



# Pollution Prevention News

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## A New Research Center Comes on Board

Lawrence L. Ross  
Staff Director, Center for Waste  
Reduction Technologies, AIChE

Chemical engineering principles and expertise are at the heart of the new interest in waste reduction and are pivotal in addressing the challenge of preventing pollution. In addition to the redesign of existing processes and the introduction of new processes, the basic concepts underlying waste reduction must be firmly integrated into corporate cultures and the educational process.

The American Institute of Chemical Engineers (AIChE), with a mission of promoting excellence in the development and practice of the discipline, decided late last year to establish the Center for Waste Reduction Technologies.

The new center will be a focal point for research, education, and information dis-

semination on innovative waste reduction technologies. The aim is to build a strong foundation for a wide range of industries as they develop the next generation of clean, economically competitive processing and manufacturing facilities. The Center's key features reflect our understanding of the type of approach needed:

- Active industrial involvement and support;
- Targeted waste reduction research for competitiveness and technological advancement;
- A "systems" view to integrating chemical engineering disciplines with those from other engineering and scientific fields;
- Education programs to better prepare

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## Blackstone's Multi-Media Inspections Prove Cost-Effective

Manik Roy, Ph.D. and Lee Dillard  
Massachusetts DEP

In a report released in July, the Massachusetts Blackstone Project Team found that inspections of industrial facilities that took a multi-media approach (examining air, water, hazardous waste, and "right-to-know" together) were generally more efficient than single-media inspections and were better able to identify source reduction opportunities as well as violations of environmental protection regulations.

A joint project of the Massachusetts Department of Environmental Protection (DEP) and the Department of Environmental Man-

agement (DEM), the Blackstone Project was designed to examine alternative approaches to inspections, enforcement, and technical assistance programs as a means of promoting source reduction. The project is being used to implement provisions of the Massachusetts' 1989 Toxics Use Reduction Act which mandate the development of a "whole facility" approach to environmental protection (see PPN, Feb. 1990).

The project targeted 26 metal-intensive manufacturing facilities located in the service area of the "Upper Blackstone," the sewage treatment plant of greater Worcester. Blackstone Project field staff inspected each

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# Environmental Education

## 'Renew America' Gives Credit to Effective School Programs

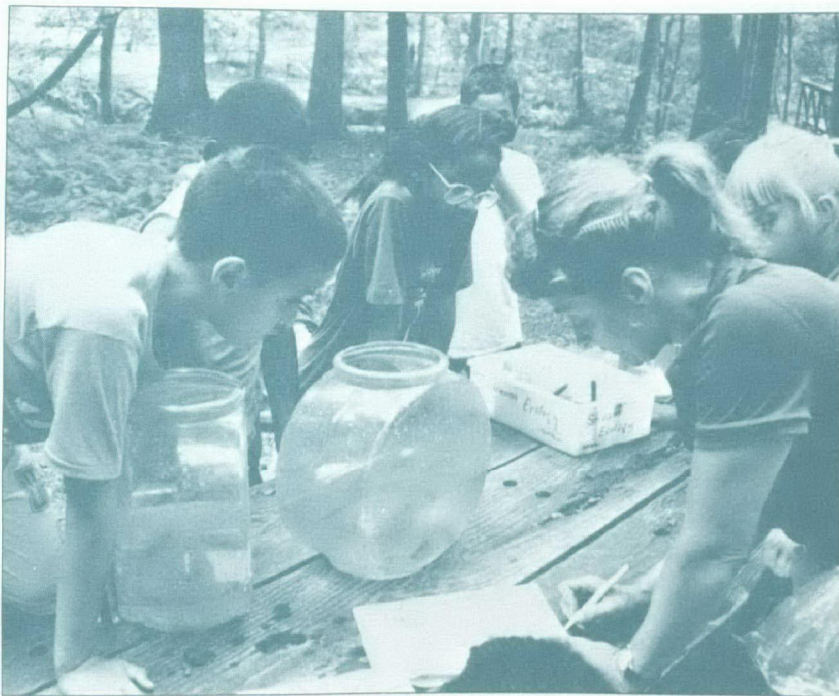
If you want to run a program in environmental education, do you have to develop it from scratch? Not anymore, thanks to a non-profit educational organization called Renew America.

