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Office of Pollution
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EPA

Pollution Prevention News

POLLUTION PREVENTION

Inside:

TRI Releases Decline by 6.6% in 1992

But total amount of toxics generated increases slightly

Analysis of the latest Toxics Release Inventory (TRI) data from 1992 shows a decline of 6.6% in the total amount of toxic chemicals released into the nation's environment over the previous year. The total amount released, 3.18 billion pounds, is 35% less than the toxics released in 1988.

Nevertheless, the total amount of toxic chemicals in waste *generated* by industry increased by a half percent in 1992, to 37.33 billion pounds, representing an additional 170 million pounds of toxic chemicals in waste managed by facilities. Projected data provided by facilities indicate that reported waste generation may also increase slightly for 1993 and 1994.

The top five industry categories for total TRI releases were chemical manufacturing, primary metals, paper manufacturing, plastics, and transportation equipment. The top 50 facilities reporting to TRI accounted for 42% of total TRI releases; the total number of facilities reporting was 23,630.

Reported off-site transfers increased 17% since 1991, largely due to increased

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White House Conference Heralds Earth Day

A conference on climate change action was sponsored by the White House on April 21 as an important milestone in the Climate Change Action Plan unveiled in October 1993 by President Clinton. The action plan is a comprehensive national strategy for reducing greenhouse gas emissions to 1990 levels by 2000. It specifies over 40 actions that rely on voluntary partnerships to create jobs, bolster the economy, and reduce greenhouse gas emissions and other harmful air pollution.

The conference was kicked-off by Vice President Al Gore. The Vice President invoked an historical reference to the famous ride of Paul Revere. In contrast to the more traditional portrait of Revere as a lone revolutionary, Gore suggested that his ride was actually enabled by the efforts of many supporters. He used the famous ride as an analogy to how the climate change issue must be addressed — not by one person or one organization, but through teamwork among many partners. "The Climate Change Action Plan," he said, "relies almost exclusively on partnerships."

In her remarks, Department of Energy Secretary Hazel O'Leary echoed the idea that teamwork will make the climate change plan a success. The night before the conference, DOE secured a commitment from 766 utilities to reduce greenhouse gas emissions.

The conference included sessions on state and local government mitigation strategies, Climate Wise and Climate Challenge initiatives and other pollution prevention voluntary programs of various federal agencies. (See page 4 for an article on the Climate Wise initiative.)

EPA News

Policy Shop Takes Unique Approach to Pollution Prevention

What causes a company to invest in less polluting technologies and practices? The answer can vary widely from company to company — a visionary CEO, the promise of economic gain, customer pressure or impending tough regulations. Recent studies provide general information regarding incentives and barriers to pollution prevention, but do not address corporate decision-making factors in specific industries.

EPA's Office of Policy, Planning and Evaluation is taking the next step with its Sustainable Industry Project. The goal of the Project is to develop and demonstrate policies which promote continuous environmental improvement and remove barriers to innovation in specific industries. The project coordinators are collaborating with industry representatives, government and the environmental community to identify a tailored set of policies to promote innovation and pollution prevention in the metal finishing, thermoset plastics, and photoimaging industries.

The project uses a "backward mapping" approach to identify the key factors that affect eco-efficiency in each industry — first, the fundamental characteristics of companies in the industry; second, the most significant incentives and barriers to "cleaner, cheaper, smarter" environmental protection; and third, the top policy options for EPA, states and industry to consider. By starting with a thorough understanding of each industry, including the factors that drive or impede progressive environmental performance in the industry, the Agency will be able to develop policies that are most likely to achieve long-term environmental success. Industry response has been supportive of the project and has indicated a willingness to develop partnership projects.

The Sustainable Industry Project Team recently completed Phase I of the Project, which entailed the identification of preliminary policy options. In Phase II, beginning in Spring 1994, the Project will develop implementation strategies.

For more information, contact Bob Benson at 202-260-8668.

Pollution Prevention Heads for the Border

The US/Mexico Pollution Prevention Work Group soon will release a bilingual pollution prevention manual directed to the wood finishing industry in the border region. The manual will be followed by a conference on the same topic. This is the second such project for the Work Group. In the fall of 1993, the Work Group issued a bilingual pollution prevention manual on metal finishing and held a conference on that topic in Juarez, Mexico. Other typical border industries, such as electronics, will be addressed with later manuals.

The Work Group was set up in February 1992 pursuant to the La Paz Agreement, by EPA and its Mexican counterpart SEDESOL, because of the huge potential for pollution prevention along the border. The La Paz Agreement was signed in 1983 by Mexico and the United States, and it empowers U.S. and Mexican authorities to act in concert to protect, conserve, and improve the environment of the border area. The mission of the Work Group is to coordinate the reduction of pollution via a range of approaches, including technical assistance, training, public and private sector pollution awareness programs, assessment of pollution prevention opportunities, policy development, and institutional support. The United States members of the Work Group include representatives of EPA Headquarters, Region 6, Region 9, Arizona, California, New Mexico, and Texas.

The Work Group has four major initiatives:

- Border Area Pollution Prevention 33/50 Program Initiative: This encompasses outreach programs such as the Maquiladora Conferences, pollution prevention meetings, and pollution prevention evaluations.
- Technology Transfer: This includes projects such as the pollution prevention manuals for the metal finishing and wood finishing industries, and the related conferences.
- Computer Database/Clearinghouse Connection: EPA includes information about accessing its databases in the bilingual material. In addition, SEDESOL is working to make its computer system compatible with EPA's system.
- Border University Support: The Work Group is reviewing research proposals from the Southwest Center for Environmental Research and Policy for the implementation of pollution prevention techniques.

