

United States
Environmental Protection
Agency

Office of
Public Awareness (A-307)
Washington, DC 20460

Volume 5
Number 3
September 1979

EPA JOURNAL

Technology and the Environment



The Environment and Technology

Can technology be a positive force in cleaning the environment while maintaining a healthy economy? Or is it an obstacle to curbing pollution? This issue of EPA Journal takes a close look at these questions.

EPA Administrator Douglas Costle writes that the job is not to abandon the historic American commitment to invention but to change the character of the technology it produces to serve health and environment as well as the economy. The President himself has called for maximum use of technology to help protect the environment as the Nation moves to double its use of coal for energy. In his second environmental message to Congress, President Carter also announced a series of initiatives to control pollution and protect the land, water, and air from degradation. These Presidential positions are the subject of an article.

Technology has created many environmental problems, but it is also the solution to most of them, says Dr. Russell W. Peterson, president of the National Audubon Society, in a wide-ranging interview.

The effect of environmental regulations on technology and business is discussed by three authors. Government regulations don't stifle the inventiveness needed to solve environmental problems, says U.S. Senator Edmund S. Muskie. Regulations have led to environmental offices in many corporations, add Drs. Nicholas Ashford and George Heaton of the Massachusetts Institute of Technology. The burden regulations can sometimes cause is discussed by Milton D. Stewart, Chief Counsel for Advocacy in the Small Business Administration.

One corporation's creative answer to pollution is described by Dr. Joseph T. Ling, a vice president of the 3M Company



in St. Paul, Minn. In another article the Environmental Industry Council describes how four other companies are cutting pollution and making a profit with new cleanup technology.

The need for appropriate technology, an approach sensitive to people's needs and the environment, is urged in an article by William K. Reilly, President of the Conservation Foundation.

An illustration of what can happen when technology is not properly controlled is given in an article by Larry O'Neill, an

EPA headquarters press officer, on an Alabama town's experience with massive pollution from DDT.

EPA initiatives to encourage environmentally-safe technology are reported in several articles. EPA-aided efforts in pollution control research are explained by Steven Reznick, Deputy Assistant Administrator for Energy, Minerals, and Industry. Co-disposal—handling both garbage and sewage

sludge in one operation—is described in another article. Reducing paint pollution at a possible capital investment cost of billions of dollars over the next 5-10 years is explained by Robert Kolbinsky, an EPA environmental specialist. EPA's program to spread pollution cleanup technical know-how is also reviewed.

Meanwhile, EPA is taking its pollution control technology to sea, as explained in a report on the *Antelope*, the Agency's new vessel to survey ocean dumping sites. □

EPA JOURNAL

Douglas M. Costle, Administrator
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Articles

EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise and radiation, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

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Front cover: Shown docked at the Nation's Capital with the Washington Monument in the background is EPA's new ocean vessel, *Antelope* shortly before it left for the Gulf of Mexico to help survey U.S. waters threatened by the world's worst oil spill. The oil was escaping from a Mexican well.

Opposite: This power plant uses innovative technology to make electricity generation environmentally safer.

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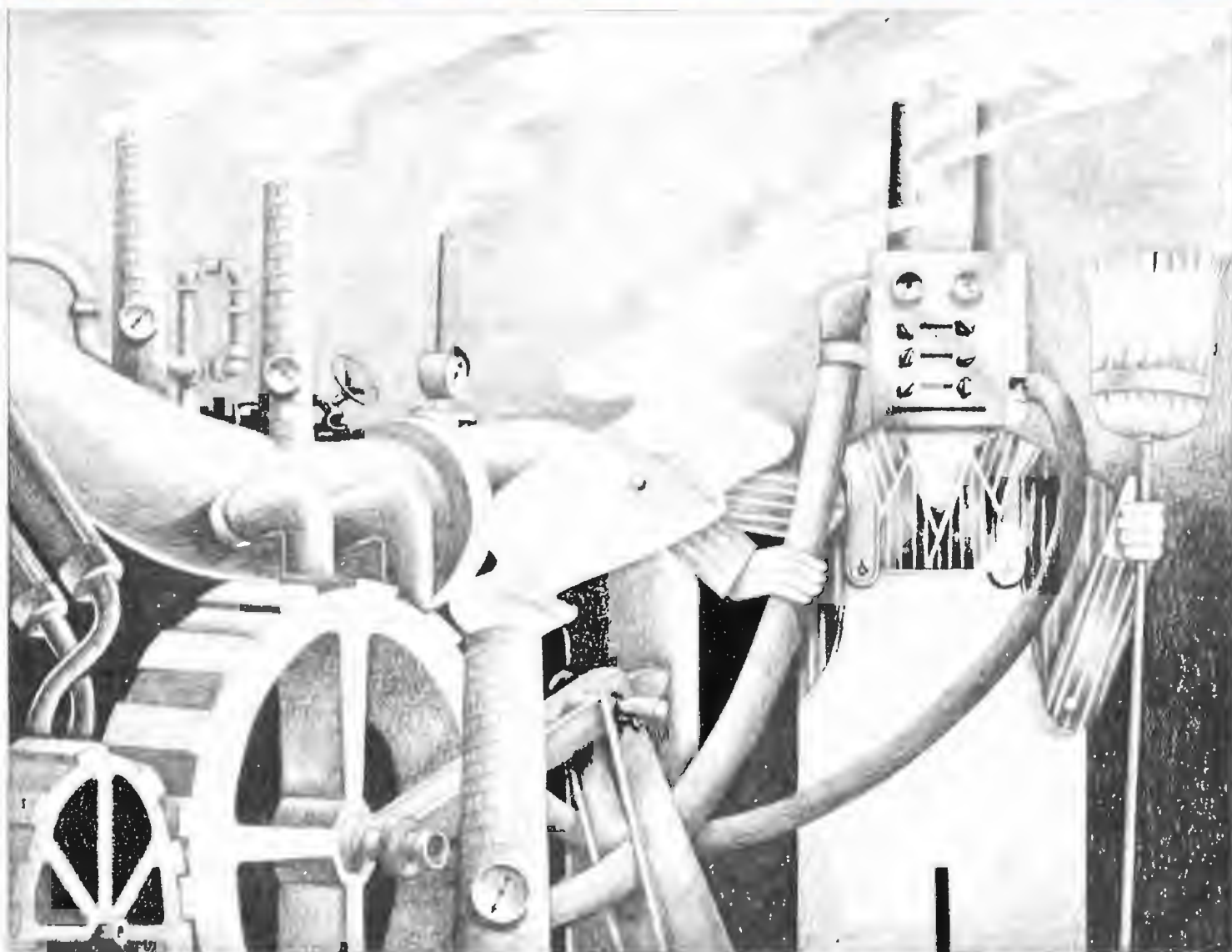
Design Credits: Robert Flanagan, Donna Kazaniwsky and Ron Farrah.