The group launched a contest last year to find and honor environmental programs that *work*—and that communities everywhere can replicate. The competition was called "Searching for Success," and the 24 award-winning programs selected from nearly 1,000 entries were honored on Earth Day in Washington, D.C., this past April.

From the entries, Renew America also created the "Environmental Success Index," a listing of all the programs that were achieving some measure of success. Renew America plans to update this listing each year to serve as a clearinghouse for information.

In the area of environmental education,

*Students studying stream ecology at Prince George's County's Schmidt Outdoor Education Center.*



Renew America's judges gave one award and singled out five other programs for special merit. The award went to the **Training Student Organizers Program (TSO) of the Council on the Environment of New York City**. The program teaches New York City high school students about environmental issues and helps them de-

velop organizing skills to involve their peers and neighbors in such projects as beach clean-ups, noise abatement campaigns, graffiti elimination, open space preservation and paper collection for recycling. Student organizers have worked with more than 275 community groups and schools in the development of 251 projects serving 61 neighborhoods in New York City.

The TSO curriculum can be adapted to students of different ages, experience and ability. "The program helps the participants to develop a service ethic and to feel more skilled, confident and able to relate to the world around them," say program organizers. The staff of the Council on the Environment works with classroom teachers each week, and students are trained for a full school term, for which they receive academic credit. The TSO program is funded by foundations, corporations and government.

One project the judges singled out for special merit is called **The Farm**, run by the **Convent of the Sacred Heart in Greenwich, Conn.** Children from the New York metropolitan area spend from one day to one week at The Farm, receiving "seemingly casual instruction in environmental values," according to Sister Suzanne Rogers, project director. "Shall we use

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## EPA Environmental Education Initiatives

EPA has embarked on a project to produce pollution prevention education materials for students and teachers. The materials will concentrate on kindergarten through grade 12 and will emphasize the need for preventing pollution at the source. Ultimately, the project aims to instill in the country's youth an ethic for more integrated environmental decision-making, pollution prevention, and protection of human health and the environment. The project will also encourage the private production of complementary educational materials, including videos, films, computer software, teaching aids, textbooks, etc. Special consideration will be given to the environmental education needs of urban versus rural youths.

Directed by an Agency-wide group, the National Pollution Prevention Environmental Education Task Force, the

project will proceed in partnership with state and local governments, industry, educational institutions, textbook publishers, and others. As a first step, a compendium of available curricula relating to pollution prevention is being compiled and reviewed. For more information, contact Priscilla Flattery at 202-245-4164.

EPA recently drafted a strategic plan on establishing an Environmental Education Program which includes programs for educating youth, training future environmental management professionals, and building public awareness of environmental problems. The program coincides with proposed legislation (such as S. 1076, the National Environmental Education Act) that would create an Environmental Education Office at EPA.



# Transportation

## In Search of Cleaner Machines

**T**he link between transportation and air pollution has been well established for a long time. Most of our common forms of transportation — cars, trucks, buses — release air pollutants that cause significant health effects, including respiratory disease, circulatory problems, neurological damage, and cancer. Recent studies show that transportation is responsible for approximately 66% of carbon monoxide, 43% of nitrogen oxides, 37% of lead, 31% of ozone-producing hydrocarbons, and 20% of suspended particulates released into the air in the United States.

Motor vehicle exhaust also contains carbon dioxide (CO<sub>2</sub>), a greenhouse gas that contributes to global warming. In the U.S., cars and light trucks are the largest source of CO<sub>2</sub>, contributing 33% of all emissions. Each of the 135 million cars and trucks in the U.S. emits an average of five tons of CO<sub>2</sub> into the atmosphere every year, for a total of about 600 million tons.

### Clean Fuels: All Run, But Which Will Fly?

The President's proposed revisions to the Clean Air Act contain a significant number of provisions that would result in cleaner running vehicles, including tighter automobile tailpipe standards, a restriction on release of carbon monoxide at low temperatures, requirements for oxygenated fuels; and requirements for either a modified gasoline pump nozzle or an on-board device to contain fuel vapors.

