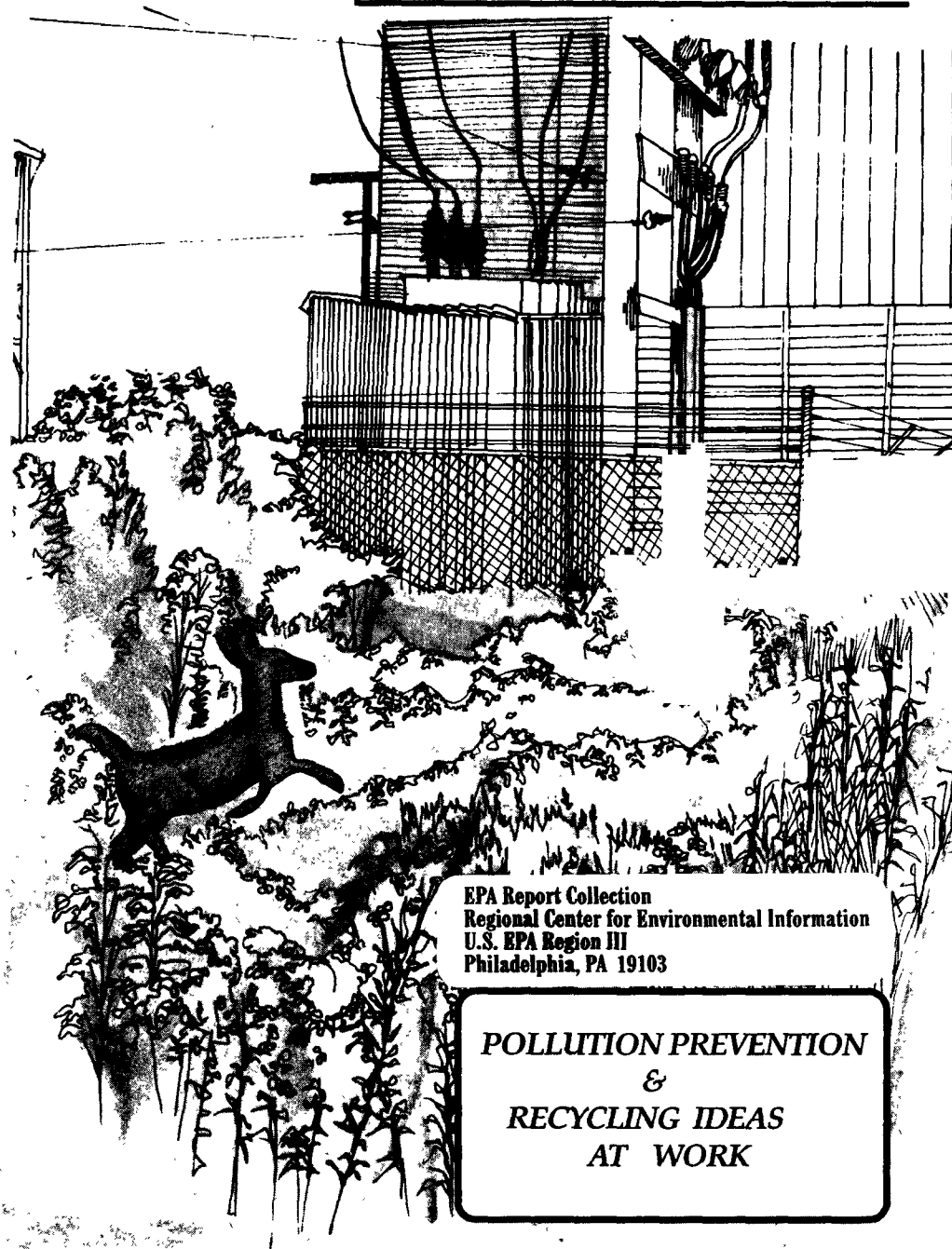




United States
Environmental Protection
Agency
Region III

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Office of External Affairs



EPA Report Collection
Regional Center for Environmental Information
U.S. EPA Region III
Philadelphia, PA 19103

**POLLUTION PREVENTION
&
RECYCLING IDEAS
AT WORK**



Regional Center for Environmental Information
US EPA Region III
1650 Arch St.
Philadelphia, PA 19103

DISCLAIMER:

This publication offers many examples of pollution prevention programs in effect throughout Region III. Company and product names appear only to provide a reference point; their use in no way suggests EPA approval or endorsement. Similarly, non-appearance is not a negative statement.