For more information about the Work Group, contact Robert Lawrence at EPA at 214-655-6580.

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Reclaiming the Houston Ship Channel

Demonstration Project Aims to Reduce Toxicity

by Donna Nickerson,
EPA Coastal Management Branch

The city of Houston looms in the background as a barge plies the waters of the Houston Ship Channel. Photo courtesy of GBNEP.

Voluntary changes in industrial process engineering and waste handling are contributing to efforts to clean up the Houston Ship Channel. In 1992, the Galveston Bay National Estuary Program (GBNEP) initiated a demonstration project to reduce toxicity in the channel by working cooperatively with facilities having the greatest potential to reduce water quality problems. The Galveston Bay program is one of 21 estuaries in the National Estuary Program which uses a consensus-based approach to manage coastal ecosystems.

The Galveston Bay project was implemented in two phases. During the first phase, EPA's Toxic Release Inventory (TRI) was used to help identify facilities discharging five priority toxics in the Channel: copper, lead, cyanide, dioxins and furans, and chlorine. Facilities on the TRI list discharging the priority toxics were invited to participate in a pollution prevention workshop. The 38 facilities that participated in the workshops were introduced to pollution prevention concepts, site assessments, and methods for developing pollution prevention facility plans as required by state law. Participants received a custom-designed workbook that included a site assessment manual and pollution prevention planning materials.

The workshop helped identify four facilities that volunteered for the second and more rigorous phases of the project: the non-regulatory technical assistance site visits (waste audits). The site visits identified a number of common pollution prevention opportunities (wastewater reduction schemes, product substitutions, improvements in storing, handling and tracking of waste, improvements in maintenance and operating procedures, and a range of industrial recycling opportunities) and made recommendations on how to reduce releases. The options identified may serve as the basis for a basin-wide pollution prevention management approach for the Houston Ship Channel. Three of the four facilities have pledged voluntary hazardous waste reduction goals of 50% by 2000, and subsequently joined the Clean Texas 2000 voluntary source reduction program. GBNEP will continue to work with the facilities to monitor their progress in implementing the recommendations and the extent of their pollutant reductions.

The Galveston Bay program is one of 21 estuaries in the National Estuary Program which uses a consensus-based approach to manage coastal ecosystems.

The project benefited from close coordination with Clean Texas 2000, a highly visible and successful program of the Texas Natural Resource Conservation Commission with industry involvement. Pollutant loadings to the Ship Channel are being steadily reduced. In the early 1970s, dissolved oxygen was non-existent in this threatened water body. Pollutant loading was extreme and miles of channel were devoid of life. Today, point source reductions as a result of the Clean Water Act and voluntary improvements by industry are restoring the channel to a biologically productive element of the estuary.

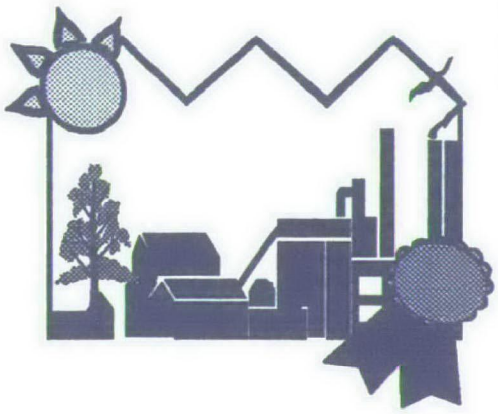
For more information, contact: Russell W. Kiesling, GBNEP, at 713-332-9937.

Update from Air Office

Climate Wise is Climate Safe

Climate Wise is a joint EPA / Department of Energy program designed to encourage the reduction of greenhouse gases. Climate Wise is a foundation plan of the more than 50 voluntary greenhouse gas emission reductions under the President's Climate Change Action Plan. The program is designed to stimulate reduction actions across all sectors of the economy, encourage participation in the full range of action plan initiatives, and foster innovation by encouraging organizations to implement reduction programs and measures that they identify for themselves.

Organizations that choose to participate in the program will receive public recognition for the actual emission reductions they achieve. Climate Wise also offers the opportunity for organizations to join the Climate Wise Pledge Program. The Pledge Program provides participants



with early recognition and encourages active planning and goal-setting to meet and report the emission reductions necessary to be Climate Wise.

To be part of the Pledge Program, organizations must agree to some mandatory requirements. Organizations are required to identify the actions they will take to reduce greenhouse emissions. These may include participating in one or more of the Climate Change Action Plan initiatives or other federal or state emission reduction programs. The Pledge Program participant can also identify actions outside the plan, such as fuel switching, process improvements, use of renewable energy, carbon sequestration activities, or employee mass transit or carpooling.

In addition to the mandatory requirements, participants are encouraged to:

- Publish a corporate policy statement that sets out the standards for the organization. The policy should note if energy efficiency and greenhouse emission reduction are already part of the company's environmental policy.
- Establish a team to develop and oversee greenhouse gas emission reduction projects.