Among the most prominent and controversial provisions is the Clean Fuels Program, which would replace a portion of the motor vehicle fleet in certain cities with new vehicles operating on clean-burning fuels. (Many of the provisions of the Clean Air Act were being debated when *PPN* went to press, including how many vehicles and cities should be included in the Clean Fuels Program.)

EPA predicts that vehicle emissions will continue to decline for about a decade in any case, because modern cars will keep on replacing clunkers. But, according to

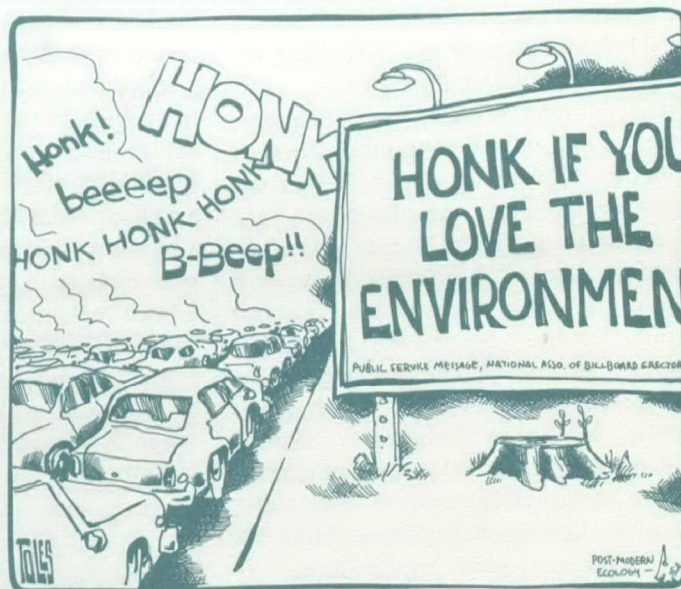
Automobile air conditioners represent the largest single source (about 20%) of America's release of ozone-depleting chemicals, in this case, chlorofluorocarbons (CFCs).

Government and industry achieved dramatic success reducing motor vehicle emissions in the late 1970s and early 1980s. Yet vehicle miles travelled are expected to increase about 2% per year into the next century — a compound growth rate of 22 percent by the year 2000. To offset this growth, cars, trucks, and buses will need to be far cleaner than they are now.

Can we do it? If not, urban living could become hell on wheels. Currently, there are 96 metropolitan areas that exceed EPA's National Ambient Air Quality

Standard (NAAQS) for ozone — i.e., smog — and 41 metropolitan areas that exceed the NAAQS for carbon monoxide.

This special section surveys various aspects of the transportation pollution problem. As this issue of *Pollution Prevention News* goes to press, the long term effects of recent events in the Persian Gulf are still highly uncertain. What is clear, however, is that American concerns for both energy security and environmental quality point in the same direction — to a need for new solutions in transportation.



Tom Toles in the Buffalo News

Don Zinger, Assistant Director of the Office of Mobile Sources, "The Clean Air Act is vital to keeping emission levels down after the turn of the century."

Following are summaries of the major clean fuels that are being evaluated:

**Compressed Natural Gas (CNG)** — More than 30,000 vehicles have been converted to run on CNG, and they emit much lower levels of smog-causing hydrocarbons than gasoline-fueled vehicles. General Motors is planning to manufacture over 1000 CNG pick-up trucks in early 1991 — the first marketed commercially in the U.S.

Even mass-produced, CNG vehicles cost more than gasoline-fueled vehicles and service station retrofit can cost between \$225,000 and \$400,000. CNG costs depend upon the price of competing energy sources, the existence of alternative

markets for gas, and the cost of collecting and transporting the gas.

**Ethanol** — Ethanol is the most commercialized alternative fuel, with 840 million gallons produced in the U.S. in 1988. It is blended into gasoline to form a 10% ethanol mixture known as gasohol, which currently has about a 7.5% share of the automotive fuels market. The price of ethanol has been dropping with improved efficiency in the production process and it may soon be competitive with gasoline. Pure ethanol, although not currently used, has the potential for 30% greater fuel efficiency than gasoline. Opinions vary on the impact of ethanol-fueled vehicles on urban ozone, and overall environmental effects of ethanol are complicated to assess.