The EPA Journal is published monthly, with combined issues July-August and November-December, by the U.S. Environmental Protection Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget.

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Text printed on recycled paper.



Discoveries for a Clean Environment

By Douglas M. Costle
EPA Administrator

From the ponderous rotation of the early cotton gins to the silent, high-velocity movement of thousands of electronic signals through a tiny microprocessor is a long way in technological terms. But there is one thing that both these phenomena have in common—they represent triumphs of the American genius for innovation.

That genius has given Americans a worldwide reputation as a unique inventive breed. It has also provided the repeated breakthroughs that have permitted this country to reach an unprecedented level of prosperity.

Yet today, there are signs that the American people are beginning to question the value of technological progress. These doubts have been intensified by a series of recent, dramatic events: the revelations about the poisoning of Love Canal residents by chemical wastes; the near-disaster at the Three Mile Island nuclear plant; the fatal crash of a DC-10 at Chicago's O'Hare Airport; and the spectacular plunge of Skylab back to Earth.

Along with isolated episodes such as these has come the wearing, exasperating gasoline crunch of earlier this summer—an experience that caused many to ask whether we may not have built our mobile, energy-profligate society on a self-liquidating foundation.

These events are evidence that we have to make some changes in the way we conduct the Nation's business. We have to curb our appetite for energy; we have to provide better safeguards against the harm

that can be done by complex technologies, such as nuclear plants; and we have to make sure that potentially dangerous products can be used safely *before* they go on the market.

They do not mean, however, that we should turn our backs on technological innovation. In fact, the importance of innovation is going to increase, not diminish, in the difficult years ahead.

What we need to do is not abandon our commitment to innovation, but rather to alter the character of the technology that it produces. We are going to need breakthroughs that will not only assure the continued vitality of the American economy, but also address such other pressing concerns as cleaning up the environment, improving the quality of health care, upgrading mass transportation, and hastening the transition to reliance on solar and other renewable forms of energy.

EPA has an obvious interest in promoting innovative approaches to solving environmental problems, and it has several tools to help it do so.

Both the Clean Air and Clean Water Acts, for example, authorize the Agency to extend compliance deadlines for companies that can show they are working on promising new pollution-control technologies. The Water Act also says that innovative wastewater treatment projects can get a higher level of Federal funding than standard treatment technologies.

Another of the Agency's legislative mandates, the Resource Conservation and Recovery Act, allows us to fund projects aimed at finding better ways to recover the material or energy value in solid waste.

One of the more unusual projects that we are supporting—in this case, in cooperation with the State of California—is one that will allow conversion of agricultural wastes into energy products.

A waste-processing plant is being built on two trailers, so it can be hauled wherever a harvest is going on.

The waste products left over after the harvesting of crops like rice and cotton, or of trees, will be fed into the unit, where they will be subjected to the high-temperature, pyrolysis process. This will convert them into three different energy products—a substance like charcoal, which can be burned with either coal or oil; a heavy-duty oil; and a low-BTU gas, which will be used to provide energy for the mobile unit itself.

Aside from the various statutory provisions that encourage innovative environmental measures, there are also steps the Agency has taken on its own.

A prime example is the decision on sulfur emissions for new coal-fired electric plants.

That decision, which I issued last spring, reflects the recognition that there is a promising new technology for controlling emissions from plants that burn low-sulfur coal.

In order to promote the rapid development of the technology—called dry scrubbing—the regulation was written so as to include an emission limitation that would allow the use of this technology at such plants.

Even while the Agency is promoting innovation in pollution abatement, however, claims have been made that EPA regulations are stifling industrial innovation in general, and thus curbing the Nation's economic productivity.

These claims have never been documented, and there is considerable evidence that they are off the mark.

One indication is the fact that only a small fraction of the money spent on industrial research and development is going into pollution-control R&D. In 1977—the most recent year for which figures are available—just 3 percent of the \$30 billion spent on industrial R&D went into developing pollution-control technologies.

Another is provided by the cases where companies have found that pollution-control measures have resulted in little net cost, or have actually saved them money.

No one knows how many companies have had such an experience. One indirect indication, however, is the value of the energy and materials recovered as a result of pollution control measures.

Based on a survey of industry, the Census Bureau estimated this at more than \$950 million for 1977. Although no more recent estimates are available, continuation of past trends would put the current figure at well over \$1 billion.

Despite the evidence that environmental regulations don't significantly impede industrial innovation—and often in fact promote it, by encouraging companies to rethink their production processes—EPA is conscious of the need to minimize the potential for such interference.

Many of EPA's present regulatory reform efforts will help to prevent any curtailing of the sector's ability to innovate. Our wholesale cutbacks in reporting requirements, our plans to minimize the red tape involved in obtaining permits for new plants, and our systematic review of the need for each of our existing regulations are examples of reform measures that will ease the regulatory demands on industry, and potentially leave more room for innovation.

While taking concrete steps to encourage innovation, EPA is also attempting to stimulate new thinking about the nature of technological innovation.

Too often, technological advance is associated with massive undertakings like the Apollo moonshot, or with highly sophis-

ticated industrial ventures requiring so much money and highly trained manpower that only the largest corporations can attempt them.

