teams participated in recycling and source reduction projects. An extensive recycling program was established for virtually all solid waste. The paper cup leak test was modified by installing a vacuum leak test. Now only one cup is wasted for every eight cups previously wasted. The hazardous materials used in their processes have been reduced from 23 to 1. They have also substituted water-based ink for solvent-based ink for printing on polyethylene coated paper—an industry first. The facility tracks the amount of waste generated per unit produced to effectively measure waste reduction.

The Interlakes Companies, Inc.  Peoria

Interlakes, a manufacturer of storage racks, worked with their paint supplier to eliminate heavy metals (lead and chrome) from their paint while maintaining a high quality finish. This reduced disposal cost (non-hazardous paint filters) and improved worker safety. They also improved general operating practices in the paint department and thus generated 90 percent less paint waste. In the die shop, chlorinated solvents were eliminated by substituting non-hazardous cleaners. Employees received training in order to understand the reasons and benefits for the change. This cleaner substitution and subsequent employee training resulted in no cleaning waste for disposal. Overall, plant disposal costs were reduced by $189,000 or 79 percent.

Justrite Manufacturing—Mattoon

Justrite manufactures containment systems for flammable and other hazardous materials. For safety can products, they replaced their solvent-based spray paint line with powder coating. This reduced paint-associated waste and volatile organic compound emissions from this line by 100 percent. They also achieved a higher quality paint finish and improved worker safety. By investing in the powder coating system they not only reduced disposal costs, but also reduced operating costs (higher quality, less rework and reject), reduced energy costs for make-up air, and reduced clean-up and liability costs.

Kraft Food Ingredients—Champaign

Kraft refines, processes, and packages edible oil. Kraft has initiated a program for the land application of wastewater treatment plant sludge that was previously landfilled. This not only resulted in the consumption of less landfill space but also provided a beneficial fertilizer to the soil. Kraft also recycles their spent bleaching clay, used nickel catalyst, waste steel, corrugated cardboard, and soda
cans. Kraft estimates they now divert approximately 600 tons per year of material that would otherwise have been landfilled.

**Medi-Physics, Inc.—Arlington Heights**

Medi-Physics manufactures and distributes radiopharmaceuticals used in diagnostic and therapeutic nuclear medicine, and therapeutic radioactive sources used in the treatment of cancer. Medi-Physics designed and implemented a new process to replace acid dissolution of enriched targets used to produce short-lived isotopes. The new process uses chemical engineering technology to mechanically enhance the removal of the isotopes from the targets. The new process eliminated the isotope by-product and enhanced the yield of the needed isotope. The process modification resulted in a 52 percent reduction in lost raw materials for a savings of $76,000 per year. The amount of long-lived isotope in the corrosive waste stream was reduced by a factor of 2,000, reducing Medi-Physics' waste disposal costs by $10,000 per year. Medi-Physics utilizes employee teams to conceive, develop, and implement pollution prevention projects.

**Mobil Oil Corporation—Joliet**

Mobil Oil’s Joliet Refinery processes crude oil into premium petroleum products. The refinery has established a core team, known as the Waste Minimization Committee (WMIN), to coordinate, track and ensure timely implementation of the pollution prevention program, projects, and procedures. This team has representatives from all departments at the facility. The facility has implemented a comprehensive program to track waste generated for off-site disposal and for wastes generated for recycle/reuse. This program includes color-coded dumpsters for various waste types. Monthly reports generated from this waste tracking program not only promote employee waste awareness but also provide specific focus areas for the WMIN committee. This program is being expanded to include waste management cost allocation to the specific waste generator. The WMIN team focused on residual oil and debris, the largest contributor to off-site landfill disposal. By training employees on source reduction and proper spill clean-up procedures, this waste stream was greatly reduced with a savings of over $85,000 in disposal costs alone. A new vessel design also allowed Mobil to recycle oily solids generated from their wastewater treatment facility and thus save over $500,000 in disposal costs. Source reduction techniques, such as review of operating procedures and process engineering modifications, were applied to spent caustic solids and caustic debris waste streams resulting in reduction of both. Mobil has also established a WMIN subcommittee to address general solid waste.

**Morton Metalcraft—Morton**

Morton Metalcraft (MMC) manufactures metal components. HWRIC staff visited Morton Metalcraft’s manufacturing facility to discuss their pollution prevention activities and to conduct a preliminary assessment of their plant operation to determine where wastes are generated and how they might be reduced. HWRIC also worked with the company to develop a facility pollution prevention pro-
gram and provided information and a presentation on program development. HWRIC staff continue to provide technical information to MMC as requested and have assisted with the company’s adoption of powder coating. The old painting process generated approximately 18,000 gallons per year of raw waste. Some simple source reduction efforts reduced this to 17,000 gallons. By installing an on-site solvent distillation unit, Morton was able to reduce off-site disposal to approximately 6,000 gallons (still bottoms) while recovering solvent for reuse, thus reducing their raw material purchases. This resulted in a savings of $43,000 per year in disposal costs alone. Although Morton invested $30,000 in this unit, they realized a payback period of less than 8 months.