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# Solar/Electric Cars Pick Up Speed In Race To Market

The solar-powered cars entered in General Motor's 1,650-mile Sunrayce USA held in July will never be seen in automobile showrooms, but some of the technology used to create these efficient, pollution-free vehicles may be found in electric cars destined for the US automobile market within three years.

Sunrayce USA, sponsored by GM, the Society of Automotive Engineers, and the Department of Energy (DOE), was designed to stimulate university research and interest in solar and electric vehicles. The 11-day race drew exotic-looking vehicles from 32 university teams.

The winning vehicle, the Sunrunner, designed and built through the efforts of more than 100 University of Michigan engineering students, completed the race from Lake Buena Vista, Florida to Detroit, Michigan race in 72 hours, 50 minutes and 47 seconds, with an average speed of about 30 miles per hour. Second and third place winners, Western Washington University and the University of Maryland, finished within a few hours of Michigan's team.

While all the students who participated in the race received an educational benefit, one of the Michigan students pointed out that the race had wider implications. "We believe that we are part of the prototype testing of this technology," Neil Chintamaneni said. "Yes, the car is expensive, but we are in the process of learning and helping the world to learn that solar energy is a practical form of energy."

Univ. of Michigan student drivers Paula Finnegan and Dave Niles with their winning Sunrunner



Photo by Bob Kalmbach

Ford's EXT-II remains an experimental vehicle, GM says it plans to market a battery-powered automobile by 1994.

GM's Impact was designed as an electric vehicle from the ground up to meet the safety and performance standards of gasoline-powered cars. The vehicle can accelerate from 0 to 60 in eight seconds, and has a top speed of 75 mph. Its battery pack is designed to last 120 miles between 2-hour recharges. Despite the significant technological strides represented by the Impact, however, cost and practicality problems have not been solved. GM noted when it formally unveiled the Impact in January that the car's operating costs in



GM's electric car, Impact

the Los Angeles market would be twice that of conventional gasoline-powered cars. Yet public concern for the environment may create a demand for these alternatives to piston engine cars.

## Sunlight and Electricity

While electric vehicles are pollution-free during operation, the electricity used to charge the car's batteries is produced by utility plants. Even this pollution may be

eliminated by using principles tested in solar races such as Sunrayce USA.

DOE and NASA's Jet Propulsion Lab are currently investigating ways to increase the range and reduce the operating costs of electric vehicles by using photovoltaic (PV) cells to supplement power during operation. PV solar cells are mounted on the exterior surfaces of these solar vehicles and convert sunlight directly into electricity.

Cars which exclusively use solar power are not practical since current PV solar cells cannot produce enough electricity to power a commercial vehicle. However, some assistance from PV cells can cut operation and maintenance costs and improve electric vehicles' market potential.

According to Richard King of DOE's Conservation and Renewable Energy Division, if a solar-assisted battery vehicle were driven less than 10 miles and then parked outside, recharging the batteries could be accomplished by the PV cells during a normal 8-hour work day. Under this scenario, King said, a consumer might recoup an investment for the PV cells in a battery-powered car in nine months.

While government and industry programs continue research into solar and battery powered vehicles, the top three finishing teams of Sunrayce USA are preparing to compete in Australia's 1,950-mile World Solar Challenge scheduled to begin November 11. In the last world race in 1987, GM's Sunracer won first place with an average speed of 41.6 mph.

## Designing from the Ground Up

American and Japanese automobile manufacturers have been researching battery-powered cars since the oil crisis of the 1970s. Ford Motor Company, General Electric, and DOE have invested \$20 million in developing an electric car, the EXT-II Aerostar. The eight-year joint project has succeeded in producing a vehicle capable of sustained speeds of 65 mph. While



# DOT: States, Cities Must Find Their Own Solutions

For an official view of transportation-related pollution and possible cures, PPN interviewed Joseph Canny, Deputy Assistant Secretary of Transportation for Policy and International Affairs. His responsibilities at the Department of Transportation (DOT) include environmental programs and general oversight of surface transportation policy.