Large-scale government or private-sector projects will always be important contributors to technological progress. But there is also a need for technological innovation on a much smaller scale—innovation that may be less sophisticated than what is being done in corporate laboratories, but that may also be more relevant to the needs and concerns of most Americans.

Two wastewater-treatment projects—underway in two communities that are widely separated geographically but share a common concern—illustrate my point.

The community of Wilton, Maine, several years ago decided it wanted to keep the energy costs involved in operating its proposed wastewater treatment plant to a minimum. So the town built the facility partially underground, and equipped it with solar panels. The plant gets most of the heat needed for the treatment process, as well as for heating the plant itself, from the Sun's rays and from the methane gas produced during the treatment of the wastewater—and thus substantially cuts its reliance on traditional sources of energy.*

The small resort community of Houghton Lake, in north-central Michigan, had a different kind of concern from Wilton's.

The Michigan town has a secondary wastewater-treatment plant. Its problem was that the treated water it was discharging contained levels of nutrients, especially phosphorus, that threatened to spur algae growth in the lake, and destroy its value as a prime spot for fishing and other water sports.

The community was reluctant to adopt the expensive course of putting in an advanced treatment system. So instead, it turned to the concept of using a nearby peat-marsh to "treat" its discharges.

Marshland of that kind has been shown to be very effective at drawing nutrients out of the water that flows through it. The upshot is that Houghton Lake has been able to get the necessary level of treatment by routing its discharges through the bog—and in the process, has saved itself an estimated \$1 million in capital and other costs.

As the experience of Wilton and Houghton Lake shows, innovation need not be a distant or arcane process. It can draw on resources as readily available as marshland, or sunlight. And equally important, it can solve the mundane problems of a town, or a county or a State—and at the same time, help provide answers to dilemmas that are global in scope, such as the energy crisis. □

*See EPA Journal, Vol. 3, #9, "Solar Power For Waste Treatment."

President Pledges Environmental Support

President Carter last month declared that his Administration's "basic commitment to clean air, clean water, and the overall protection of the environment remains strong."

In his second environmental message to Congress, the President also announced a series of initiatives including protection of coastal areas, expansion of the wild and scenic river program, added funds for acid rain assessment, and improvement of public lands management.

"Making the Clean Air and Clean Water Acts work is an important commitment of my Administration," he said. "We will continue the progress we have made in the past two years in promulgating fair standards and regulations, and we will continue to encourage new approaches to control of pollution, such as alternative and innovative wastewater treatment projects. The

President Defends Environment (Excerpt from President's remarks at town hall meeting in Bardstown, Ky., on July 31.)

"This afternoon I met at a nearby power plant with about 50 or 60 of the leaders in the Kentucky coal industry—operators, railroad managers, coal miners, and power producers, electric power producers. I told them that the worst mistake that the coal industry could make was to insist upon a lowering of the environmental standards of our Nation. If there is one thing the people of our country fear about coal, it is that it is dirty and it will lower the quality of our life. That is not true. We can burn twice as much coal in this Nation and not lower our environmental standards at all.

"That is what I believe our Nation wants to do and that is what I am determined to do with the help of people in Kentucky and every other State that produces coal in our country."

Environmental Protection Agency has taken a number of steps in the right direction. For example, the bubble concept, offset policy and permit consolidation are intended to simplify pollution controls."

Carter also pledged that he would seek reauthorization of the Safe Drinking Water Act, which expires next year, as well as "reauthorization and vigorous enforcement of the comprehensive Toxic Substances Control Act."

In the same message, the President announced the appointment of Gus Speth as Chairman of the Council on Environmental Quality. Since Speth already is a member of the Council, the appointment will not require Senate approval.

The President singled out EPA for special praise for its flexible and creative methods of dealing with regulations.

"Agencies should seek and adopt innovative alternatives to government regulations which reduce burdens on private citizens or businesses," he declared.

"The Environmental Protection Agency has become a leader among Federal agencies in examining new approaches and has made several moves to streamline its regulatory process." In addition to utilizing the bubble concept, offset policy, and permit consolidation, he said, "EPA is doing an effective job of implementing my Executive Order on regulatory reform and published the first agenda of regulations issued by any Federal agency." He noted that a regulatory calendar is now prepared and published on a government-wide basis by the Regulatory Council, which EPA Administrator Costle heads.

The President sounded a warning note in describing the major energy production effort that his Administration is now pursuing.

"I do not pretend that all new replacement sources of energy will be environmentally innocuous," he conceded. "Some of the new technologies we will need to develop pose environmental risks, not all of which are yet fully understood."

However, he added that he would "work to ensure that environmental protections are built into the process of developing these technologies, and that when tradeoffs must be made, they will be made fairly, equitably, and in the light of informed public scrutiny. We will examine not only the impact of new energy technologies on land and water and the effects of toxic chemicals, but also the longer term implications of increasing carbon dioxide concentration in the atmosphere."

The Administration has proposed the creation of an Energy Mobilization Board to speed up decision-making on critical energy facilities. The President noted that this will cut out excessive delays, but he added, "I will not allow it to undermine protection of our Nation's environment. I

intend, for instance, to make the environmental impact statement process fit the decision schedule set by the Energy Mobilization Board so that waivers of these statements will be rare. Only in exceptional cases will alternative procedures be necessary for the orderly completion of a critical energy facility. With the exception of new requirements imposed when construction of a critical facility is underway, the Board could not waive substantive environmental standards." The President will retain the right to override decisions of the Board on any



waiver issue, and the Board waiver decisions also would be subject to judicial review.

Among the initiatives outlined in the environmental message were the following:

- New measures to protect and enhance America's coastlines, and endorsement of the designation by conservation groups of 1980 as the "Year of the Coast."
- Four new Wild and Scenic River designations in Oregon, Idaho, and Colorado to be submitted to Congress, and 145 new national recreation trails to be established

by the Forest Service by next January plus 75 more by December, 1980.

- Establishment of a 10-year program to deal with the acid rain problem caused by burning fossil fuels, including a doubling of funds to \$10 million in its initial year by reprogramming current research money.
- Increased enforcement of laws to prevent illegal trade in wildlife and plants, which now threatens extinction of many species.
- New studies of ways to reduce the loss of agricultural topsoil by wind and water erosion.