Motorola, Inc.—Schaumburg

Illinois facilities of Motorola manufacture electronic products including cellular telephones, two-way radios and base stations, ballasts for fluorescent lighting, parts for the automotive industry, and personal paging systems. Motorola has a strong commitment to pollution prevention with emphasis on source reduction, reuse, and recycling. In 1989, Motorola made a corporate-wide commitment to eliminate the use of chlorofluorocarbons (CFCs) and other ozone depleting compounds by the end of 1992. These compounds were used primarily to clean printed circuit boards after soldering. Motorola has now implemented a no-clean soldering technology. Not only did this eliminate 100 percent of ozone depleting substances, but it also reduced production time and eliminated the CFC-based cleaning equipment which has since been decommissioned and scrapped. This resulted in a cost savings from avoided solvent purchases of over $100,000 per year for the two Cellular Subscribers Group facilities that had been using CFCs. The solder system greatly reduces volatilization of solvents, thereby limiting volatile organic compound emissions. Nitrogen hoods were also installed to reduce the oxidation of the solder, thus reducing the amount of lead-bearing solder waste.

Motorola has also established a team of employees, known as the Green Team, to address their packaging material problem. Motorola estimated that approximately $50 million per year was spent on packaging material, most of which was eventually landfilled. The Green Team focused on source reduction techniques to redesign packaging in order to reduce the amount of material used in Motorola products and to implement packaging reuse programs between facilities. The team also worked with vendors and suppliers to provide materials in reusable containers. In addition, the team prepared packaging guidelines for the Motorola employees involved in product packaging. Cost savings are expected to exceed $5 million.

HWRIC staff have been working with Motorola on establishing a pollution prevention program. Pollution prevention staff have regularly provided Motorola with case study information relating to their various businesses. Since the new USEPA administration identified pollution prevention as a top priority, Motorola has increased interest in formalizing a corporate-wide program. HWRIC staff made a presentation to their Environmental Council meeting on developing a comprehensive program. Copies of this presentation have also been provided to their corporate environmental department. HWRIC will con-
continue to work with both the corporate environmental department and the Communication Sector to further pollution prevention efforts and implement a program.

**MPI Label Systems, Inc.—University Park**

MPI Label Systems, Inc., a label print shop, operates a 6-color press. They switched from traditional alcohol-based inks and alcohol solvent cleaning agents to water-based inks and aqueous cleaning agents. This switch was successful due to cooperation between the ink manufacturer and the printer. The water-based ink required a number of changes in methods and procedures including changes in paper stock requirements, customer approval for use of water-based inks, and process modifications. As a result of these process modifications, solvent emissions to the plant air have been reduced approximately 80 percent. The toxicity of the gaseous and liquid waste have also been reduced approximately 90 percent. Hazardous liquid wastes have been eliminated, although wastewater sent to the sanitary sewer has increased. Solid wastes have remained relatively unchanged. The annual savings resulting from the ink and cleaner change are as follows: $15,000 less spent on waste disposal and handling; $500 in lowered insurance premiums; and, $1,000 saved by being able to reuse wiping materials. This overall savings per year is $16,500.

**Navistar International Transportation—Melrose Park**

Navistar has established a Source Reduction Committee made up of members from every business unit of the plant. This team established goals to reduce volume and toxicity of wastes, obtain environmentally acceptable raw materials, and implement recycling programs. The team then targeted streams for reduction due to volume, toxicity and cost. They developed a plan to address each of five streams. Team members worked with their coolant vendor to develop a new coolant containing no diethanolamine—their number one Toxic Release Inventory chemical. They also worked with their paint manufacturer to eliminate the use of methyl ethyl ketone in their paints. Navistar installed a coolant repolishing unit to reduce coolant waste and replaced Stoddard solvent with non-hazardous cleaners in part washers. They also implemented an office recycling program. In addition to these activities, Navistar has developed a smokeless diesel engine to be on the market in time to meet Clean Air Act regulations for diesel vehicles.

Additional activities by the Source Reduction Committee include: replacing a CFC-based cold cleaning solvent used in the Receiving Inspection and Quality Control Department with a natural based solvent containing no ozone depleting chemicals; installing a new fully contained airless blast cleaning unit to remove rust and scale from parts prior to machining, resulting in a 42-ton reduction in annual particulate matter emissions; contracting with Safety-Kleen to recycle the ethylene glycol used in the engineering test cell for diesel engine development; and, implementing a paint gun recycling system with Safety Kleen to eliminate paint gun cleaning solvent, resulting in a yearly savings of $3,800 in disposal and new solvent purchases.
Navistar also operates a Parts Distribution Center (PDC) in West Chicago that implemented several activities to reduce their solid waste stream consisting primarily of used cartons, pallets, and other packaging materials. Corrugated containers received from vendors are now reused to ship orders to customers. Other corrugated materials, paper, and damaged pallets are recycled. Shrink wrap from incoming shipments is reused as dunnage in export orders. Pallets and other containers are reused wherever possible. The PDC estimates an 80 percent reduction in landfilled materials from 1989 to 1992 from their source reduction and recycling efforts which translates to savings of $67,240 in avoided disposal costs.

HWRIC began working with Navistar after they won a Governor’s Pollution Prevention Award in December 1992. Center staff visited their Melrose Park facility for an awards representation for all shift personnel. Navistar will be using the Center’s pollution prevention program development guide, Pollution Prevention: A Guide to Program Implementation, company-wide. They plan to modify it to be Navistar-specific then distribute it to their other facilities. A presentation on pollution prevention program development was made to all facility line supervisors at their daily production meeting.