**PPN:** *Many people feel that even with alternative fuels and improved car engines, we face more serious pollution in the future. What is DOT's view — and role?*

**JC:** As I understand the EPA projections, there should continue to be improvement over at least the next several years as the older, dirtier vehicles are pulled out of the fleet and replaced with contemporary designs. Beyond that, the new standards in the Clean Air Act amendments should result in substantial continuing reductions in pollution levels, both in tailpipe emissions and evaporative losses. How that will balance against the continuing growth in traffic and increased congestion in urban areas is a matter of conjecture. We can only hope that continued progress on vehicles and in alternative fuels will help achieve the standards. . .

The nature of transportation programs has historically been one of local and state decision-making with the federal government providing funding. With a few exceptions, like the interstate highway system, the decisions about when and where to build the highway and how many lanes, and what kinds of public transportation systems, have been local decisions.

In the past, we have not provided as much flexibility in our programs as might have been helpful to permit more creative packaging locally of transportation programs. But there is a fair amount of money that's available in the current highway and transit programs that can be used for either. Highway funding can be used for high occupancy vehicle lanes and construction of busways, for example.

While there is flexibility under the current programs, there isn't enough, and we hope to deal with that in reauthorization of the surface transportation programs next year.

**PPN:** *The National Transportation Policy issued by DOT in February does not contain plans to restrict the use of cars by private individuals as an environmental measure. Why not?*

**JC:** We see that as something that ought to be developed at the state and local level. . .

We have a longstanding difference of opinion with some people within EPA. We tend to view transportation as a service function or a following function. Transportation serves other societal activities and needs, and most often tends to follow land use and development decisions. Consequently, to try to restrict transportation after those decisions have

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***If we as a nation were to conclude that our reliance on the automobile has become excessive, we could change that.***

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been made is likely to be counterproductive from an environmental perspective. If you don't provide adequate capacity, you have higher levels of congestion on the roads and that generates more pollution. Another concern is that by restricting transportation, you restrict economic vitality in a metropolitan area.

**PPN:** *What is DOT's attitude towards Intelligent Vehicles and Highway Systems (IVHS)?*

**JC:** We think there's a lot of promise in IVHS. It's not a panacea — there are no silver bullets. We search for incremental progress in various areas, and IVHS is one of them. Congested traffic generates more emissions than free-flowing traffic, so to the extent that we can facilitate traffic flow, we can solve some of these problems and reduce emissions in the process.

**PPN:** *The Netherlands Environmental Plan sets specific goals for transportation, such as 75% reduced emissions of NO<sub>x</sub> and hydrocarbons from private cars by the year 2000. Do you see the U.S. ever setting such specific goals?*

**JC:** I don't. The U.S. and the Netherlands are really very different. I expect that the population density of the Netherlands is equivalent only to our most densely populated areas, say New Jersey or New York. To try to take policies that are progressive and effective under those circumstances and apply them to the U.S., where there are more dispersed land use patterns and long distances to be traveled, is not a sound approach.

**PPN:** *Higher gasoline taxes have also been proposed as a way of making the individual driver bear more of the actual costs of transportation, including environmental costs. What is DOT's position?*

**JC:** As a pollution control device, we are very skeptical. In the short term, gasoline consumption and travel may be reduced. We certainly did find that driver behavior changed somewhat during the energy price shocks during the 1970s but what principally happened was that people bought smaller, more fuel-efficient cars and kept driving. Gasoline tax increases that are large enough to substantially dampen consumer demand could have serious macroeconomic effects.

**PPN:** *Is there any chance the baby boom generation will cut back on their driving out of environmental concern?*

**JC:** We haven't seen any evidence of a major shift away from automobiles. . . If you look at any recent period, the total number of vehicles on the road continues to grow, and my sense is that it's growing faster on a percentage basis than the driver-age population is growing.

If we as a nation — from the grassroots — were to conclude that our reliance on the automobile has become excessive, we could change that. It would take a long time to reduce the patterns of suburban spread development that occurred since 1946, yet we could begin to build at densities that would be more amenable to transit, and to locate business and residential services in ways that would support the operating requirements of transit services. But in general, the current population patterns don't provide for this, especially with the growth in two-earner families.