It is also possible, within the confines of this publication, that a company appearing as an example of a practicable pollution prevention effort could be out of compliance with certain EPA regulations or requirements not related to that effort. That situation neither reduces the viability of the P2 project nor removes the company's responsibility to comply in the other areas.

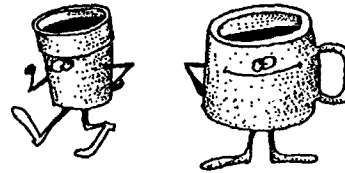
We thank the companies who permitted our use of their examples and acknowledge those who's information we found in the public domain.

***POLLUTION PREVENTION
&
RECYCLING IDEAS
AT WORK***

U. S. EPA, Region III
Regional Center for Environmental
Information
1050 Arch Street (3PM52)
Philadelphia, PA 19103

A New Castle, Delaware company that manufactures rigid polyvinyl chloride (PVC) plastic film has reduced its hazardous waste by over 3200 pounds a year. They did it by changing from leaded to non-leaded lubricating oils in some of their equipment.

A Philadelphia suburban hospital made a simple change in its food service and saved itself an estimated \$8,000 a year in supplies, reduced its disposal costs significantly, and even got some advertising mileage out of it. The hospital accomplished all of that, plus prevented pollution, by selling reusable coffee mugs to replace the disposable polyurethane cups they had been using.



Through a relatively simple procedural change that took more thought than technology, a Navy aircraft repair facility saved itself an average \$8,000 per aircraft in waste disposal costs and reduced its hazardous waste from paint stripping by an average 60 percent. All they did was stop covering the floor under an aircraft with paper while stripping paint.

These initiatives are indicative of a trend now sweeping through American business and industry—SAVE MONEY BY PREVENTING POLLUTION. They are also evidence that pollution prevention (P2) activities don't have to be grand in design to be meaningful.

The next several pages will offer you a look at what some companies, large and small from within the region and beyond, are doing to save money while helping protect the environment. The examples are projects that are in place and working in American business and industry today. They are presented as very brief case studies intended more to stimulate your thought processes than to offer specific answers. They are ideas that are making a difference for their companies, things that you can adopt or adapt to fit your situation, things that are proven to affect profits as well as the environment.

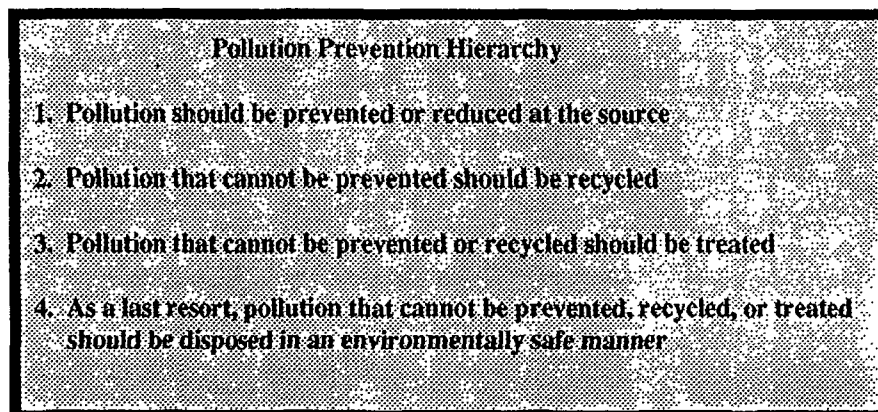
Speaking about the kinds of companies cited, Alfred Marcus, an associate professor at the University of Minnesota's School of Management says "They don't do these things because they are in love with nature. They do it because it's smart."

In a recent speech before the International Institute of Synthetic Rubber Producers, Monsanto's CEO Richard J. Mahoney said "Our waste elimination initiatives will allow us to recoup some of the \$150 million worth of raw materials and energy which each year does not end up in a product for a customer."