- A Presidential directive to Federal agencies to modify their pest control programs and adopt Integrated Pest Management strategies where practicable. Carter cited research showing that multiple control techniques like IPM can be more cost-effective than chemicals alone in reducing pest damage.

- A new transportation policy that would, among other things, mitigate adverse effects of transportation projects on the environment. □



Resources, Technology, and the Environment

An Interview with
Dr. Russell Peterson



Dr. Russell Peterson is President of the National Audubon Society. He was Governor of Delaware, Chairman of the President's Council on Environmental Quality, and Director of the Office of Technology Assessment, U. S. Congress. Dr. Peterson was also President of a citizens organization, New Directions, and was an executive of the DuPont Company. He was Vice Chairman of the U. S. delegation to the U. N. World Population Conference in Bucharest. He is on President Carter's 12-member commission to investigate the nuclear accident at Three Mile Island.

In your judgment, will technology play a central role in providing solutions to environmental problems?

Technology certainly will play a key role. In fact, I don't see how we can solve many of the critical environmental problems without the application of technology. Application of technology has created many environmental problems, but it is also the solution to most environmental problems.

Would you say that pollution is part of the price for technology that we must pay?

I don't think we need to plan on accepting penalties from pollution in order to further some other objective. I think we ought to be very hard-headed about avoiding pollution as we develop new technologies. Pollution doesn't have to be a component of technological advance. It has been to a great extent in the past.

But if we are determined at the start to be selective in creating new technology and if we are insistent upon providing various regulations and controls, we can avoid in many cases and minimize in other cases insults to the environment.

For example, consider the current great concern about energy. There are many people saying we must forego various environmental regulations in order to assure that we get adequate energy.

I am dead set against that attitude. We have the resources and the knowledge so that we can both protect the environment and get the energy. But as long as the leadership says we are just going to work towards one of these targets and trade off on the other, then we are going to be in deep trouble.

I think the threat from polluting the environment is equally serious to the threats that come from an inadequate supply of energy.

So we need to do both. When we set out to do things without upsetting the environment, we can do that. But for so many decades, no one worried about

this. We just went ahead with developments running rough shod over the environment. Finally, the situation got so bad that in the late sixties the people rebelled against it, particularly the young people, and that led to the big environmental movement and the passage of so many pieces of legislation in Washington, the State capitals and city councils. Today we have many, many watchdogs around the community to see to it that we pay attention to environmental quality, as well as economic prosperity.

Since environmental degradation carries with it a very high financial penalty, when you analyze the impact over the long term, it is important that we get the economists and the business managers to weigh the long term costs along with their short term benefits.

So the main message is that we need to select approaches which permit us to reach our economic goals and at the same time protect the environment.

Do you think we can continue to have a reasonably clean environment if we are going to rely on coal and nuclear power for most of our energy needs in the next 10 or 15 years?

I think we can use coal in substantially larger quantities without a major impact on our environment if we insist upon the current laws of the land, insist upon carrying them out. For example, it is essential that we require the use of stack gas scrubbers in coal-fired power plants.

It is essential that we abide by the strip mining regulations. We can afford to be very selective in where we use coal and how we mine it and where we mine it. We can be highly selective for at least a century because there is so much coal out there available. Then if we abide by the tough regulations for mining and for burning it, we can use more.

In regard to nuclear, I think that the bankers and the people

are likely to blow the whistle on nuclear energy before many sources go by.

So I anticipate that nuclear energy will go the way of oil. It will peak out in production, probably about the same time that oil peaks out. That will be the mid-1990's, and it will be down hill from that time on.

The real pressure in the energy area I think should be on conservation which is by far the single best source of energy. Every time we stop wasting a unit of energy, we have it available to use elsewhere.

The second best approach, and the only one that has merit over the long run, is the development of renewable sources of energy, and by that I mean primarily solar energy with all of its ramifications, like wind energy and biomass. With the right resolve to develop renewable sources of energy and with the increasing costs of other kinds of energy, I think we can by early next century have at least 25 percent of the total energy from renewable sources.

With an all-out effort on conservation, we should be able to get by the year 2000 with much less than 90 quads of energy per year. That is an appreciably lower target than most people are willing to accept, but almost monthly we find official estimates of the demand for energy by the year 2000 being lower as we demonstrate that we can get by with less energy, and do so without impacting on the economy. The United States now uses about 78 quads of energy a year. (A quad is one quadrillion British thermal units of energy, and is equivalent to using about half a million barrels of petroleum per day for one year.)

So, to sum up, I would give top priority after conservation to developing renewable sources of energy. Recognizing that oil and nuclear will both peak out in production by the 1990's, we will need to have some additional sources of energy, and the only one that I can see available is coal.

Some time early in the next century I think we could develop sufficient renewable

sources of energy to start reducing the use of coal, too. But in the interim period we are going to have to use more coal, and I think we ought to do so, as I said earlier, insisting at the same time on very tough environmental controls. If we do so, use of this fuel will have a limited adverse impact on the environment.

One of the major problems of burning coal or oil or natural gas, is the increase in the atmosphere of carbon dioxide which over the long run can have a major impact on the environment as a result of heating up the Earth and melting some of the ice caps and raising water levels along our continents. How serious that will be is very uncertain.

Based on your experience as a member of the commission on the Three-Mile Island incident, do you think the nuclear power plants can be operated safely?

I do not want to comment on my Three-Mile Island experience because we are in the middle of that study, and I think it would be inappropriate for me to pass judgment on that until we have had the opportunity to digest the information coming in to us.

I can say this much about the Three-Mile Island study. I do not think that it would be very difficult for the commission to agree on what happened at Three-Mile Island, but it will be very difficult to agree on what might have happened.

There wouldn't be any basis for a presidential commission or the many other groups studying Three-Mile Island including groups from overseas, if all they were concerned about is what did happen. It is what might have happened that frightens people very much. How one can minimize such threats is the big challenge, and I want to minimize my comments on that until after October 25th when the Three-Mile Island commission makes its report to the President.