# Transportation

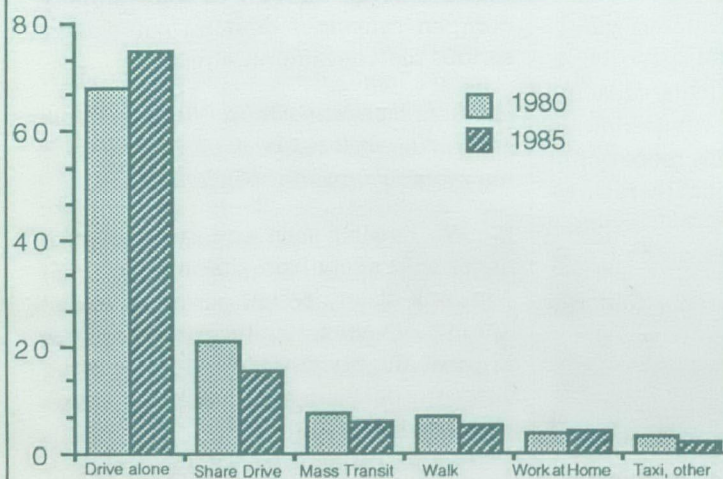
## Fuel Efficiency:

### Silver Lining Behind Current Clouds

In the years following the first oil crisis of 1973, average new car fuel economy doubled from 14 miles per gallon to 28 mpg. But when oil prices collapsed in 1986, so did concern over oil consumption; between 1985 and 1989, oil use in the U.S. increased about 10 percent, and improvements in vehicle fuel efficiency leveled off.

Meanwhile, prototypes for high-efficiency automobiles have been available for several years. Volvo, Renault, Volkswagen, General Motors, Ford, Peugeot, and Toyota have working prototypes that get about 60 or more miles to the gallon in city driving and 70 plus on the highway. Renault's VESTA2, which uses new lightweight construction materials, boasts 78 mpg city and 107 mpg highway mileage. Volvo says its LCP 2000 can deliver 62 mpg city and 81 mpg highway; it seats 4 people, accelerates to 60 miles per hour in 11 seconds, and more than meets U.S. safety standards. Engineers estimate the LCP 2000, completed in 1985, could be manufactured at a cost comparable to today's sub-compact. But Volvo still has no plans to market the car in the U.S. Whether any of these cars will ultimately reach the market will depend on a host of factors — oil prices and availability, fuel economy standards, and environmental concerns.

"Car manufacturers are probably going to give much more



### We Want to be Alone

More American commuters drive to work alone in their own cars than use any other form of transportation. The proportion of workers using public transportation declined by over one-half from 1960 to 1980, and the decline continued to 1985. There was also a significant shift between 1980 and 1985 from ride sharing to driving alone.

It has been estimated that 33 million gallons of gasoline could be saved each day — and car air pollution significantly reduced — if the average commuter passenger load were increased by one person.

Source: U.S. DOT

### Cutting Aerodynamic Drag

Pollution prevention opportunities abound, even in invisible places. Consider aerodynamic drag: Every automobile pushes an average of 4.5 tons of air out of its way each mile that it travels. Likewise, every large tractor-trailer truck pushes about 20 tons of air travelling each mile. The collective national energy penalty for pushing all of this air is enormous, amounting to an estimated 8 billion gallons of diesel fuel per year for heavy trucks alone. At typical highway speeds, nearly half of the power developed by an engine is used to overcome the resistance of the atmosphere. The drag coefficient of American cars has improved since the late 1970s, from an average of 0.44 down to 0.3 for the Ford Sable; European car manufacturers have undertaken innovative improvements in this area as well.

credence to introducing fuel efficient technologies now than three years ago when we were not worried about oil security and global warming," says Deborah Bleviss, executive director of the International Institute for Energy Conservation in Washington.

Fuel economy improvements could mean environmental benefits in addition to keeping down fuel costs and lines at the gas station. One estimate is that each increase in average fuel efficiency of 1 mile per gallon reduces CO<sub>2</sub> emissions by about 40 billion pounds per year, roughly the equivalent of closing 6 coal-fired power plants.

### Clean Fuels from page 3

**Hydrogen** — Although hydrogen is being tested as a motor vehicle fuel in other countries, it has not yet attracted much attention in the U.S. because of its currently very high costs.