P2 is working, for the companies doing it and for our environment. We hope that you'll find something in here that motivates you to join us. Whatever you decide to do, or not do, will leave its mark—if not in your bottom line, most certainly in the earth's.

Although EPA promotes the prevention or reduction of pollution at the source as the preferred action, the Agency recognizes the realities that not all waste can or will be eliminated. There will always be things to discard. Even Allen Hershkowitz, a waste disposal expert with the Natural Resources Defense Council, says "... civilization has its costs. We're trying to reduce them, but we can't eliminate them."

Consistent with that, EPA has established a range of appropriate activities. This "Pollution Prevention Hierarchy" serves as the outline for this publication and as your reference point as you consider your options for improving your fiscal posture through pollution prevention.



PREVENTION AT THE SOURCE

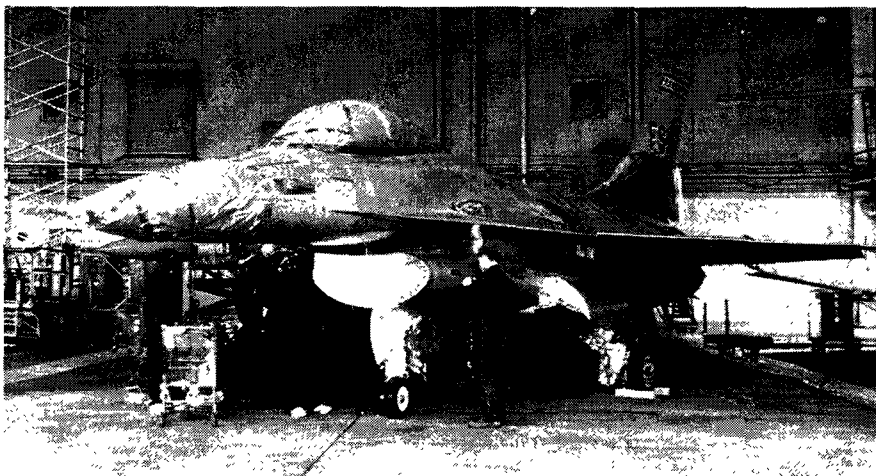
While there are many activities that the general public considers as pollution prevention, EPA's position is that the only way to truly prevent pollution is to stop creating waste up front. Anything less than that yields something which must be disposed of or treated at some point during its life cycle.

This typically requires a change in the manufacturing process or, in some cases, the procedures following production. As you will see, these need not be as drastic or as costly as they would appear at first glance.

EPA strongly advocates this option as the preferred, as the true pollution prevention activity.

PROCESS CHANGES

In the opening example, the Naval Aviation Depot (NADEP), a naval aircraft repair facility located on the Norfolk Naval Base in Virginia, made a simple change in a "we've always done it this way" procedure to achieve a 60 percent reduction, by weight, in hazardous waste and an estimated savings of \$6,000-\$10,000 per aircraft in disposal costs.



U.S. Navy Photo

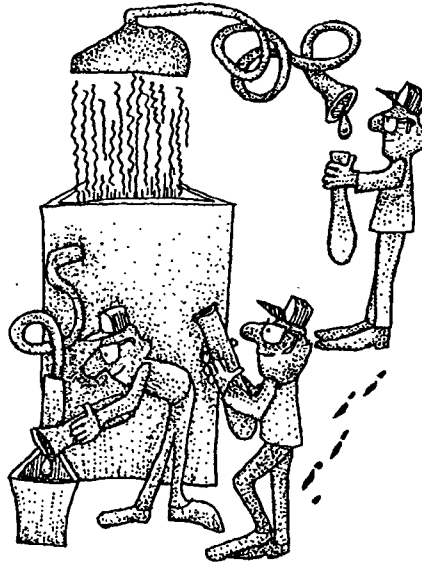
Naval Aviation Depot employees developed a method to reduce hazardous waste emissions and disposal costs by using a new paint stripping method that does away with Kraft paper

****** In the Depot's paint stripping process, solvents used to remove paint from aircraft contribute significantly to the depot's hazardous waste stream. Compounding that, workers routinely covered the floor with a coated paper to catch the droppings. This simple procedure may have been great housekeeping but contributed significantly to their waste disposal problems because it made the paper a hazardous waste.