Nichols-Homeshield, Inc.—Chatsworth

Nichols-Homeshield, a metal parts fabricator, implemented several pollution prevention activities. They formed a problem solving team with employees from the punch press department to eliminate the use of a methylene chloride-perchlorethylene solvent mixture. The team determined that a caustic water solution could clean the drop outlets effectively and safely thus eliminating waste disposal and raw material purchase costs for the solvent. Labor costs were also reduced. Another activity was the reduction of coolant application by installing a misting application system to eliminate the need to flood the products with coolants. Management worked with the employees to implement this project. The result was reduced disposal and coolant costs and also improved product quality and reduced down-time necessary to clean out the used coolant. They also replaced petroleum naphtha solvent with a non-toxic cleaner and began purchasing other cleaners in bulk to eliminate drums. Employees have also initiated a project to use solvent distillation still-bottoms as a paint reducing agent for the coil coating department. This initiative resulted in a $3,000 per year savings in waste disposal and raw materials purchases. Another project implemented was a counter flow coil washing and rinsing process that reduced water usage by 67 percent, saving $5,000 annually in operating costs. An inventory tracking system was also implemented and reduced paint waste associated with end-of-shelf life by 110 gallons annually. Nichols-Homeshield has management commitment to their pollution prevention program, including an environmental steering committee which encourages employee involvement teams to improve quality, reduce waste and respond to environmental concerns.

North American Lighting, Inc.—Flora

North American Lighting (NAL) previously used Freon in a sonic cleaning process. They found that high pressure air blasting was an inexpensive alterna-
NAL achieved a savings of over $200,000 per year by eliminating the purchase of 4,400 gallons of Freon on an investment of $30,000 for the air blast system. This change also resulted in eliminating 22.5 tons of VOC emissions from the Freon system.

**Office of Printing Services/Univ. of Illinois—Champaign**

The Office of Printing Services (OPS), an in-house printer for the University of Illinois, operates offset presses. Through OPS's cooperation, HWRIC was able to make a comparison of the waste generated when using soy-based inks versus petroleum-based inks. OPS performed a work-and-turn run on a 6-color press using soy-based inks on one side and petroleum-based inks on the other. Both sides of the paper had identical text and graphics. No major process modifications had to be made to switch from petroleum-based to soy-based inks.

HWRIC staff collected samples of the soy-based and petroleum-based inks, blanket washers, and roller washers. Measurements on the amount of ink, blanket and roller washers used for each run were also taken. The samples were analyzed for total solids in HWRIC's laboratory. Based on the measurements taken and analyses performed on the samples, the following conclusions were determined: 1) soy-based inks had about 80 percent less volatile components, which contribute to air pollution, compared to petroleum-based inks; 2) about 10 percent more petroleum-based ink than soy-based ink was required to complete identical print runs; and 3) more than 99 percent of air emissions were from solutions used to clean the press compared to those given off by either type of ink.

One method suggested by HWRIC to reduce these air emissions is to install automatic blanket washers which would reduce the amount of cleaners used, and therefore emissions to the air. Using information obtained from a vendor of automatic blanket washers, HWRIC calculated that the purchase of this technology for OPS's 6-color press could lead to savings of approximately $38,000 per year with a return on investment in 2.3 years.

**Olin Corporation—East Alton**

The Olin-East Alton facility produces and distributes brass and brass alloys as well as Winchester ammunition for both private and public sector clients. Since 1990 Olin has had a "Total Chemical Management" program that evaluates processes, identifies chemicals used and the wastes they generate, and identifies and implements techniques to reduce usage of these chemicals. Multi-disciplinary teams from the various production areas are in charge of the evaluation process. Some of the projects that were undertaken by the teams include: a 79 percent reduction in the use of the solvent trichloroethane (TCA) by reformulating an existing product; the use of alternative products; equipment modification; and, product elimination. Mineral spirits that were used throughout the facility for parts cleaning were reduced by 88 percent through one of two methods—substituting water-based cleaner or use of an industrial cleaning machine that is effective without the use of liquid cleaners. In the Winchester production area, bullets were cleaned using a combination of corn cobs (cob meal) and TCA as the
tumbling media. Lead from the bullets was present in the waste, requiring special disposal practices. To improve this process, the tumbling media was replaced with Triple Super Phosphate which encapsulates the lead so that the metals cannot be leached. This project alone saved Olin a total of $132,665 in raw materials and disposal costs.

**P & H Plating—Chicago**

Reducing waste in the electroplating industry is important as the metal finishing process uses chemicals that are not only toxic but also resistant to degradation or decomposition. The process modifications used at P & H Plating are waste reduction options available for all electroplaters. First, an existing zinc cyanide plating line was changed to an alkaline non-cyanide zinc bath. Second, a closed loop system to treat plating rinsewater from the modified plating line was installed so that plating chemicals were recovered and the water purified. The goal was to return both the recovered zinc and the clean water to the plating line for continued use. The recovery/recycle system successfully treated the rinsewater and facilitated the recycling of the treated rinsewater and the precipitated zinc. The elimination of cyanide from the plating process resulted in: line workers dealing with a less toxic plating bath; compliance with disposal regulations was made easier; and, treatment and disposal costs for the company were reduced. The recycling of the water and zinc further reduced the costs for treatment and disposal. The company estimates that is saves approximately $17,000 per year in operational costs with this system.