Can environmental clean-up be profitable and can it benefit the overall economy in the long run?

Environmental clean-up is always profitable. There have been many examples of companies forced by pressure of laws or pressure from the community to stop polluting. Once they set up processes to recover the pollutant and found that that pollutant could be marketed, they ended up making more money as a result of the clean-up than they were making before.

When you weigh all of the costs, short term and long term, not only to the company involved, but to the community, I think the cleaning-up process almost invariably comes out with a net benefit.

You drew a fair amount of criticism when you were Governor of Delaware from the corporate community for your coastal zone protection measures. Is it possible for business and environmentalists to agree on technology?

Yes, it is possible. In fact, it is very important that we work harder at that. I think by getting together ahead of time, listening to each other, learning from each other, that we can find routes into the future which will solve the problems and minimize the confrontation between industry and environmental groups.

The Coastal Zone Act in Delaware was a good example of how community action can completely change the plans of a huge industry, plans which were destined to destroy a very valuable natural area, and yet not interfere with the fulfillment of the objectives of industry.

I had a great concern about having adequate refineries in the east. And the oil companies planned to move to virgin territory to build new refineries. But in the case of the Delaware coastal area where they had planned to put up a whole series of refineries, they were blocked by the Delaware Coastal Zone Act from doing it in that spot. However, they have proceeded

to markedly increase the capacity of their existing refineries, and thus obtain more refined product without having to mar virgin areas.

In fact, the coastal zone law in Delaware, contrary to what oil companies and some big business located in Delaware have said, attracted business to Delaware. The management and employees of companies are obviously much interested in the quality of their living environment.

To have a place in their front yard where they can go hunting and fishing and boating and swimming or just lie out in the sun is a great asset and since there are so many businesses which have a higher level of employment per million dollars investment than oil refineries or highly automated chemical plants, the actual job level in Delaware, I think, was improved as a result of the Coastal Zone Act rather than hurt.

We have a great tourist business in Delaware. Many jobs are provided in lower Delaware as a result of the relatively unspoiled open spaces that we have there. If industry had built the series of refineries and had put in a deep water port and so on in Delaware Bay, as had been planned, it would have been completely incompatible with the use of that area for recreation and would have cost Delaware more jobs than would have been brought in through those low-level employment industries.

This battle between industry and environmental groups is a result primarily of industry being focused on making a buck today and environmentalists focusing on the quality of life in future generations. Somehow we need to get decision-makers thinking about the long term, as well as the larger geographic area.

To say it a little differently, we need to get decision-makers to think holistically, to think comprehensively. This is not only true in industry, this is true in government.

Our government is plagued with the myopia of the elected official who, with rare excep-

tions, is primarily concerned with getting re-elected. Thus, he has a short term focus. He can't even see the big problems which must be looked at over a longer term.

Elected officials, with rare exception, are not leaders. They are followers. They try to find out in what direction their constituents want to go and then try to get out in front of that parade.

So the way to make things happen in the United States is to inform the people, work together to mobilize and focus the convictions of the people and help them get their message to the elected officials. The elected officials pay much more attention to a constituent than they do to an expert in Washington.

So here at the National Audubon Society where we have 400,000 members around the country, 80 percent of whom are very active in the neighborhoods, we have a very effective grass roots force.

We are out to provide our members with as much solid, even-handed authoritative information as we can about the critical issues of the day and then work with them at the appropriate juncture to bring their grass-roots force to bear on the decision-makers in State Legislatures and in the Congress. This approach includes working with people from the business community, from various levels of government, and other public interest groups to arrive at solutions to our problems that take into consideration the interests of our pluralistic society.

The emphasis on a solution to our energy problem seems to be on large-scale systems with major environmental impact. Could there be a significant role for appropriate technology using smaller, decentralized systems?

I think there is a major role for the use of appropriate technology in solving the energy problem. In regard to conservation

of energy, every one of us can play an important role in stopping wasting energy, by how we establish the temperature controls in our own home, how we decide to insulate our home, how we decide to provide for our transportation, whether or not we insist upon getting a car that gets 40 miles per gallon rather than driving some gas guzzler.

In fact, most of the important decisions in conserving energy are made at the local level, primarily in our own homes, in our own work places. But when it comes to the supply side of the energy equation, it is also important that we concern ourselves with decentralized approaches.

The sun is today the major source of energy, and yet we use only a very small portion of that which comes in to the Earth. The opportunity for using larger quantities is great. But those opportunities primarily involve using it on the site, collecting it on the site.

The sun provides us free energy transported right to the point of use, our own work site. One of the problems has been that we have moved over the decades in the opposite direction towards highly centralized power plants, billion dollar plants, very expensive, extensive transmission systems.

So people in that business, the utility people, the manufacturers of the large power plant equipment, the bankers—all think in terms of big centralized facilities. When they are asked about solar energy, they say, well, one of the big problems with solar energy is it's so diffuse and you have to collect it and bring it together in some centralized place, and that's very, very difficult.

That's obviously the wrong kind of reasoning. One of the big pluses of solar energy is that it is delivered free to the point of use.

We can design our homes and work places so that we use the energy from the sun more effectively.

We have, in the past, used windmills, small hydro-powered plants, lots of them all over the country, back when we were a poor Nation. When we found oil and pumped it out of the ground and sold it for almost nothing, we got away from the windmills and the small hydropower plants and wood fires, and went to these highly centralized facilities, because the cost of oil was so low.

But now the day of reckoning is arriving, when we are rapidly depleting that cheap, convenient source of energy—oil. And some people say we can't use windmills and the small hydropower plants or wood fuel because they're too expensive. But how can they be too expensive in an affluent society, when they were such central elements of our way of life when we were a poor Nation?

Everything is relative. Relative to cheap oil, windmills weren't very attractive, but relative to very expensive oil, or nonexistent oil, windmills will be very attractive.

If we really modified our economic structure to include wide adoption of appropriate technology, do you see the average person being better off, as a result, and would the environment be better off as a result?