In other times it had made sense to use the paper to keep the "mess" off the concrete floor and out of the drains. "Today," says NADEP's environmental specialist Kevin Sommers, "we realize we were actually manufacturing hazardous waste, to the tune of an average 20 drums per aircraft." They eliminated the paper, allowing the paint and un-evaporated solvents to drop directly onto the floor. Workers now simply squeegee up the mess, filling an average of four drums per aircraft.

****** In its metal stripping process, NADEP substituted an organic, protein-based solution called B-9 for the more common but more toxic cyanide solution. This reduced the hazardous waste from this process by 75 percent, saved \$15,000 a year, and reduced the amount of other metal-stripping compounds needed because B-9 is more versatile. As a bonus, they also made the process itself safer for the employees.

****** The Joseph Krow Fur, Leather and Suede Co. in North Versailles, Pennsylvania installed an advanced filtration and distillation unit to recover perchloroethylene, a cleaning solvent. The distilled solvent is reused in the leather cleaning process, reaping substantial savings on the purchase of virgin solvent. In addition to that savings, the new system eliminates disposable filter cartridges, meaning a savings in the purchase, disposal, and cleanup associated with them.



**** Tyler Pipe in Macungie, Pennsylvania produces cast iron soil pipe for the plumbing industry. Until recently it had been using a coke-fired furnace to melt the iron, producing vast amounts of sludge from an exhaust scrubber; the company was spending as much as \$300,000 a year to dispose of it.**

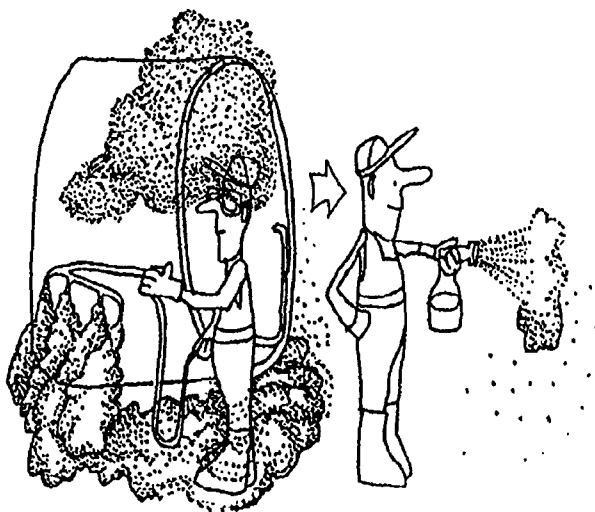
To remain fiscally viable, Tyler converted to electric induction furnaces, which yield only small amounts of dust requiring treatment and disposal, and which requires no water treatment. In addition, the process reduced energy consumption, reduced loss of metal through oxidation, and substantially reduced the amount of hazardous waste and related disposal costs. Tyler estimates first-year operating savings of \$10 - \$12 a ton.

**** The General Dynamics Land Systems plant in Eynon, Pennsylvania initiated a comprehensive hazardous waste minimization program in 1984. From 1984 through 1991, the program has resulted in a 96 percent decrease in hazardous waste generation (1122 tons annually to 49 tons). The decrease is attributable to one or more of the following approaches: 1) administrative controls; 2) materials substitution, and 3) engineering changes. The facility anticipates additional reductions in 1992 resulting from the application of more stringent administrative controls and the introduction of a solvent recovery system.**

**** The coatings on medicinal capsules and tablets are traditionally solvent based. Merck & Co, in West Point, Pennsylvania, has developed a water-based film coating that has reduced chloroform and alcohol emissions by ten-fold. Similarly, 3M's pharmaceutical unit developed a water-based coating for its tablets which, although costing \$60,000, resulted in a 24 ton annual reduction in air pollution, a \$180,000 savings in pollution control equipment, and a \$15,000 annual savings in material costs.**

**** To eliminate the use of mercury bearing Thimerosal in one of its biological manufacturing processes, Merck's pharmaceutical and research plant in West Point, Pennsylvania, has developed, tested, and received FDA approval for a substitute agent.**