**R. B. White, Inc.—Bloomington**

R. B. White, a sheetmetal fabricator, uses an aqueous degreasing/phosphating process to remove oils from metal and to apply a rust inhibitor prior to painting. HWRIC engineers tested various ultrafiltration membranes on R.B. White’s cleaning bath and demonstrated the effectiveness of this technology at the pilot scale. HWRIC engineers then helped the company install an ultrafiltration unit into the company’s process line in order to remove emulsified oils from the bath and to recover the phosphating and cleaning agents. Prior to the installation of the ultrafiltration system, this 5,000 gallon degreasing/phosphating bath was disposed of approximately every three months. Once the ultrafiltration system was operating, oils were continuously removed from the bath, thus generating only about 100 gallons of waste per year. The phosphating and cleaning agents now mostly remain in the bath, thus reducing the requirements for new chemicals. R.B. White saves approximately $30,000 per year from reduced disposal and chemical costs.

**R. R. Donnelley & Sons—Mattoon**

R. R. Donnelley operates large printing facilities. In 1990, their Mattoon facility generated 31,700 gallons of waste gravure ink and 17,800 gallons of waste cleaning solvent. By modifying their process, some of the ink and solvent were gradually fed back into the ink supplies for the printing press. This reuse resulted in a total waste volume reduction of 16,900 gallons per year, or 34 percent.
**Shell Oil Company—Wood River**

Shell Oil Company’s Wood River petroleum refinery manufactures primarily gasolines, fuel oils, asphalts, and lubricants. In 1992, Shell achieved significant solid waste reductions at their wastewater treatment plant. Analysis of their primary solids from the wastewater treatment plant indicated that a large percentage of these solids were calcium carbonate. By adjusting the pH of the neutralization process, thus preventing the calcium from precipitating, and reducing the lime used in the sludge dewatering process, they reduced their sludge volume from 8,705 tons to 2,901 tons. Slop oil emulsion solids were also reduced from 4,553 tons in 1991 to 973 tons in 1992 by decreasing the oil entering in upstream sewers through operator education on proper handling practices and by installing low shear pumps to reduce the generation of stable oil/water emulsions. Based on the avoided disposal cost of the wastewater treatment primary solids at $195 per ton and the slop oil emulsion solids at $170 per ton, Shell estimates they saved $1.2 million in 1992. The payback period was less than 2 months for the revisions to the wastewater treatment neutralization system and less than one year for the new slop oil sludge pumps.

**Stimsonite—Niles**

Stimsonite, a manufacturer of highway safety devices such as reflectors, signs and sheeting, fill plastic shells with an epoxy material in one step of their manufacturing process. Previously this epoxy was provided in drums. Stimsonite worked with the vendor to purchase the material in reusable totes. These totes held the equivalent of 6 drums, yet only occupied the space of four drums banded together. The use of these totes resulted in a cost savings of approximately $40,000 in avoided drum disposal costs. Reusable containers were also employed in other areas, reducing landfill waste. The company received a $12,000 cost break from one of their suppliers for using the reusable totes. In addition, the company has implemented a comprehensive recycling program which provided a cost savings of $8,000 per year in disposal costs.

**Sun Chemical—Northlake, Kankakee, and Chicago**

Sun Chemical manufactures specialty inks and chemicals. They reduced the generation of two waste streams at the Kankakee facility. The first waste stream eliminated through process modifications was 95,000 pounds per year of spent non-halogenated solvents. The spent solvent waste stream was generated from a sampling valve manifold used for assuring product quality. The ink manufacturing process was modified to directly reintroduce the samples into the product line. The resulting payback from this process modification has resulted in Sun Chemical saving $75,000, including recovered raw material costs and avoided waste disposal costs. Additionally, the corporation reduced the amount of solid, flammable hazardous waste from 60,000 pounds to 54,000 pounds. A steam stripper was installed to remove the volatile organic compounds from the spent filter media (solid, flammable hazardous waste) resulting in 36,000 pounds of recovered and reused toluene and 6,600 pounds of contaminated and reused water. Sun Chemical is committed to pollution prevention and has a team in
place to continuously assess waste reduction opportunities and quality improvements.

Sun Chemical’s General Printing Inks Division in Chicago produces packaging ink for the printing industry. The products are manufactured with various solvents, including toluene, ketones, acetates, alcohols, ester, resins and pigments. In 1990, the company was able to reduce their volume of waste from 227,313 gallons to 198,215 gallons. At the same time, the pounds of ink they produced increased from 36 million to 41 million pounds. Overall, the facility achieved 13 percent waste reduction in 1990. They were able to do this by implementing the following: dedication of equipment to specific products, reuse of water rinses into products; reuse and reclamation of cleaning solvents; quality controlled production; and, waste reduction training.

The Northlake facility has dramatically reduced waste associated with equipment washing by implementing better production planning methods. They now process more compatible batches of chemicals through specific equipment to reduce the need for cleaning after every batch. Some equipment was dedicated to certain product lines, thus completely eliminating the need for cleaning between batches. This resulted in a waste reduction of 28 percent while increasing productivity by 13 percent. Sun’s Northlake facility estimates they save $20,000 in labor costs and $162,000 in disposal costs as a result of implementing this system.

**Sundstrand Aerospace—Rockford**

Sundstrand, a manufacturer of aerospace components, formed a waste minimization committee to respond to environmental concerns regarding the generation of waste and the use of CFCs in the manufacturing process. A directive to eliminate the use of CFCs by 1994 had been issued by division management. Sundstrand has implemented several projects to reduce or eliminate waste generation at their Rockford facilities, as well as other facilities nationwide. By switching to aqueous degreasing or less hazardous solvents for cleaning, Sundstrand has reduced their CFC usage and their 1,1,1-trichlorethane usage by as much as 90 percent at some Rockford facilities. A high-volume low-pressure (HVLP) painting system was also installed to reduce overspray emissions and paint consumption. Sundstrand also implemented a comprehensive paper and cardboard recycling program. In 1992, Sundstrand saved $380,000 through their waste reduction and recycling efforts.