If you define appropriate technology as I do, which means the application of that kind of technology which is most appropriate to the task at hand, then I think we would be better off economically and environmentally.

But if you define appropriate technology as the most simple and most small-scale type of activity, in some cases, it may not be as desirable as an alternate kind of technology. So I believe we need to free up our thinking from the inhibitions that come from maintaining the status quo, and search for that

kind of technology which does give us, over the long term, both the better economic and environmental qualities.

And that doesn't mean that in all cases it would make sense to move from the highly centralized, highly capital-intensive, to the small-scale operation. You need to put the alternatives on the right scales, and weigh them from the interests of the final consumer.

Many times these things get completely out of the control of John Q. Citizen. I think the movement toward the highly centralized power plants is a good example. Today, for example, bankers, utility executives, nuclear scientists, and government officials—appointed and elected—put a lot of effort into establishing billion-dollar nuclear plants, which need to be around for decades in order to get a decent return on investment, it's not likely that they're going to be able to think very clearly about an alternate kind of energy which calls for putting hundreds of thousands of gadgets on individual rooftops, as a competitor for those billion-dollar plants.

To illustrate that, today when a public utility decides that it needs additional capacity for electricity, it will vote to add a new power plant—a coal-fired plant or a nuclear plant—costing a billion dollars, and it will go to a bank or two and borrow that money, because by law, it is guaranteed a fair return on its investment.

And the new plants cost much more than the old plants it has on line. So the incremental cost of that electricity is high, but you and I, who have been paying for our electricity monthly, find that the utility ups our rates as a result of the new, more expensive plant it puts on line.

But that higher rate is averaged over all of the electricity you're getting, not only from the new plant, but from the older plants. And so the actual increase is pretty small. If another power company, a new one,

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Deputy Administrator Barbara Blum inspects the EPA ocean survey ship, the *Antelope*, aided by Captain Glenn Germaine

EPA Gets Ocean Ship

The EPA has acquired an ocean-going vessel, the *Antelope*, to help monitor and collect scientific data at ocean dumping sites.

"For too long we have considered our oceans an international refuse container," said EPA's Deputy Administrator Barbara Blum. "Now we are limiting ocean dumping and other harmful practices. The ship will help monitor those activities."

The ship's initial three-year mission is to survey sites now used for the disposal of wastes in the ocean. Scientific data collected by the *Antelope* will aid EPA in its

responsibility to oversee ocean dumping activity carried out under EPA and Corps of Engineers permits.

The 165-foot *Antelope* was launched in 1966 as a U.S. Navy patrol gunboat. She served with the U.S. Seventh Fleet in Vietnam and with the Sixth Fleet in the Mediterranean, and was retired in 1977. The EPA obtained the surplus ship at no cost in a transfer from the General Services Administration.

Now on her first cruise as an EPA survey vessel, *Antelope* is enroute from her home port, Annapolis, Md., to Jacksonville, Fla. There she will undergo additional refitting and upkeep work.

The *Antelope* has already been extensively converted from her original Navy configuration to perform peacetime scientific missions as an ocean survey vessel. The conversion included the removal of all weaponry and the installation of three complete laboratories and a survey center containing mini-computers and analytical equipment.

A crane also has been installed on the after portion of the ship to handle survey

gear, and the vessel has been equipped with special stabilizing equipment for use in rough seas.

In the first year of her new oceanographic mission, the *Antelope* will perform surveys off the U.S. East Coast and Puerto Rico.

EPA regulates the dumping of industrial wastes, dredged materials, and sewage sludge by issuing the required dumping permits only in cases where the ocean environment will not be disrupted and no feasible alternative exists. Under the Agency's regulatory program, ocean dumping off the United States has declined from almost 11 million tons in 1973 to about 7.4 million tons in 1977. This total will decrease further, since EPA regulations call for the phase-out of all ocean dumping of sewage sludge by the end of 1981.

The *Antelope* is being operated under contract for EPA by Interstate Electronics Corporation of Anaheim, Calif. For her survey work she maintains a team of twelve scientists, assisted by an equal number of operating crew. □

A DDT Legacy

By Larry O'Neill



Perhaps it will sound familiar: a productive river poisoned by steady discharges of a toxic pesticide from a chemical manufacturing plant.

The Kepone catastrophe in Virginia's James River several years ago . . . right? Wrong. It is the more recent DDT contamination of Alabama's Tennessee River near the small, largely black town of Triana.

But if your guess was the Kepone calamity, the error is easily forgiven. As already indicated, the nature of these two incidents is similar. So, unfortunately, are some of the consequences. Like fishermen on the James, most of Triana's roughly 65 commercial fishermen have been put out of work because of the pesticide contamination. And like Kepone production workers, many of Triana's roughly 1,000 residents are plagued with uncertainties about the long-term health effects of a persistent insecticide.

Like other chemical catastrophes such as the birth defects from New York's Love Canal dump, Alabama's DDT woes again dramatize the unpredictable nature of the chemical trade—operations long since forgotten can rise again with a vengeance to threaten people and the environment.

EPA banned almost all uses of DDT in 1972 because of its persistence, its ill effects on wildlife, and possible health hazards to people. It has remained off the market since that time for all but a few special uses to protect health, such as controlling rabid bats.

The discovery of DDT in the Tennessee River near Triana began with an Army environmental agency's survey in 1977 of the Redstone Arsenal between Triana and Huntsville, Ala. Military scientists found high levels of the banned insecticide in a discharge ditch at the Arsenal, in the sediment of two streams that feed the Tennessee, in the Tennessee itself, and in fish from the river and streams.

The Army knew there was DDT at the Arsenal. It had leased some of the property to the chemicals group of Olin Corp., Stamford, Conn., to produce the pesticide from 1947 to 1971.

During that time, Olin discharged certain amounts of the insecticide and occasionally dumped bad lots of it into a "discharge ditch" at the Arsenal. Other residues of pesticide were poured into nearby settling ponds. In 1971, the Army closed the plant for failure to meet EPA-prescribed standards, and later, in fact, tore it down. Some of the DDT waste sites were treated with chemicals intended to neutralize the insecticide and then were filled and planted with grasses.