**** At its plant in Danville, Pennsylvania, Merck eliminated a caustic purification step in one of its drug manufacturing processes merely by changing the quantities of the ingredients. In doing so, it has reduced air emissions, reduced flow to wastewater treatment, and saved the company over \$280,000 a year with no capital expenditures.**



**** The American Mirrex Co. manufactures rigid polyvinyl chloride (PVC) plastic film at its plant in New Castle, Delaware. By abolishing water soluble glycol-based oils from their processes they eliminated several thousand pounds of glycol waste residuals from their annual wastewater.**

**** Engineers at DuPont, headquartered in Wilmington, Delaware, figured a way to adjust a production process in one of its plants to use less of just one raw material. In doing so they cut the plant's 110-million-pound-a-year waste rate by two thirds. The change also increased yield and cut costs for a net savings of \$1 million a year.**

**** DuPont's agriculture division has developed a new generation of herbicides that break down faster, leave less residues, and can be applied in small doses.**

**** In its auto paints and coatings division DuPont is developing a water-borne paint that will eliminate the need for solvents currently used to deliver the paint to the car's surface. Although still in developmental stages with no estimates available, eliminating the use of solvents will eliminate the introduction of solvents into the air through the spray process and in water or landfill through the drippings which must be cleaned up and treated.**

**** At Monsanto, workers at the Nitro, West Virginia plant changed raw material requirements and cut their total emission of toxic fumes by over a third.**

POST-PROCESS CHANGES

**** Merck substituted citric acid for the 30 percent phosphoric acid solution it had been using to clean stainless steel manufacturing and research equipment. The change eliminated phosphate from the wastewater while maintaining the required pH levels in the effluent.**

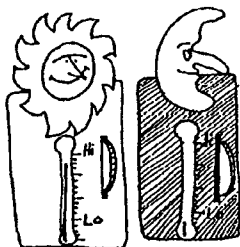
**** At its Danville, Pennsylvania plant, Merck recovered usable solvents through a distillation process that yielded solvents of a quality suitable for reuse in the manufacturing process. Cost savings for 1990 were over \$100,000 and projections look to recovering over 195,000 gallons of solvents a year.**

**** Unable to eliminate the use of heavy metals in its metal plating operations, NADEP changed the after-plating rinse process to recover heavy metal particles flushed from the surface. They now recover 98-99 percent of the cadmium from the wastewater, reduce the amount of cyanide in the wastewater by 95 percent, and reduce the amount of water used by 70 percent.**


MISCELLANEOUS CHANGES CAN HELP, TOO

**** The Composite Products venture at Air Products and Chemicals, near Allentown, Pennsylvania has developed a process to grind up old tires into small particles and then chemically change their surface characteristics, and their uses. As an additive to polyurethane resin it improves several of the polymer's qualities, saves energy in production, and costs less than virgin polyurethane resin.**

**** 3M installed set-back thermostats in one of their facilities to control heating and cooling during non-operating hours. For a one-time investment of \$11,800, they save \$56,000 in annual energy costs.**



**** 3M operates a 105 van ride-sharing pool that saved 53 million commuter miles and 3.4 million gallons of gas, and also eliminated 2.3 million pounds of air emissions since 1973.**



**** At Abington Memorial Hospital in Abington, Pennsylvania, the physical plant layout forced the hospital into using all polystyrene products in its cafeteria operation. Hoping to make an environmental as well as a budgetary impact while renovating to accomodate washable dishware, nutrition director Bob Vasek decided to sell reusable coffee mugs.**

Eight months into the program, the hospital has sold 536 mugs, each emblazoned with the hospital logo on one side and their "AWARE OF THE ENVIRONMENT" slogan on the other. The hospital sold the mugs at their cost of \$2.60 each, offered a 50 percent savings on fill-ups the first month of the program, offers an on-going \$.10 per cup discount for each mug refill, offers a free mug-full with the daily breakfast special, and runs monthly specials on "mug-fulls" of such things as soup and yogurt that are normally sold in styrene bowls.

In return, they estimate that they'll save \$8,000 this year by not buying roughly 270,000 styrene cups, and they know they'll save landfill space. As a side benefit,

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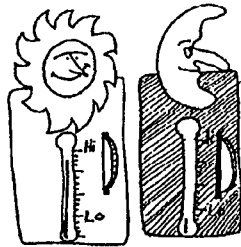
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The company is working on a similar process to use scrap plastics.