**Tellabs Operations, Inc.—Lisle**

Tellabs designs and manufactures voice, data, and digital telecommunications equipment. Since 1988, they have been working to reduce the CFCs used in their wave soldering operations. By implementing a no-clean flux process, they reduced CFC use in 1992 by 78 percent, thus saving $930,000 in material costs to date. They are also moving to a spray fluxing process to reduce raw material consumption and hazardous waste generation, with an expectation of saving nearly $90,000 per year. Tellabs also uses closed-loop recycling for their solder residue.
UNO-VEN, a petroleum refining company, manufactures and markets products under the “76” brand. UNO-VEN implemented a pollution prevention project known as the “Desalter Effluent Treatment Process” to reduce the load of benzene, toluene, ethylbenzene, and xylene (BTEX) in the desalter effluent water to the wastewater treatment (WWT) system. This has allowed them to comply with the new national emission standards for hazardous air pollutants for benzene emissions at the WWT system. UNO-VEN installed a hydroclone to separate the desalter effluent into a water portion and an oil portion. The oil portion is returned to the crude charge to be rerun with the crude oil feed. The water portion is commingled with a heated water stream and sent to a low-pressure flash vessel. The vapor from the flash vessel, which contains the benzene and other hydrocarbons, is directed to the crude distillation tower overhead system. The bottom product from the flash vessel, the desalter effluent water, is then pumped to the WWT system. By installing this process, UNO-VEN recovers 90 percent of the BTEX in the desalter effluent stream (22,500 pounds of benzene and 54,000 pounds of total BTEX per year). This resulted in a cost savings of $7,000 per year in treatment costs and an avoided cost of approximately $1,000,000 in capital expenditures that would have been required to meet the national emission standards for benzene.

Viskase Corporation, a manufacturer of food casings, has implemented a number of pollution prevention techniques resulting in significant reduction in waste generation. Good housekeeping and preventive maintenance modifications have included the elimination of all PCB containing capacitors, eliminating the potential for releases of PCBs in the event of a leak; the provision of secondary spill containment for hazardous chemical storage tanks and for truck and railcar unloading areas, eliminating the potential for accidental release to the environment from a leak, overflow, or unloading incident; and, leak detection and fail-safe pump shut-offs to protect workers and the environment from carbon disulfide releases due to equipment malfunctions.

Viskase has also reduced the emission of carbon disulfide per pound of product by 12 percent since 1988. A new unloading and storage system has eliminated about 5,000 pounds per year that would have been released to the environment. Sulfuric acid use was reduced 20 percent by upgrading an evaporator system and the wastewater pH control system. Releases of 300,000 pounds of ammonium sulfate have been eliminated by upgrading an evaporator and other system modifications. About 32,000 pounds per year of chlorinated solvents have been eliminated by substituting non-hazardous aqueous-based degreasers.
SECTION TWO

Pollution Prevention Technical Assistance Efforts

In 1986, HWRIC's Pollution Prevention Program was established as a long-term approach to solving Illinois' waste management problems. An effective pollution prevention program looks at all wastes and releases to air, land, and water. HWRIC's program encourages companies to look at the flow of materials through their facilities, to identify where and why wastes are generated, and to identify ways of reducing these wastes. The descriptions below provide examples of types of work HWRIC has undertaken at the request of these companies. These companies are not yet at a stage where they can provide documented cost savings associated with their pollution prevention programs or projects. We include them here as further examples of pollution prevention activities occurring in companies throughout Illinois. As a non-regulatory agency, all recommendations provided by HWRIC are advisory only.

Abbott Laboratories—North Chicago

Abbott is a major manufacturer of pharmaceuticals and other health care products. HWRIC has worked with Abbott to develop a corporate-wide pollution prevention program and carried out a preliminary assessment of Abbott's printing operation. An assessment report and recommendations were provided to Abbott. One recommendation for the printing operation, converting to soy-based ink from petroleum inks, has been implemented.

HWRIC staff met with Abbott's environmental staff to discuss their pollution prevention activities and to tour their North Chicago manufacturing facilities. As discussed at this meeting, Abbott developed a management commitment statement and a corporate-wide pollution prevention plan for distribution. HWRIC periodically assists Abbott as they adapt this plan to the plant level and identify further pollution prevention opportunities. HWRIC staff have also provided additional pollution prevention training to Abbott personnel.

A.O. Smith—Granite City

A.O. Smith manufactures automotive structural components at their Granite City facility. Presses stamp and shape the various parts. In order to reduce press wear, petroleum-based lubricants are applied to the parts prior to stamping. During the cleaning operations which follow, the lubricants are emulsified into the wash and rinse water and, prior to this project, were ultimately discharged to the sanitary sewer. HWRIC engineers worked with A.O. Smith personnel to test an ultrafiltration system to remove the oil emulsion from the wash water thus enabling the wash water to be recycled. Based on the results of this testing, A.O. Smith designed and fabricated an ultrafiltration system for use in their facility.
HWRIC engineers worked with railroad personnel to develop a pollution prevention program. Assistance included developing a corporate pollution prevention statement, setting up and participating on a pollution prevention team, quantifying and assigning costs to various waste streams, and examining alternatives for reducing waste. Pilot scale ultrafiltration testing was performed by HWRIC to evaluate this technology for recycling a caustic cleaner to clean locomotives.