**Liquefied petroleum gas (LPG)** — A number of fleets in California are testing LPG, which is cleaner burning than gasoline.

**Methanol** — Substituting methanol for gasoline could reduce ozone as well as visible smoke, oxides of nitrogen, and particulates; however, the full environmental verdict on methanol is not yet in.

The California Energy Commission has sponsored extensive tests of methanol-fueled vehicles in cooperation with automobile manufacturers and oil companies. "Fuel-flexible vehicles" (FFVs) have been developed that can run on any mix of methanol, ethanol, and gasoline. The first methanol heavy-duty truck engine demonstration project in the U.S. began in Los Angeles this year.

Although produced only in small quantities to date, methanol is believed to be potentially competitive with gasoline. EPA's analyses suggest that both dedicated methanol vehicles and vehicles optimized for ethanol could compete in cost with future gasoline vehicles.

**Reformulated gasoline** — Reformulated gasoline is gasoline whose physical or chemical properties have been changed in some way to achieve a particular objective.

Oil companies and automobile manufacturers are engaged in a joint research project to test the use of 25 different gasolines in various vehicles to determine their potential for meeting stricter emissions standards with minimal impact on engine performance. Several major oil companies are now marketing newly reformulated gasolines or intend to market them soon.



## Blackstone

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facility in teams of one to three inspectors (depending on the complexity of the facility), with each team inspecting the facility's compliance with air, water, hazardous waste, and SARA 313 requirements, and identifying source reduction opportunities. The facilities were also provided technical assistance, when requested, as part of DEM's "Central Massachusetts Pollution Prevention Project."

According to the project report, single-inspector and two-inspector teams are the best candidates for future DEP use. Single Blackstone inspectors completed multi-media inspections of facilities that were regulated by two DEP programs in less time than two single-media inspectors; similarly, paired inspection teams were more cost effective than the status quo for inspecting facilities regulated by three DEP programs.

Among other things, the Blackstone inspectors found 16 violations and five other problems that probably would not have been found during standard inspections, including unpermitted waste streams and an unintended loophole between the air and pretreatment programs.

The project also provided valuable information for pretreatment and identified specific source reduction opportunities at 16 of the 26 facilities. According to the report, the coordination of DEP's regulatory and DEM's technical assistance activities enhanced DEP's regulatory activities, and encouraged industry utilization of DEM's expertise, without compromising the mission or reputation of either agency. Also, 21 of the facilities said they would support DEP changing all inspections to multi-media inspections.

Because of the success of the project, DEP will be testing the approach in other settings in FY91: using different subject industry groups and more DEP inspectors in all four DEP regional offices. The effectiveness of source reduction-biased enforcement will also be evaluated in FY91.

For a copy of the executive summary of "The FY90 Report on the Blackstone Project," write to Walter Hope, Mass DEP, One Winter St., 5th Floor, Boston, MA 02108. For the complete 140-page report, send a check for \$8.60 written to "Commonwealth of Massachusetts" to State Bookstore, Room 116, State House, Boston, MA 02133.

## Renew America

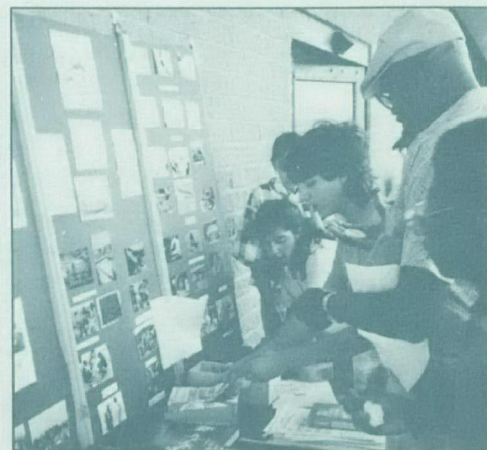
from page 2

chemicals to control the beetle or shall we use slower, organic methods of control and risk losing the crop? Such a decision would be made with the students.... Every event is an opportunity to foster the development of healthy attitudes about the plant, animal and human community.