****** The American Mirrex plant in New Castle, Delaware removed over 3200 pounds of hazardous waste a year from their waste stream by changing from leaded to non-leaded lubricating oils in some of their equipment.

In a separate action, the company changed a cleaning agent and eliminated approximately three pounds of tetrachloroethylene and methylene chloride from their yearly waste stream.

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TREATMENT

As a last resort, when all else has failed and something remains to be disposed of, EPA recommends proper treatment to render the material non-hazardous before disposal.

BMY Combat Systems in York, Pennsylvania is replacing a conventional chemical precipitation system with an evaporator/crystallizer and filtration system to eliminate wastewater discharges, produce distilled water of a quality higher than the public water supply previously used, reduce water consumption, and enhance product quality through improved rinsing. This improved rinsing, combined with procedural changes, is expected to reduce the amount of wastewater treated by more than 75 percent.

The new system is also expected to yield a five-fold reduction in the amount of hazardous wastewater treatment sludge generated. Those solids that are generated will be reclaimed and processed into raw materials for industry. This will eliminate the continuous discharge of industrial wastewater into the Susquehanna River basin and reduce the amounts of corrosive waste and treatment sludges from about 1.5 million pounds a year to about 30,000 pounds. Reclaiming the sludge will divert an estimated 16 tons of hazardous waste annually, resulting in an annual savings of \$75,000 - \$150,000 in avoided disposal costs.

**** R.D. Werner Co, Inc** in Greenville, Pennsylvania extrudes aluminum to make ladders, scaffolds, and staging. In 1987 the firm produced 4.7 million gallons of corrosive hazardous waste that cost them \$176,000 to dispose of. An effective although unspecified waste minimization program has eliminated the need for sulfuric acid and reduced the need for landfilling solids and treating hazardous waste.

They replaced chlorinated solvents with mineral spirits. They send the dirty mineral spirit solutions off-site for recycling/reclamation and reuse the cleaned solution.

By eliminating chromium from the cooling water treatment, Werner has removed the need for extensive treatment of the waste.

Werner removes liquid sludge from its waste stream by turning it into a solid filter cake, which it then sends to a reclamation facility to extract the aluminum for use in making alum.

To remove aluminum from its extrusion dies, Werner uses a sodium hydroxide solution. This process generates a corrosive liquid with a high pH that used to be disposed of as a hazardous waste.

Through its various process changes Werner has been able to isolate the resulting sodium aluminate from its wastestream and turn it into a commercial substitute for virgin material. The company produced 1.2 million gallons of sodium aluminate and is now expanding its market, making this former hazardous waste a commercially viable reclamation product.

****** Most of NADEP's liquid wastes flow to the industrial wastewater treatment plant for treatment before discharge. The plant treats about 100,000 gallons a day, creating a sludge that qualifies as hazardous waste. By adding a drier to the pre-disposal process, NADEP reduced the volume of sludge by over 50 percent, from 450,000 pounds a year to less than 200,000. They estimate their savings in hazardous waste disposal at \$40,000 a year.

****** Reichhold's Cheswold, Delaware plant manufactures emulsion polymers. By installing a \$1.3 million hybrid biological treatment system and a new main vacuum system, the company reduced its air emissions by 70 percent between 1987 and 1990.

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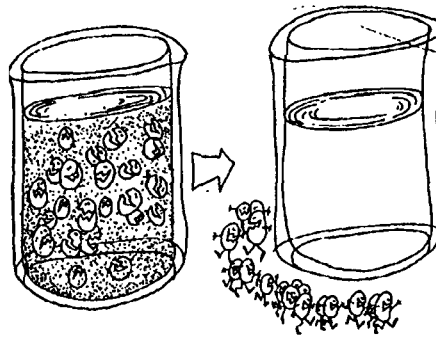
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**** DuPont** sells wastewater treatment services to 1,000 outside customers from around the country, who bulk ship chemical waste to the plant for treatment. DuPont uses carbon filtration and micro organisms to remove toxins and yield clean water.