(Continued on next column)

Energy Star Powers Down Computers

Computer equipment is the fastest growing electricity load in the commercial sector. It already accounts for 5 percent of commercial electricity consumption — and it could increase to 10 percent by the year 2000. Conventional computers run at full power during the day, and as many as 30-40 percent are left running at night and on weekends. To combat this wastefulness, EPA has formed a voluntary partnership with leading computer, monitor, and printer manufacturers. By introducing energy-efficient computer equipment to the marketplace, the Energy Star Computers program will cut nearly $2 billion from ratepayers' annual electricity bills by the year 2000 — saving enough electricity to power Maine, New Hampshire, and Vermont for an entire year.

The vast majority of computer companies that sell products in the United States have joined the Energy Star Computers program, accounting for 70 percent of all U.S. sales of desktop computers and 90 percent of the laser printer market. Equipment that qualifies for the EPA ENERGY STAR℠ logo can "sleep" or "power-down" when not in use, and can awaken with a simple touch of the keyboard or mouse.

The savings potential of these more efficient products is significant. Depending on computer usage, the Energy Star sleep feature can cut a computer's electricity use by 50-75 percent. As an added benefit, these efficient systems give off less heat while sleeping, reducing the amount of electricity needed to cool a building by 5-10 percent. By the year 2000, Energy Star Computers and other campaigns to promote energy-efficient computer equipment will lead to annual savings of 26 billion kilowatt-hours of electricity and substantial reductions in air pollution emissions.

Because Energy Star computers, monitors, and printers cost the same as their less efficient counterparts, buying them to replace old equipment is highly profitable. President Clinton has directed the U.S. Government — the largest buyer of computer equipment in the world — to purchase only Energy Star equipment where it's available and meets performance needs. This Executive Order took effect in October 1993 and will save taxpayers $40 million annually. EPA alone will save enough money using the new equipment to fund the Energy Star Computers program several times over. For more information about Energy Star Computers, call 202-775-6650.

Update from Air Office

- Set performance improvement targets as an incentive for reductions.
- Monitor and evaluate performance to establish appropriate targets and assess progress. DOE soon will release Voluntary Greenhouse gas Emissions Reporting System Guidelines to help companies design and record emission reduction achievements.
- Increase awareness of energy efficiency among employees and report performance changes and improvements to employees and shareholders. Publicizing improvements boosts morale and helps maintain the program's focus.

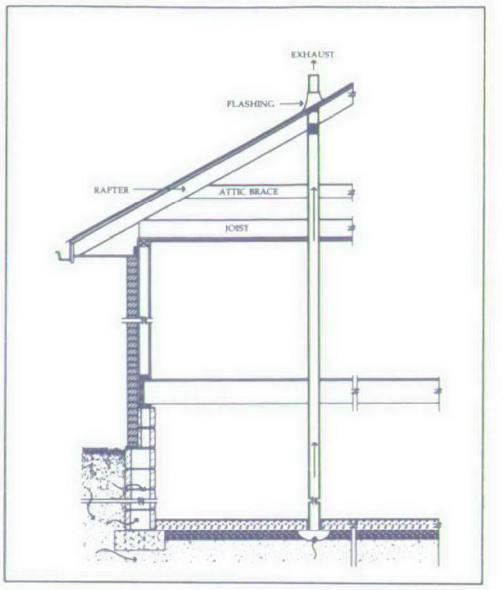
For more information, contact Pamela Herman at EPA at 202-260-4407, or Gerald Kotas at DOE at 202-586-9220.

Model Standards Address Radon Problem

The environmental quality of houses is on the minds of many homeowners these days. Air quality is affected by natural elements, as well as by gases emanating from manufactured materials.

One such naturally occurring indoor air problem is radon gas. Radon is an invisible, odorless, tasteless gas that comes from the breakdown of uranium in soil, rock and water. Because radon gas cannot be detected by human senses, it can unknowingly accumulate within a structure, posing serious health risks. If radon gas is inhaled into the body, it can cause lung tissue damage and may lead to lung cancer.

Because of this health risk, EPA has taken a major step in preventing radon buildup in new homes. EPA is encouraging the adoption of Model Standards which focus on the use of passive radon control systems for all new homes in Zone 1 areas. Zone 1 areas are those



parts of the United States where there is a high potential for elevated radon levels in homes. Approximately 33 percent of the United States is a Zone 1 area. The implementation of the Model

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EPA Seeks Showcase Buildings

The United States spends approximately $70 billion annually to operate commercial and industrial buildings, and much of this sum is spent on wasteful and inefficient technologies. In 1993, EPA introduced the voluntary Energy Star Buildings program to help building owners take advantage of the wide variety of cost and energy-efficient technologies that exist for buildings. These technologies can cut a building's energy use by more than 40 percent — which amounts to $28 billion that can be reinvested into the economy each year. In addition, profitable and efficient use of energy translates into less air pollution.

To demonstrate the savings potential of the Energy Star Buildings program, EPA is working to identify approximately 20 buildings nationwide that will showcase comprehensive energy-efficient upgrades over the next 1-2 years. Showcase building owners will work closely with EPA to perform a series of accelerated, profitable, and state of the art energy-efficient upgrades. The EPA strategy is designed to maximize savings, prevent oversizing, and minimize equipment costs. It begins with a complete Green Lights upgrade, followed by a comprehensive survey and tune-up of existing building systems. It then calls for investments in technologies that will indirectly reduce heating and cooling loads, including energy-efficient office equipment and improved insulations and glazing. The next step is to improve the performance and operating efficiency of fans and air-handling systems.

To participate in the showcase, your facility should contain at least 25,000 square feet of office space and should include energy-usage monitoring systems that allow for regular reporting of successful upgrades. While Energy Star Buildings Partners have 7 years to complete 90 percent of their upgrades, a showcase building owner must agree to complete all upgrades in 1 to 2 years, with the goal of cutting electricity use by up to 50 percent.