As a major manufacturer of electric motors, G.E. was concerned with their oily wastewater. This 4,000 gallon per month waste stream was produced in association with metal cutting and cleaning operations. HWRIC engineers conducted bench scale oil/water separation and ultrafiltration tests to determine if these technologies could effectively treat this waste stream. Results of the testing were very encouraging and the company plans to rent full-scale systems to perform pilot testing at their facility.

Illinois Benedictine College has converted its educational laboratories to microscale glassware and experimental apparatus. Through this conversion, lab chemical usage has been reduced by 95 percent or more. This has resulted in improved environmental control by reducing amounts of spent chemicals requiring disposal. Significant cost savings have been achieved through reduced chemical purchases. Funding was provided by HWRIC to conduct training workshops on this change in methodology for other educational institutions.

HWRIC has developed an on-going relationship with Illinois Power, a major utility in Central and Southern Illinois. HWRIC hosted a pollution prevention training seminar at their Decatur facility which led to their desire to develop a program of their own. HWRIC staff have provided assistance with pollution prevention program development and recycling opportunities for various materials.

HWRIC began working with their recycling team members from the Urbana maintenance facility to identify the types and quantities of waste generated at the facility. An initial assessment was conducted with the team members to identify waste reduction opportunities and to familiarize their staff with the assessment procedure. This allowed Illinois Power staff to develop skills to conduct further assessments at other facilities. A report was prepared for the corporate environmental department presenting pollution prevention options for all areas investigated, including office departments and maintenance crews, identified by the team and HWRIC. The report was then presented to the Urbana facility manager by the recycling team. Following the recommendations presented in the report,
Illinois Power is implementing some pollution prevention activities at their Urbana maintenance facility and at other facilities throughout the state. HWRIC has also provided the team members with case studies and other information dealing with utilities and automotive maintenance shops. The Center and Illinois Power co-sponsored a conference on pollution prevention for the utilities' Granite City area customers.

**Jostens—Princeton**

HWRIC staff visited Jostens' two facilities in Princeton: one manufactures plaques and the other custom jewelry. Program staff met with Jostens personnel from both facilities to discuss pollution prevention activities and made a presentation on program development to their plaque manufacturing safety committee (comprised of employees from all departments). HWRIC provides information on technology alternatives pertaining to etching and electroplating processes, and pollution prevention techniques to both facilities as requested.

**Outboard Marine Corporation—Waukegan**

OMC manufactures component parts for outboard motors and stern driven engines at their Waukegan facility. Approximately 4 million pounds of die cast and oily waste were generated annually at this facility. These materials comprised approximately 47 percent of the facility's total waste and were made up of die lubricants, machine sump oil, hydraulic components and water soluble coolants.

HWRIC engineers worked with OMC personnel to evaluate three technologies using different types of equipment in order to reduce the die cast and oily waste volume. The three technologies evaluated included: 1) ultrafiltration, 2) vacuum evaporation, and 3) atmospheric evaporation. Results of this testing indicated that all 3 technologies could reduce this waste volume by over 90 percent. Additionally, the water produced from these technologies could be reused within the facility for makeup of fresh die lubricant. The ultrafiltration system was ultimately selected by OMC for permanent use in the facility due to economic considerations. An economic assessment of the 3 technologies indicated that the ultrafiltration system would payback in about 1.19 years while the vacuum evaporation and the atmospheric evaporation systems would require 1.48 and 1.51 years, respectively.

**Pre-Finished Metals/Material Sciences Corp.—Elk Grove Village**

Pre-Finished Metals, a subsidiary of Material Sciences Corporation, is a coil coating company that HWRIC helped to develop a pollution prevention team. Presentations on developing a pollution prevention program have been provided by HWRIC staff to different environmental management groups working for several Material Sciences Corp. facilities. HWRIC engineers also investigated alternatives for recycling solvent wastes for the company.
USET staff worked directly with HWRIC personnel to develop a process using surface chemistry principles and emulsion formation theory to treat oily sludges. These sludges are the solidified materials which accumulate in the bottoms of tanks associated with oil fields, pipelines and refineries. Approximately 330 gallons of sludge was removed from a pipeline storage tank in southern Illinois and brought to HWRIC’s pilot laboratory facility for process development testing. The treatment system developed in this project is accomplished in three steps: 1) emulsification of the tar-like sludge by mixing in water, diesel fuel and emulsifiers to lower the sludge’s viscosity and make it pumpable, 2) centrifugation of the emulsified material through a solid/liquid centrifuge to remove dirt, scale and other contaminants, and 3) centrifugation of the oil/water emulsion through a liquid/liquid centrifuge to separate the oil from the water.

The composition of oily sludges varies considerably from site to site. The sludge used in this project was comprised of approximately 69 percent oil, 22 percent water and 9 percent solids. The oil generated from this process is approximately 98 percent pure and can be introduced into the refining process. The water can be reused in other processes or ultrafiltered and discharged to the sewer. The solids are the only remaining waste material and they comprise only about 9 percent of the initial waste volume.