ALTERNATIVE FUELS

Although "alternative fuels" conjures up images of incineration, the following examples demonstrate that there are imaginative sources of energy available to the enterprising manager.

While waste incineration may be a viable option, it is most certainly a contentious one over which the debate continues to rage, particularly in terms of where it fits into the P2 equation. Some make the argument that incineration reduces the volume of material destined for landfills; others counter that it merely transfers the pollutants from one medium (i.e., soil or water) to another (i.e., the air).

Some companies report success at converting their own solid waste to energy. One company on the west coast actually survives (thrives) by burning scrap tires to generate electricity which it sells to the public utility. Monsanto has been experimenting with the mass burning of scrap tires for energy and some cast cement companies have been burning shredded tires in their kilns for years.

**** 3M** uses hot exhaust from air pollution equipment to conserve energy. Through process changes and equipment modifications at one of its plants, 3M captures 80 percent of the exhaust air, recirculating half of it in product driers and burning the other half to make steam for use in the plant. With a capital outlay of \$690,000, they save \$460,000 annually in energy costs, conserve 86 billion BTU's annually, and eliminate 5 million pounds of air emissions annually.

** In one of its laboratory/office complexes, 3M uses a different approach to energy innovation. The gas and oil-fired engines used to generate the facility's electricity give off heat in the exhaust and in the cooling water. 3M captures that heat and uses it to drive steam turbines to generate more electricity and to warm water for space heating.

** In yet another plant 3M spent \$50,000 to install circulating fans in product-drying oven-rooms. By mixing hot air from the ovens with fresh air from the outside, the plant uses less energy to heat the incoming air and has cooler, more comfortable oven-rooms. For their investment they save 8 billion BTUs a year and eliminate 900,000 pounds of air emissions

** In Virginia Beach, the city's operating landfill provides naturally occurring methane to an electricity generating station located on site. The city leases land to a private company under contract to build and operate the plant. The company pays the city \$10,000 a month for the methane, which it burns to generate electricity for sale to the local power company. By design, the plant will generate nine-mega-watts of electricity, enough to power 10,000 homes a year, while saving 150,000 barrels of oil each year.

** The eight cities comprising Virginia's Hampton Roads area have joined to form the Southeastern Public Service Authority (SPSA) to coordinate waste management. The Authority operates several transfer stations to which the cities bring their collected household waste. SPSA sorts out the recyclables and converts the rest of the trash to Refuse Derived Fuel (RDF) which it either burns for energy at its plant or ships to the Norfolk Naval Shipyard for fuel to power a trash-to-steam plant. SPSA also shreds tires and adds the particles to the RDF.

TRADE ASSOCIATIONS

Under terms of an agreement negotiated by The International Fabricare Institute, which represents most of the dry cleaning industry, a contractor picks up used solvents, processes them, and sells recharged solvents back to the members at more affordable rates than any single independent could expect. The contract also indemnifies the independent members from any spills or mishaps once the contractor picks up the materials.

The National Paint & Coatings Association has recently initiated a pollution prevention award program for its membership. "The awards will recognize outstanding achievement by members of the paint and coatings industry in protection of the environment through waste minimization and/or toxic reduction technologies or practices," says Association President Jerome J. Crowley, Jr. Programs will be evaluated on the basis of effectiveness, replicability (i.e. feasibility of adoption by other similar manufacturing operations), financial feasibility, sustainability, and benefit to the paint and coatings industry.

GOVERNMENT'S ROLE

Government regulation should be the answer of last resort, not the preferred alternative. EPA realizes that; business and industry realize that. Self regulation is better than governmental regulation.

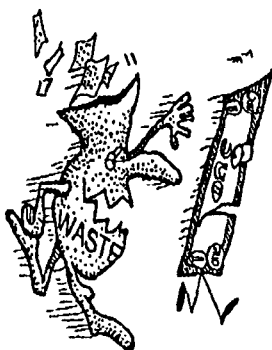
Robert P. Bringer, 3M's vice president for environmental engineering and pollution control, says that his company, like any other, wants to develop new products more quickly. "But," he continues, "regulations have the opposite effect; they are time expanding. So, if we get rid of the pollution, we get out from under the regulation."