By taking part in the first phase of the Energy Star Buildings program, showcase buildings reap benefits that go beyond the resulting energy and cost savings. EPA supports its showcase buildings participants with an array of helpful resources such as objective technology information, savings analysis software, and survey and analysis guidance. Owners of multiple buildings choose just one building to showcase, but can see the potential savings from upgrading all their facilities. In addition, EPA provides showcase building owners with positive public recognition for their part in preventing pollution and caring for the environment.

For more information on participating, call 202-775-6650.

Focus On: The Federal Government

EPA to Issue Guidance for Green Products

by Eun-Sook Goidel
EPA Pollution Prevention Division

The United States government is the nation's largest consumer, purchasing over $200 billion worth of goods and services annually. One of the goals of Executive Order 12873, signed by President Clinton on October 20, 1993, is to use the government's purchasing power to jump-start the markets for "greener" products and services. Section 503 of EO 12873 requires EPA to "issue guidance that recommends principles that Executive agencies should use in making determinations for the preference and purchasing of environmentally preferable products."

The Executive Order defines "environmentally preferable" to mean "products that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." EPA's goal is to translate that general intent into a usable and implementable set of guiding principles that Executive agencies can use to identify, select, and purchase products and services that have fewer environmental burdens.

EPA issued a concept paper in January, setting out its preliminary thinking on the subject. EPA received over 50 sets of written comments on the concept paper, and a public meeting was held in February to discuss the issue.

No Consensus Yet

The process of creating guiding principles to selecting environmentally preferable goods and services highlights a number of challenges. First, the existing acquisition process, which often adheres to rigid specifications and prioritizes low-cost, is not conducive to incorporating environmental considerations. Second, there is no general consensus on what "environmentally preferable" means. For example, can one product be considered environmentally preferable to another if it utilizes recycled materials but uses more energy to produce? Often, selecting the environmentally preferable product means making choices concerning trade-offs; e.g., less toxic materials for more energy or material use, or less water pollution at the expense of more air pollution.

These difficult choices illustrate the importance of looking at products and services in terms of their life cycle. Rather than focusing on a single aspect or single impact, the life cycle approach stresses improvements in as many stages of the life of the product or service as possible. This includes

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Government Officials "TEEM" Up to Implement Pollution Prevention

On the morning of March 8, the General Services Administration (GSA) kicked off TEEM 94 — an acronym for "The 1994 Energy and Environmental Management Conference." This conference was attended by 500 officials of federal, state, local, and tribal governments who came to learn about successful energy and environmental solutions and to network with public and private sector professionals in the field of energy and environmental conservation. GSA, in cooperation with DOE and EPA, sponsored this conference as a means of forwarding the goals of the Clinton Administration's Climate Change Action plan.

A highlight of the conference was a town meeting hosted by GSA Administrator Roger Johnson at which Vice President Al Gore presented a new executive order on energy conservation (see inset on this page). Also present was Secretary of Energy Hazel O'Leary who spoke on implementing the executive order.

GSA will sponsor more conferences for government officials around the country with the same goals as TEEM 94 over the coming year. Interested in participating? Contact Mike Ziskind at 202-501-0498.

Executive Order 12902:

Energy Efficiency and Water Conservation at Federal Facilities

Under the new energy efficiency executive order 12902 signed by President Clinton in March 1994, federal agencies are required to:

- Reduce overall energy use in federal buildings by 30% by the year 2005 from 1985 energy use levels.
- Increase overall energy efficiency in industrial federal facilities by 20% by 2005 using 1990 as the baseline year.
- Minimize use of petroleum products at federal facilities by switching to less-polluting alternative energy sources.
- Significantly increase the use of solar and other renewable energy sources.
- Designate one major building as a showcase for energy or water efficiency.
- Design and construct new facilities to minimize life-cycle cost through energy efficiency and water conservation technologies, and utilize passive solar design and active solar technologies wherever cost-effective.

Each agency must undertake a prioritization survey of its facilities leading to the development of a 10-year plan to conduct comprehensive energy and water audits at each facility. Recommendations resulting from each audit for the installation of energy efficient, water conservation, and renewable energy technologies must begin to be implemented within six months of completion of the audit.

Denver Helps Water Users Save Money

In the early 1980s, Denver, Colorado found itself in a difficult position—despite increased demand for water, long-term supplies were limited. In addition, Denver Water, the local water utility, was under pressure from environmental groups to implement water conservation programs. Denver Water responded initially with a number of residential programs that resulted in significant but insufficient water conservation.

In 1990, recognizing the significant role that the non-residential community could play in water conservation, Denver Water created a pilot program to identify areas where commercial facilities could conserve water. The overall objective of the program was to identify, evaluate, and disseminate information relating to specific water uses and water conservation opportunities for non-residential users. Denver Water supplies approximately 80 billion gallons of water annually to the City and County of Denver, and to suburban areas outside the city. Approximately 15 to 20 percent of the total water supply is used by industrial and commercial facilities.

With little knowledge of how the non-residential sector used water and how it could conserve, Denver Water decided to conduct extensive research through commercial and industrial water audits. The main incentive for companies to participate in the voluntary audits was the quick payback realized from water savings. Although some cities have required participants to pay a portion of the cost of the audit, Denver Water decided to provide the service for free in order to ensure a high rate of participation.