Vermont Foundry Company is a copper base alloy foundry (e.g. brass and bronze) which produces castings for bathroom fixtures, pressure vessels, drains, gratings, etc. Working with their vendor, the foundry has been able to utilize a citrus-based binder in their core making operation. Citrus binder cores do not have to be segregated and can be blended in with the other sands. This allows Vermont to dispose of their waste sand as an Illinois special waste instead of a hazardous waste. Vermont does reuse 90 percent of the green sand. Left over metal pieces from the melting operation and the finishing operation are remelted in the furnaces. Used drums are reused to ship parts to customers. All sands are run through what is termed the “ball mill.” The ball mill is a series of screens which separates the sand and fines from the brass particles and slag. This metal residue is then sold based on the copper content. The slag and dross that occur during the melting operation are also separated according to copper content and sold as a product. The zinc oxide produced during the melting operation is either sold to a fertilizer manufacturer or traded for zinc. This facility does have programmatic activities in place to implement pollution prevention options such as upper management support, good communication, tracking of waste disposal and cost of waste disposal, and good community relations. HWRIC staff have conducted a pollution prevention assessment at Vermont Foundry Company.
SECTION THREE

Other Types of Assistance Provided by HWRIC to Meet Industry’s Pollution Prevention Needs

Regulatory Success Stories

HWRIC provides confidential, non-regulatory assistance to Illinois citizens and businesses on general environmental management. This can involve analysis of regulatory requirements for existing and anticipated activities, and assistance in setting up systems for the proper physical management of wastes including questioning regulatory agency personnel on possible problems with compliance. In addition to the environmental benefit, HWRIC assistance may help firms save money through avoiding activities that have severe regulatory exposure, avoiding possible future liability and fines from improper management of wastes, and finding ways of correcting non-compliance. Referrals to other sources of help are an important component of HWRIC’s assistance efforts.

Automotive Parts Manufacturer

An automotive parts manufacturer considered developing a new line of products that use approximately one million pounds per year of barium hydroxide as a raw material. HWRIC personnel assisted by providing an analysis of the environmental regulatory requirements for the management, use, and disposal of barium hydroxide. This information allowed the firm to properly evaluate the cost of managing the material and to prepare an economic evaluation of the proposed project.

Central Illinois Municipality

A city in central Illinois had been storing old capacitors and transformers behind its public works building, not realizing that some of them contained polychlorinated biphenyls (PCBs) which were leaking onto the soil and contaminating it. A cleanup was accomplished as soon as the problem was discovered, but they still needed to dispose of the existing transformers and capacitors. HWRIC personnel assisted the city in locating a firm that could manage these materials, thus saving the city about $20,000 in disposal costs.

Environmental Group

HWRIC personnel assisted an Illinois environmental group with evaluation of an oil refining technology. The group was working with a northern Illinois refinery to assess its pollution prevention activities and was concerned about the dangers of the use of hydrogen fluoride in processes at the plant. They were interested in learning about possible alternatives to this process. HWRIC personnel examined the process and provided the group with a summary of possible alternative processes.
**Illinois Road Authority**

HWRIC personnel assisted an Illinois based road authority with the evaluation or proposals for asbestos abatement at several of its buildings and also provided general information on effective environmental management to assist the authority in their future property dealings.

**Metal Finisher**

HWRIC personnel assisted a metal finisher with wastewater treatment problems. The firm was exceeding copper limitations on its effluent to the local sanitary district and had been warned that they would need to come into compliance. HWRIC personnel inspected the facility and discovered that there were problems with waste water flow in excess of the design capacity of the treatment system, and that there were operational and quality control problems with its use. Recommendations were given to improve maintenance of the system, change the way in which operational parameters were measured, and to institute a water use reduction plan in the process areas.

**Metal Manufacturer**

HWRIC personnel assisted staff of a metal manufacturer in an evaluation of regulatory requirements for operation of a wastewater treatment system. There was a concern that the operations might be regulated under the Resource Conservation and Recovery Act (RCRA). This would have required either obtaining a RCRA permit to treat the waste water or having the waste water shipped to an outside treatment facility, both expensive options. Examination of RCRA regulations and USEPA policy determined that the operation would not be subject to full RCRA regulation. This allowed the firm to save a great deal of money by treating the materials in-house. The cost for obtaining a permit would have been approximately $50,000, and would have added several thousand dollars per year to their operating expenses.

**Private College**

HWRIC assisted a small liberal arts college with an evaluation of its waste management practices and an assessment of its future needs. Waste management problems existed in three areas: laboratory wastes, janitorial wastes, and maintenance wastes. HWRIC personnel recommended methods to improve management and inventory practices, and provided information on proper avenues for disposing unusable material.

**Shelving and Cabinet Manufacturer**

A shelving and cabinet manufacturer was concerned that it might be subject to the new Clean Water Act regulations that require permits for the discharge of storm water from certain types of industrial facilities. The need to obtain a permit would have necessitated a great deal of paperwork and expensive analy-
sis of storm water on the part of the facility. HWRIC personnel reviewed the applicable regulations, inspected the manufacturing facility, and provided a synopsis of the storm water permitting requirement as applicable to the company's situation. This saved the firm several thousand dollars in expenses for a permit application and water analysis.

**State Agency**

An Illinois state agency received a notice of violation after an inspection by USEPA. The violations involved improper documentation of waste shipments of solvents sent to a recycling facility. HWRIC personnel examined the notice of violation, provided suggestions on methods to resolve the problems, and drafted a response letter to USEPA. The response was satisfactory, and these actions eliminated possible fines and expenses involved in litigation that could have grown out of the violations.