But discharges over the 24-year life span of the Olin plant combined with gradual erosion of the settling ponds washed a heavy load of DDT into the Tennessee River watershed. Some 4,000 tons of it eventually were estimated to be in a roughly 2.5 mile stretch of one Tennessee tributary—the Huntsville Spring Branch. Small but still significant amounts have been found in the river itself and in another tributary, Indian Creek.

After being informed of the Army's findings, EPA Regional Administrator John White of Atlanta in September, 1977, advised that fish caught in the Tennessee near the Arsenal "should not be eaten." A similar warning was given for ducks taken from the river. White also noted that "some channel catfish were found to contain quantities of the pesticide in excess of 400 parts per million (ppm)."

The Food and Drug Administration prohibits the interstate sale of fish and shellfish containing more than 5 ppm DDT.

Tests on fish from Triana residents' freezers showed from 3 to 60 times this amount.

Despite these findings, Alabama officials have consistently refused to close the contaminated waterways to fishing. One State official was quoted as saying, "I'd be glad to eat the fish from there anytime" and that "when someone shows those levels of DDT are harmful to humans we will reconsider. This doesn't mean that someone in Triana has to die or even get sick."

The Army has taken steps to prevent further contamination of the Tennessee. Thus far, it has spent about \$800,000 on clean-up efforts including a second sealing of the DDT settling ponds, diverting drain-

age at the Arsenal away from the pesticide-laced areas, and constructing retention dams in a drainage ditch. But the malevolent genie already had escaped the bottle, and its touch was not limited to fish.

Blood tests done earlier this year on 12 Triana residents by the Center for Disease Control (CDC) found levels ranging from about 50 parts per billion (ppb) to more than 600 ppb. Regional Administrator White described these as "14 times higher than the national level." Other experts compared them to levels found in DDT production workers.

Triana police chief Joe Fletcher's level was 273 ppb. He has said, "I'm scared . . . If we had worked in the plant we could understand having high levels of DDT. But why should we take responsibility for someone dumping in the river?"

Whether any Triana residents will become ill from DDT exposure is uncertain. Dr. Phillip Landrigan, chief of special studies for CDC, has noted, "Plenty of animal work shows reproductive problems. Human studies, however, which were restricted to males, show nothing—even at high doses." (Earlier this year, the National Cancer Institute reported that DDT probably is not, as once believed, a cancer agent.)

To better understand the insecticide's health effects, CDC this spring began examining about half the town's residents and checking their DDT levels. The purpose, according to CDC's Dr. Kathleen Kreiss who is directing the study, is to judge whether any health problems can be correlated with consuming large amounts of DDT. Particular attention is being paid to such illnesses as kidney disease, headaches, and high blood pressure. The results of this study won't be known until the end of this year.

The economic havoc wrought by the DDT is more certain than its health implications. FDA prohibitions against selling contaminated fish and fears of potential buyers have put Triana's commercial fisherman,

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The Will to be Innovative

By Senator Edmund S. Muskie

It has been a decade since Apollo 11 landed on the moon. It has been almost two decades since President Kennedy committed the country to the Apollo project. That decision required a marriage between government and science which can only be compared in our time to the Manhattan project.

In his fifth address to the Nation on energy, President Carter set this country on a similar course. By declaring war on energy dependence, the President has also called on government and science to achieve goals never before attained.

The relationship between academic research and the war in Vietnam blurred the importance of science and technology to many young Americans, but recent polls, including one from the National Science Foundation, have indicated that the pessimism of the general public has faded. Once again, most people believe that science, if properly applied, can help improve the human condition.

If there is any pessimism about the capability to develop new technologies to solve our problems, it comes instead from those industries whose competitive existence depends on innovation.

This could be a serious problem.

To those industries which must remain economically solvent and also work to prevent pollution, such pessimism could be crippling to both their individual corporate profits and national pollution goals.

Some industries will have to make important decisions about research and technology in the months and years ahead if they are going to be productive and not pollute.

Three major assumptions, held by most of the business community, however, have stifled the volume of technical innovation which could be utilized for pollution control.

First, the business and energy communities do not believe that support for the environmental laws of the last decade is strong and will last.

Second, many industries believe Federal regulation is strangling their creative efforts and forcing research into a defen-



sive, rather than an innovative, posture.

Third, many believe pollution control does not produce economic benefits.

All of these assumptions are wrong.

The first assumption—that somehow a dramatic change will occur in the environmental consciousness of this Nation—can quickly be discarded. Although the pressure for this Nation to achieve energy independence will test how dedicated government and industry are to protecting the environment, surveys continue to show the American public is unwilling to trade a clean environment even for energy.

It is true that the business community needs secure policies in order to make investments. Security should exist in the fact that the environmental laws we have passed since 1970 have remained in effect and will not be abolished. They may be amended, as all ongoing programs are, but, just as a *Los Angeles Times* editorial stated after the third air pollution alert in that city in a month:

"... Many businesses and automobile lobbies (must) get it out of their heads that they can force Congress to back away from the Clean Air Act."

The second assumption is a more difficult one to dispel in this era of anti-regulation ferment.

Congress has ventured down many avenues trying to spark innovation in

pollution control technology. The fact that we have stringent pollution laws and regulations confirms that pollution control was simply not being achieved under the free enterprise system without regulation.

To get the job done, Congress has had to remove economic incentives for those polluting industries which continue to defer compliance. We maintain a strong environmental research program within EPA. And, most importantly, Washington has had to actually write technological limits into law.

Federal regulation has not smothered technological ingenuity, but has instead, guided it in specific directions. The best example that comes to mind is the automobile mileage standards. The auto industry kicked and screamed that it could not improve the mileage ratings of the fleet in such a short time. Well, the job is being done, and the improved mileage ratings have become a major selling point in 1979. There is actually competition in the industry based on gas mileage.

New environmental policies have not hurt innovation. They have actually stimulated new technology and resulted in a redesign of many business products and processes.