Denver Water wanted to audit companies with the potential for the highest water reduction, yet also realized the importance of the pilot program containing a diverse group of users. In order to satisfy those criteria, Denver Water reviewed the list of its 100 largest users of water and selected companies in a range of industries. The 36 participants in the first audits fell into eight basic categories: manufacturers, food processors, schools, beverage processors, health care facilities, laundries, restaurants, and office space.

The main incentive for companies to participate in the voluntary audits was the quick payback realized from water savings.

The audits were conducted consultants who visited each facility and met with plant managers and engineers in order to gather background information, learn about any existing water conservation programs, inspect specific water uses, and tour the plant. The consultants divided water use into 11 categories: domestic, heating/cooling, once through cooling, washing and sanitation, laundry, kitchen, process uses, landscape irrigation, leaks, miscellaneous, and unaccounted water use.

Based on the information collected during the visit to each facility, the consultants developed site specific findings and recommendations, such as the following:

- **Domestic**: Install ultra low flush (ULF) toilets, flow restrictors for faucets and showers.
- **Cooling/heating**: Increase cooling tower and boiler cycles of concentration. Reuse and optimize blowdown requirements. Minimize flash-mixing and repair leaks in condensate return system.
- **Once-through cooling**: Eliminate once-through cooling by using existing cooling tower systems. Replace water-cooled equipment with air-cooled. Once-through cooled water can be reused for irrigation, make-up water or irrigation.
- **Laundry**: Use continuous-batch washers with full loads and electronic control systems to optimize water use. Reuse final rinse water.
- **Kitchen**: Minimize electric garbage disposal use. Replace water-cooled ice machines with air-cooled models. Recycle final rinse water to initial cycle.
- **Purification**: Improve equipment efficiency by minimizing backwash duration and recycling backwash.
- **Process**: Recycle water from rinse baths and use counter-current systems. Use solenoid valves and water level sensors to maximize efficiency.
- **Landscape irrigation**: Decrease overall turf watering and eliminate daytime irrigation. Use automatic timers for the irrigation system. Follow xeriscape guidelines and Denver Water evapotranspiration recommendations.

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Facts

- Of non-agricultural water use in the United States, business and industry use 32 percent of publicly supplied water.
- A study by Denver Water indicated that about 48 percent of the water supplied to manufacturers is used for heating and cooling purposes.
- The same Denver study indicated that health facilities potentially could save 42 percent of their annual water use through a variety of conservation measures.
- An investment of $3050 in faucet aerators by a Denver college has the potential to save more than two million gallons of water per year valued at $11,000 — a payback period of less than four months.

TSCA New Chemicals Program Embodies Pollution Prevention

EPA's New Chemicals Program, mandated under Section 5 of the Toxic Substances Control Act (TSCA), plays an important role in preventing pollution. TSCA requires that EPA review new chemicals for the risks they may pose to human health and the environment *before* they enter the market. The TSCA §5 statutory authority covering chemicals "from cradle to grave" and across all environmental media embodies the pollution prevention paradigm.

EPA has reviewed more than 20,000 chemicals since the New Chemicals Program started in 1979. The program has identified close to 1,700 cases where action taken as part of the program has prevented pollution or risks to human health that otherwise might have resulted from the manufacture, process, use and disposal of the chemicals.

The program works as follows. Anyone who plans to manufacture or import a new chemical substance must provide EPA with a pre-manufacture notice (PMN) at least 90 days prior to the activity. To determine whether a substance is "new," the company must consult EPA's Inventory of Chemical Substances (commonly known as the TSCA Inventory). If the substance is not listed, it is a "new" chemical.

EPA scientists from various disciplines work together to predict the potential risks to humans or the environment from each new substance. The evaluation uses data submitted on the PMN form, other information available to EPA, and exposure and release modeling. Companies are encouraged to provide information on the PMN form about steps taken to prevent pollution and to reduce exposures to, or environmental releases of, chemical substances.

After reviewing the PMN, EPA might suggest the use of "benign by design" chemistry (see article page 9) to help the company identify alternate synthetic pathways that will help reduce toxicity and pollution. If EPA determines that a new chemical may pose an unreasonable risk, EPA can enter into a consent order permitting the company to manufacture or import the new substance under certain restricted conditions intended to control exposures and releases of the substance. As part of this process, EPA may require a Pollution Prevention Plan for the chemical either before production begins or when a certain production volume is reached.

To further promote pollution prevention, EPA has begun to look for PMNs worthy of formal recognition for new chemical substances that may constitute safer substitutes or be developed via pollution prevention processes (see box below).

Additionally, EPA has proposed a new Low Exposure/LowRelease ("LoREX") Exemption Rule that provides an abbreviated 30-day review period for substances that meet specified criteria for negligible exposures and releases (58. *Fed. Reg.* 7646; Feb. 8, 1993).

For more information on pollution prevention in the New Chemicals Program, contact Roy Seidenstein at EPA at 202-260-2252.

Chemical synthesis software

In an effort to help chemists identify theoretical reaction pathways that are environmentally safer, J. Dirk Nies of Chemical Information Services, Rockville, MD, and EPA staffers Paul Anastas and Stephen C. DeVito are evaluating computer-based software tools for synthesis design. Such computer software has been under development for the past 25 years. Its purpose is to help chemists identify new syntheses for target molecules from the myriad potential routes and to suggest novel chemical reactions that might be investigated.