**Trade Association**

A trade association needed to evaluate the implications of the Clean Air Act Amendments (CAAA) on solvent usage practices of its membership. The CAAA bans certain ozone-depleting solvents commonly used by industry and will necessitate use of a substitute solvent. However, many substitute solvents being considered will also be restricted by the new air toxics provisions. HWRIC personnel assisted the trade group by reviewing the ozone depletion and air toxics provisions of CAAA, and provided information on what solvents would be restricted (and thus more expensive to use). This helped the trade association's members evaluate long-term decisions on solvent selection.
Available Services from the Hazardous Waste Research and Information Center

HWRIC works to help businesses and other entities with their waste management problems. This may involve answering a regulatory question or providing a referral to outside services, to conducting a site visit and waste assessment, or doing a more detailed research and development study on alternative technologies for reducing waste or reusing waste materials. This success story booklet provides examples of Illinois companies who are reducing or better managing waste. In some cases HWRIC played a direct role in providing the help needed to implement a new strategy or technology. In other cases, HWRIC gathered pertinent successes from industries and other organizations in the state.

It is clear from these brief success stories that there is much industry and others are doing to increase operational efficiency, reduce waste, save money and protect the environment. It is our hope that these examples will encourage others to look for similar alternatives within their facilities. The Center is prepared to help in this regard and we encourage all who are considering pollution prevention strategies to call on us for assistance.

Services available include:

- presentations for industry on how to develop a pollution prevention program
- work with industrial facility staff to develop an action plan for incorporating pollution prevention into the company’s way of doing business
- train facility staff in pollution prevention concepts and techniques
- provide guidance manuals, reports, and factsheets on pollution prevention
- evaluate equipment or techniques as applied to pollution prevention in a specific industrial process
- provide technical information to a company in order for them to evaluate modifying their waste generating processes in-house vs. using a vendor
- provide regulatory information and referrals to appropriate sources for assistance
- funding for technology demonstration projects

In addition, HWRIC’s guidance manual, *Pollution Prevention: A Guide to Program Implementation*, presenting HWRIC’s 8-step process to developing and implementing a pollution prevention program is available free of charge.

If you already have a success story at your facility we encourage you to share it. One way to do this is to submit an application for a Governor’s Pollution Prevention Award, usually solicited in the period February through March. These applications, or help in implementing a pollution prevention program, can be obtained by calling or writing HWRIC. Another way is to complete the case study form on the next page and send it to HWRIC for inclusion in future updates of this booklet.
CASE STUDY SUBMISSION FORMAT

Name and Address of Facility:

S.I.C. Code:

Contact Person and Telephone:
(for HWRIC use only)

Description of project, program or technology (explain improvements in process efficiency and how this differs from past practice):

Waste Volume and Toxicity Reduction (volume reductions should be given in mass or volume units but they may also be given as percentages):

Cost Savings and Other Economic Benefits (include savings in disposal, waste management, raw materials, etc.):

Other Benefits (such as improvements in worker safety, community relations, technology transferred or commercialized, cooperative activities with suppliers and/or vendors):

Please feel free to attach additional sheets as needed for any answer
Return to HWRIC: 1 E. Hazelwood Drive, Champaign, IL 61820
## Company Index

### A
- A.O. Smith 23  
- Abbott Laboratories 23  
- Advanced Filtration Systems, Inc. 3  
- AGI Incorporated 4  
- Arens Controls, Inc. 4

### B
- Baxter Healthcare Corp. 4  
- Bulk Molding Compounds 5  
- Burlington Northern Railroad 24

### C
- Caterpillar, Inc. 5  
- CCL Custom Manufacturing 6  
- Chicago Whitemetal Casting 6  
- Chrysler Corporation 6  
- Crosfield Catalysts 7

### D
- DAP, Inc. 7  
- Diamond Star Motors 8  
- Dow North America 8

### E
- Eagle Wings Industries 8  
- Eaton Corporation 9  
- Excelsior Foundry 9

### F
- Four Star Tool, Inc. 10

### G
- G.E. Motors 24  
- G.E. Plastics 10  
- General Tire, Inc. 10  
- Graham Plating 11  
- Griffin Wheel Company 11

### H
- Harris Corporation 11  
- Henry Pratt 12  
- Hevi-Duty Electric 12

### I
- Illinois Benedictine College 24  
- Illinois Power 24  
- Imperial Bondware 12  
- Interlakes Companies, Inc. 13

### J
- Jostens 25  
- Justrite Manufacturing 13

### K
- Kraft Food Ingredients 13

### M
- Medi-Physics, Inc. 14  
- Mobil Oil Corporation 14  
- Morton Metalcraft 14  
- Motorola, Inc 15  
- MPI Label Systems, Inc. 16

### N
- Navistar International 16  
- Nichols-Homeshield, Inc. 17  
- North American Lighting 17

### O
- Office of Printing Service 18  
- Olin Corporation 18  
- Outboard Marine Corporation 25

### P
- P & H Plating 19  
- Pre-Finished Metals 25

### R
- R.B. White, Inc. 19  
- R.R. Donnelley & Sons 19

### S
- Shell Oil Company 20  
- Stimsonite 20  
- Sun Chemical 20  
- Sundstrand Aerospace 21

### T
- Tellabs Operations, Inc. 21

### U
- U.S. Emulsion Technologies 26  
- UNO-VEN Company 22

### V
- Vermont Foundry Company 26  
- Viskase Corporation 22