"The Farm program has had a positive impact on the lives of many children and those whose lives they touch," Sister Rogers added. "Some students have returned to their schools and initiated programs to conserve energy, or recycle waste, or ban styrofoam products. We hope and expect that the 'ripple effect' will occur, and that those who are influenced by these children will make a noticeable impact on the health of our planet."

As this school year begins, every school district in Wisconsin has incorporated environmental education into every subject area at every grade level, as part of "Wisconsin Environmental Education Initiatives," another program mentioned for special merit. The Wisconsin program involves extensive teacher training and certification, as well as special educational materials and public television programming. The Prince George's County Public Schools system in Maryland was also recognized for its success in integrating environmental education into its social studies, science, history, math, and other curricula.

Other special merit designations went to:



Beach Channel High School students campaign for protection of wetlands around Jamaica Bay.

- the **Textbook Review Program**, a Texas program in which representatives of the **Sierra Club** and **Audubon Society** evaluated textbooks for environmental content and made recommendations to the state board of education that led to changes in the board's requirements, and
- the **Small Farm Educational Program of the Heifer Project International Learning and Livestock Center in Perryville, Ariz.**, a 2-acre farm run by students using only renewable energy and biological controls.

To enter next year's Searching for Success competition or to learn more about the Environmental Success Index, write to Cathy Nemsick, Renew America, 1400 16th St., NW, Suite 710, Washington, DC 20036, or call (202) 232-2252.

## Center

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students for engineering practice in waste reduction;

- Commitment to technology transfer and industry/university collaboration; and
- Leadership and outreach beyond the Center itself.

The Center's research efforts will be carried out by university-based consortia and single investigators. Companies may fund research targeted to their specific needs or the needs of their industry sector. We will encourage companies to volunteer to "test prove" new and emerging waste reduction technologies.

The Center is also committed to bringing advances into the education process to ensure that environmentally compatible design becomes a permanent feature of industrial practice. Vehicles to achieve this goal include new course materials for undergraduate and graduate curricula, continuing education courses for practicing engineers, and student internship programs.

For further information, please contact me at the Center, 345 E. 47th St., New York, NY 10017 (Tel: 212-705-7407; Fax: 212-752-3294). We look forward to a new and productive era in waste reduction technology research.



# Calendar of Events

Title	Sponsor	Date/Location	Contact
WPCF Annual Conference	Water Pollution Control Federation	Oct. 7-11 Washington, DC	Conf. Dept. 703-684-2400
Annual Meeting	National Association of Solvent Recyclers	Oct. 8-10 Corpus Christi, TX	Kimberly Levy 202-463-6956
Solid and Hazardous Waste Management (course)	Florida Chamber of Commerce	Oct. 17-19 St. Petersburg, FL	Carol McRae 904-385-1790
Solid Waste Recycling Conference & Exhibition	RSWT 90	Oct. 30-31 Detroit, MI	Ben Deutsch 800-999-3123
Hazardous and Solid Waste Minimization (Course)	Government Institutes, Inc.	Nov. 1-2/Las Vegas, NV Nov. 8-9/Parsippany, NJ	Terri Green 301-251-9250
5th National Household Hazardous Waste Management Conference	U.S. EPA, CA Dept. of Health Services, CA Integrated Waste Management Board	Nov. 5-7 San Francisco, CA	Michele Sevigny 508-470-3044
Haz. Waste Management & Pollution Prevention Course	Applied Environmental Technologies Corp.	Nov. 7-8/Boxborough, MA Nov. 28-29/Pittsburgh, PA Dec. 12-13/Meriden, CT	Kimberly Moore 800-926-1AET
11th Annual Meeting	Society of Environmental Toxicology and Chemistry (SETAC)	Nov. 11-15 Arlington, VA	Randall S. Wentzel 301-671-2063
Crossroads: Architects & The Environment	American Institute of Architects	Nov. 13 Washington, DC	Doug Greenwood 202-626-7463
Used Oil Management And Compliance Conference	National Oil Recyclers Assn., Gov't. Institutes, Inc.	Nov. 27-28 Washington, DC	Terri Green 301-251-9250
Pollution Prevention Strategies	American Ecology Services Inc./Geraghty & Miller	Nov. 29-30 Arlington, VA	Richard Miller 212-371-1620

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