Most of these software tools are retrosynthetic — that is, they generate syntheses for target molecules by working backwards from the target to candidate starting materials. Other programs are synthetic — they identify side reactions, by-products, and the effects of varying conditions on reaction outcomes. However, none of them was built with the explicit objective of identifying environmentally benign chemical synthesis routes.

Out of some 20 software packages examined, several programs appear to have potential to provide theoretical alternative synthesis pathways in support of EPA's pollution prevention initiatives.

Applying retrosynthetic and synthetic programs in sequence permits optimal routes to be identified, and their associated condition, by-products, estimated costs, and potential hazards to be compared. Future developments in computer-assisted synthesis design tools will include features to make them function as true expert systems in support of pollution prevention and benign-by-design goals.

Recognizing Promising New Chemicals

Besides regulating risky chemicals, EPA's TSCA §5 PMN Program will now recognize new chemical substances that may be safer substitutes for chemicals currently used, or that will be created via pollution prevention processes. Criteria include actual test data on the PMN substance itself, less toxicity associated with the chemical or with related chemicals, reduced exposures and releases, conservation of energy and water, and environmentally beneficial uses.

EPA will issue a letter to the manufacturers of these substances, noting their contribution to pollution prevention. The letter also will ask the company to inform EPA of the commercial success of the product over time, and of any toxicity data that become available.

Green Chemistry: Benign By Design

The moment chemists put paper to pencil, or fingers to keyboard, to design a synthetic chemical, they also make decisions about the use or generation of hazardous substances that may require treatment, recycling, transportation or disposal. The goal of green chemistry and green technologies is to reduce or eliminate the toxic substances used or generated in the process, as well as the associated costs.

Traditionally, organic chemists have been trained to identify reaction pathways that maximize yield as the fundamental evaluation criteria for a reaction scheme. This approach tends to discount the potential problems associated with hazardous feedstocks, solvents, catalysts, by-products and impurities. Because of the rising costs of waste treatment, waste disposal, regulatory compliance, and liability insurance, chemists must consider the environmental impacts of a given synthetic method on the overall economic equation.

EPA's Design for the Environment (DfE) program has created the Green Chemistry: Benign By Design approach which offers a new intellectual challenge to organic chemists. Through the National Science Foundation's (NSF) university grants program, EPA and NSF will award approximately $2 million in grants annually in chemical engineering and a comparable amount in chemistry over the next several years.

Targets of the grants will include research advances in aqueous-based solvent systems, ambient-temperature reactions, just-in-time in-situ generation of toxic intermediates, chiral catalysts, artificial enzymes, built-in recyclability, and molecular manufacturing. EPA expects that advances in environmentally benign chemistry in time will become an integral part of the education and training of future chemists.

OPPT will co-sponsor the third ACS National Meeting on pollution prevention in Washington, D.C. on August 21-25, 1994. The program, *DfE: The Environmental Paradigm for the Twenty-First Century* will afford an opportunity for discussion and exchange of ideas on implementation of pollution prevention as an integral part of national environmental and economic policies.

For more information, contact Dr. Paul Anastas at 202-260-2257.

Benign by Design Examples

Following are some examples of the Green Chemistry: Benign by Design approach to chemical engineering:

■ Biocatalysts and benzene substitutes

Chemistry professor John W. Frost of Michigan State University applies a biotechnology approach in his search for a new route to industrial chemicals. Frost uses microbes to convert D-glucose into industrially important compounds, with the goal of replacing benzene as a starting material.

Benzene, used in the manufacture of a variety of chemicals, is a carcinogen and must be derived from nonrenewable fossil fuels. Frost points out that about 12 billion pounds of benzene are produced in the U.S. each year, and that 98 percent of all organic chemicals are currently manufactured from petroleum feedstocks.

D-Glucose is abundant and inexpensive in the U.S. because it can be derived from numerous agricultural products, as well as from waste streams from food products processing. Frost says using genetically engineered microbes and D-glucose as starting materials not only provides a more benign synthesis route, but also may improve the long-term, global competitiveness of U.S. industry.

■ Photochemistry

Harnessing the energy of visible light to bring about desired chemical transformations without using or generating toxic compounds is the aim of two different research groups. Gary A. Epling, professor of chemistry at the University of Connecticut, Storrs, is exploring the use of nontoxic food dyes as catalysts in oxidation reactions that previously could only be carried out with toxic compounds of metals such as cadmium, lead, mercury, nickel, and chromium.

In demonstrations, Epling's 120-watt spotlight, available at hardware stores for about $5.00, has reacted 20 g of material in 12 to 24 hours of illumination. He speculates that with more powerful sources, or by using a solar collector for sunlight, it should be feasible to perform reactions on the kilogram scale, particularly if improvements of efficiency result from additional research.

Chemistry professor George A. Kraus at Iowa State University, Ames, is developing a photochemical alternative to certain Friedel-Crafts reactions, by eliminating toxic Lewis acids, such as aluminum chloride, and avoiding toxic solvents commonly employed in such syntheses. Both strategies use visible light as the reagent to provide the driving force for chemical transformation.

Guidance for Green Products

(Continued from page 6)

design, raw material and natural resource use, and energy consumption, through manufacture, distribution, use, maintenance, and disposal.

Even with a life cycle approach, there will not be a universal ranking of environmental preference. Local conditions will affect the "greenness" of a product or service. For example, a process that uses large amounts of water may not be appropriate in dry regions such as the Southwest, and a process that generates large amounts of solid waste may not be desirable in the Northeast where landfill space is scarce. Even with certain basic assumptions such as these, companies may alter the equation by, for example, using recycled waste water for industrial processes in the Southwest or recycling waste in the Northeast.