Monsanto's Mahoney put it this way. "...cleaning up early, and doing it your way, is in the best financial interests of the corporation. Doing it with our creativity pays dividends—rather than waiting to comply with a 'one size fits all' prescription thought up by others."

Talking about 3-M's pollution prevention initiatives, Bruce W. Piasecki, an associate professor of environmental management at Rensselaer Polytechnic Institute said "The company is run by a group of executives who believe in making decisions without relying on signals from the Government."

While not abdicating its regulatory and enforcement roles, EPA recognizes the realities of economics and the desirability of avoiding the need for regulations. Under the progressive administration of William K. Reilly, EPA is taking a position that voluntary observance of guidelines is as important and effective as compliance with regulations; and is offering up such guidance.

EPA has established a list of 17 specific chemicals that it, in concert with industry, believes to be of such concern that they require immediate attention. The Agency has requested American industry to voluntarily reduce its emissions of those "chemicals of concern" by 33 percent by the end of 1992 and by 50 percent by the end of 1995, with 1987 as the base. All indications are that industry is accepting the "33/50" challenge, echoing Mahoney's belief that it's better for them to do it their way than to have to do it somebody else's way, implying hope that compliance will stave off regulations.



Aware of the savings that can be realized merely by switching to modern energy efficient lighting, EPA has launched what it calls its Green Lights program. Just one such bulb, over its lifetime (about 10 times that of the average bulb), can save over 500 pounds of coal or nearly one barrel of oil while eliminating over 380 pounds of carbon emissions. Business and industry nationwide — like Region III's Aristech Chemical Corp, Bell Atlantic, The Oliver Carr Co, Crestar Bank, Energy User News, the National Wildlife Federation, Thrift Drug, USF&G, and Waste Management Inc — have joined forces to

multiply those benefits several fold as they "re-light" their offices and plants. Cooperating companies are realizing savings in supply costs and manpower to change bulbs because of the longer life of such bulbs.

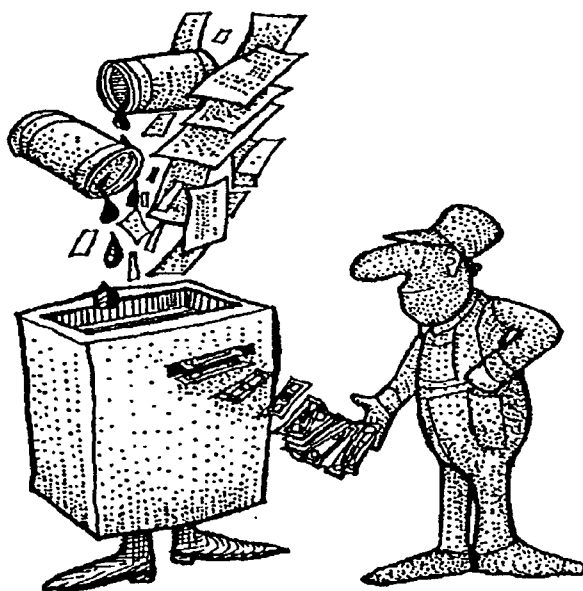
EPA provides financial incentive for pollution prevention initiatives in several ways. Depending on the offense, Region III aggressively attempts to negotiate penalty reductions in exchange for P2 actions. The Region has granted over \$100,000 in penalty relief in exchange for millions of dollars worth of pollution prevention enhancements.

The Agency makes grant money available to qualified businesses to help finance research, design, and construction of pollution prevention projects. Region III has several million dollars outstanding in approved P2 grants, and it was a Region III grant that made the Delaware Reclamation Plant a reality.

CONCLUSION

Pollution Prevention is an EPA priority that will take us into the 21st Century. The Agency sees it as the preferred alternative to dealing with hazardous waste or, for that matter, waste in general.

P2 is a lot like the current trend in quality, which is away from quality control that merely rejects defects toward quality assurance that attempts to build quality into the process. Like the quality effort, pollution prevention will require a change in attitude, a change in thinking, a change in mind set. And like the quality initiatives, pollution prevention will reap its own rewards for its devotees, commensurate with the level of commitment.



CONTACTS

NOTES

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