In implementing Section 503, EPA is trying to ensure that all government employees who make purchasing decisions, from paper to satellites, add environmental criteria to their decisions, along with price, performance, health and safety. To accomplish this, the guidance will emphasize the importance of providing environmental information of a product or service along its life cycle to purchasers. In addition, EPA wants the guidance to help federal consumers go beyond merely substituting one product for another, to thinking more broadly about whether, and how, a process needs to be performed. EPA will strive to create guidance that is flexible and creates incentives for continuous improvement in the environmental performance of the goods and services the government purchases.

EPA plans to have the draft guidelines ready by this summer, at which point they will be published in the *Federal Register*, and at least one public meeting will be held to solicit additional comments. The guidelines will then be issued in final form. There also are plans for developing outreach, training and pilot programs with other federal agencies to meet their specific needs.

For more information, contact Eun-Sook Goidel at 202-260-3296.

TRI Releases Show Modest Decline in 1992

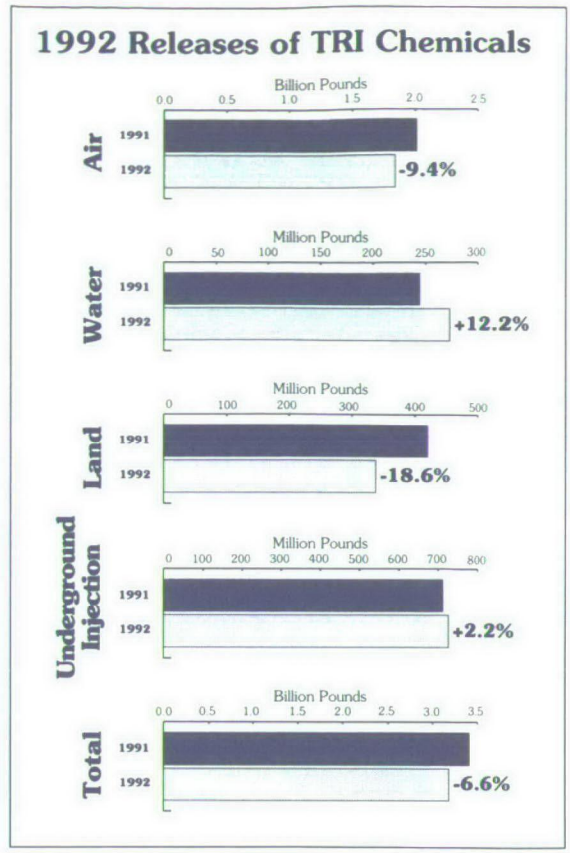
(Continued from page 1)

transfers for recycling. Reported air releases declined 9.4% since 1991, largely due to decreased emissions of solvents, ammonia and chlorine. Surface water discharges increased 12.2% due to increased run-off and one accidental release of phosphoric acid from fertilizer facilities in Louisiana and Texas. Land releases declined 18.6%. (See graph.)

Second year of prevention reporting

In the second year of waste management information reporting, 36% of all facilities reported that they implemented at least one source reduction activity, down from 37% in 1991. Recycling on or off-site accounted for disposition of 52% of the toxic chemicals generated in waste, the same percentage as in 1991.

National and state-specific TRI data are available through the EPCRA Hotline at 800-535-0202. The complete TRI database is available to the public through the National Library of Medicine's TOXNET system (call 301-496-6531 for access information) and the Right-to-Know Network (contact the Unison Institute at 202-797-7200).



EPA Addresses Radon Problem

(Continued from page 5)

Standards will result in significant risk reduction as about 145,000 of the one million new homes built each year are in Zone 1 areas. It is estimated that over 200 lives will be saved.

A passive radon control system can be installed in a newly constructed home easily and relatively inexpensively. The system uses standard building materials and costs between $350 and $500, depending on the size, structure and location of the house. There are five parts to a passive radon control system: a layer of gas permeable material such as gravel, a layer of polyethylene sheeting, sealing and caulking all openings in the foundation floor, installation of a polyvinyl chloride (PVC) vent pipe, and a roughed-in electrical junction box for the future installation of a fan, if needed.

Before the foundation floor is poured, the gravel is laid down, covered by the polyethylene sheeting, and the PVC vent pipe is installed. When the floor is in place and all openings are sealed, a physical barrier to radon entry is created. In addition, the vent pipe draws air from under the foundation, preventing gas from seeping into the house. If the radon level remains above four picocuries per liter (piC/L), then a fan is added to the vent pipe to improve its performance.

For more information about radon-resistant new construction, contact Jennifer Keller at EPA at 202-233-9338.

EPA Resources

New Pollution Prevention Spreadsheet Software

P2/FINANCE is a new spreadsheet software tool that helps companies collect and analyze data essential to a clearer financial evaluation of product or process costs and pollution prevention costs. The software offers a valuable starting point for introducing a Total Cost Assessment (TCA) approach to companies and is available free of charge to any federal, regional, state or local government employee from the Pollution Prevention Information Clearinghouse (PPIC).

TCA differs from conventional practices in four key ways: a broader inventory of costs and savings; allocation of all costs and savings to specific process and product lines rather than to overhead accounts; expanded time horizons for the capture of long term benefits; and the use of profitability indicators which incorporate the time value of money.

Users of the software input capital and operating costs for their product/process and an alternative option, and the program outputs a fifteen-year cash flow analysis and a profitability analysis. The analysis calculates three financial factors: net present value; internal rate of return; and simple payback. P2/FINANCE comes with a user manual and free access to a user hotline.

For more information on how to obtain P2/FINANCE, contact PPIC at 202-260-1023.

New Pollution Prevention Case Studies

EPA has made available two new documents on pollution prevention case studies. *Summary of Pollution Prevention Case Studies With Economic Data (by SIC Codes)*, (EPA 742-S-94-001), was created in response to the need for more economic information on pollution prevention projects. This document offers a spreadsheet of over 300 pollution prevention projects implemented by companies from a variety of Standard Industrial Codes (SIC). The document also provides references to more detailed data on each case study.

The second document, *Abstracts of Pollution Prevention Case Study Sources*, (EPA 742-B-94-001), is a reference guide for locating pollution prevention case studies. To enable the reader to locate the source of each case study, the Abstract is cross-referenced with the *Summary* document. For each source, the Abstracts document contains a short description of the content, a contact name and telephone number, and price information.

For copies of either document, contact PPIC at 202-260-1023.

Green Lights Fax Line

The Green Lights/Energy Star automatic fax line is up and running. Callers can receive by fax the latest information on Green Lights, Energy Star Buildings, Energy Star Computers, and the Methane Programs. Available information includes, for example, the most recent Green Lights participant list, a list of qualifying Energy Star computer products, and specific product and technical information. To access, dial 202-233-9659 from a touch-tone phone or directly from a fax machine.

Business Guide to Reducing Solid Waste

EPA's Office of Solid Waste and Emergency Response has developed a *Business Guide for Reducing Solid Waste*, (EPA 530-K-92-004). The Guide offers step-by-step instructions designed to assist medium and large businesses, governments, and other organizations establish a waste reduction program. Although it is not specifically designed for smaller companies, they may find the Guide useful as well. While employees at all levels can benefit from the Guide, it is directed to members of a waste reduction team.

For more information, contact the RCRA Hotline at 800-424-9346.

State of Federal Facilities

EPA's Office of Federal Facilities Enforcement has released *The State of Federal Facilities*, (EPA 300-R-94-001). The document provides a comprehensive overview of environmental state of affairs at federal facilities through the end of FY 1992. This is the first attempt to collect and present data regarding the major program activities tracked by EPA Headquarters. For more information contact the Office of Federal Facilities at 202-260-9801.

Denver Saves Water

(Continued from page 7)

Based on the audits, the consultants also created checklists which can be used to identify water conservation opportunities in a variety of settings.

One year after the audits, Denver Water completed detailed evaluations of nine companies that had implemented at least some of the recommendations. The nine companies had cut water consumption from 3 to 28 percent, saving approximately 63 million gallons of water annually. Savings are expected to grow as more recommendations are implemented and as equipment is replaced with more water efficient models. In addition to demonstrating the potential for savings among non-residential users, the program has provided detailed water conservation plans for nine major industries in the Denver areas. Denver Water is now marketing the water conservation program to industrial and commercial facilities throughout its service area.

This case study is excerpted from "Water Audits for Business and Industry," published as part of the Global Cities Project's Building Sustainable Communities Water Efficiency Series. For information on the Global Cities Project, call 415-775-0791. For information on the Denver Water conservation program, contact Edwin Hernandez at Denver Water at 303-628-6563.

Calendar

Title	Sponsor	Date/Location	Telephone
Innovative Environmental Strategies for the 90s	National Association of Local Gov't Environ. Professionals	June 1 - 3 Washington, D.C.	Sandra Garbrecht or Stephanie Marrone 202-638-6254
Promoting Pollution Prevention by Voluntary Initiatives	Hampshire Research Institute/ EPA	June 1 - 3 Williamsburg, VA	703-684-5588 703-548-0426 (fax)
Pollution Prevention: Putting a P2 Spin on Regulation	EPA/Managed by the Wastewatch Center	June 15 - 17 Woods Hole, MA	508-470-3044
Laboratory Waste Minimization Workshop	American Chemical Society	June 16 Anchorage, AK	Bill Gray 202-872-4467
New England Resource Recovery Conference and Exposition	New Hampshire Resource Recovery Association	June 13 - 14 Portland, ME	603-224-6996
Air & Waste Management Assn. 87th Annual Meeting & Exhibition	AWMA	June 19 - 24 Cincinnati, OH	Pam McCalla 412-232-3444
Laboratory Safety and Environmental Management '94	Env. Testing and Analysis AIHA/National Safety Council	June 20 - 23 Alexandria, VA	Vicki Martin 818-575-6858
32nd Annual International Solid Waste Exposition	Solid Waste Association of North America	August 1 - 4 San Antonio, TX	301-585-2898
Design for the Environment: The Environmental Paradigm of the 21st Century	American Chemical Society, EPA	August 21 - 25 Washington, D.C.	Dr. Joseph Breen 202-260-1573 202-260-0981 (fax)
Second Int'l Symposium on Environmental Contamination in Central and Eastern Europe	Budapest '94	Sept. 20 - 23 Budapest, Hungary	John Moerlins 904-644-5524
Environmental Alliance for Senior Involvement Leadership Conf.	EASI	Sept. 22 -24 Chevy Chase, MD	703-253-5821 703-253-5811 (fax)
Florida Environmental EXPO	Fla. Dept. of Env. Protection, AWMA, EPA, others	October 11 - 13 Tampa, FL	813-725-8202

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