For example, the provisions of the Clean Water and Clean Air Acts have been the catalysts for many corporations to re-evaluate their entire production systems in order to minimize energy waste and pollution. Georgia Pacific Corporation, in 1978, transformed pollutants and other wastes into enough fuel to supply half of the company's production energy needs—enough power for a city population of 500,000.

The Philadelphia Water Department may be the first metropolitan treatment agency to take advantage of the "alternative and innovative" technology provisions added to the 1977 Clean Water Act. It has perfected an innovative biological treatment technique.

Environmental laws in other nations have also stimulated, not retarded, technological progress. The Organization for Economic Cooperation and Develop-

ment reports that environmental regulation has helped Japan develop cheap alternatives to PCB's and devise new techniques to meet strict auto emission standards. In Norway, environmental laws stimulated the development of a cheaper energy-saving alternative to open-furnace burning. The French Government has even urged that many unrecovered pollutants be recovered for their economic value.

But no matter how much government direction is provided to find innovative technology, new investments will simply not be made if those in the market place do not see economic benefits from such undertakings. This brings us to the third reason why business believes innovation is crippled—that it just doesn't pay.

I have already mentioned a few cases where innovation has resulted in economic benefits. We get a clearer picture of just how economically important industrial innovation and research are when we look at cases where enough research has *not* been undertaken. Even though some industries believe taking a short cut will result in economic benefits, the reality of not investing in research can mean long-term problems and economic losses.

The recent corporate decision by General Motors to shift a large portion of its production line to diesel-powered vehicles has been met with strong public approval. Quick economic benefits? The prospect of an automobile which can get considerably better mileage ratings is attractive, but diesel engines also emit pollutants whose effect on humans and the environment are unknown. One Environmental Protection Agency study has already determined that diesel-powered cars emit unacceptably high levels of air pollution and should be altered to ward off possible health hazards.

It is far less of a gamble to invest in a major undertaking when adequate research has already taken place or when technology is already available to correct pollution problems. The Senate Environment and Public Works Committee has had to make a special request of \$4 million for EPA to conduct a study on diesel health effects—an important study in light of the



Incinerator designed to burn hazardous wastes at the 3M company near St. Paul, Minn.

apparent auto industry decision to invest billions of dollars in diesels.

Probably the most urgent environmental issue on the agenda for this Congress is trying to solve the problems associated with the release of hazardous wastes into the environment.

Every week we read about yet another case where hazardous wastes have been haphazardly dumped or stored. Even though acceptable ways to deal with such wastes have been technically available for many years, the cost of utilizing innovative disposal methods, like recycling and incineration, has always encouraged the cheapest and easiest alternative in the short-run. In the long-run, those companies who have been directly or indirectly responsible for improper waste disposal and "midnight dumping" of dangerous chemicals damage their reputation, force legal action, and invite regulation.

Those companies which made technical decisions long ago to deal with their waste in the best possible manner find it much easier and less costly to comply with new Federal regulations which force all companies within a certain industry to use acceptable disposal techniques. Thus, the

regulations not only remove the competitive advantage from less responsible companies, but actually give the advantage to the responsible ones.

To those who criticize the growing number of regulations which face American industry, it should be clear that pollution control regulation only fills the void left by a lack of sound business approaches to environmental problems. The more technical decisions made by industry to solve pollution problems, the better the argument that industry can manage the problems of air, water, and land pollution on its own.

A competitive edge should always exist for those companies seeking technical ways to improve their product; but an economic advantage should not continue for those who are careless in their production.

Any assumption that the atmosphere for industrial innovation in today's society is less favorable than in the past is unfounded.

I believe it does pay to be innovative.

It does pay to develop new technologies to handle difficult pollution problems.

There is no question that the development of new technologies needs a boost. Not only does industry have to be shaken from its current malaise, but more economic incentives need to be pursued, and a broader communications network to identify new technologies needs to be set up.

Most important, many more industries will have to decide that the courage to be different, the will to take a chance on new technologies, is really beneficial.

It is important to the Nation as a whole.

As we are about to embark on another major venture where government and science together seek to reach important goals, it is helpful to remember the important new technologies this Nation discovered on our way to the moon.

It is also important to hope that industry and government can work together to produce that same stimulus for new technologies to help solve the many pollution problems we still have here on Earth. □

Senator Muskie is Chairman of the Subcommittee on Environmental Pollution, Senate Committee on Environment and Public Works.

Making Cleanup Pay

By Dr. Joseph T. Ling



Air pollution control equipment at Chemolite plant at 3M Company in Cottage Grove, Minn.

Like other companies, 3M found itself caught between the pincers of inflation and economic downturn in 1974 and looked for ways to reduce costs and ease the fiscal pains of recession.

In methodical sequence, our board chairman, Raymond H. Herzog, asked each division and department chief, "What can you do to help reduce costs?" Everybody had an acceptable answer but me.

"Not only can't we reduce our environmental costs, they're going to increase significantly," I said. "The only alternative is noncompliance with regulations, and then we have to decide which one of us goes to jail!"

"In that case," Mr. Herzog responded, "why don't you see what you can do to eliminate the sources of pollution, so we won't have to worry about complying with guidelines and regulation?" It was a good question. Some of our technical people had been exploring process changes and other approaches along that line. However, these efforts were individual and unorganized. Like most companies, 3M primarily was fighting pollution with "black box" controls at the end of the production pipeline. This was the conventional way.

Eliminating sources of pollution on an organized, company-wide basis, however, provided us with an escape route from between the fiscal rock and compliance hard place, where we had so uncomfortably found ourselves.

Beginning in 1974, we developed a program called Pollution Prevention Pays, or 3P, for short. Its objective was to eliminate or reduce pollution at the source, before it was created, and thereby reduce the cost and complexity of environmental compliance.

The program was begun in 1975 in the United States and since then has been adopted by 14 of our subsidiary companies overseas as well. The results have been significant and gratifying.

Thirty-nine pollution prevention or reduction programs have been selected for recognition by 3M in the United States. These represent a savings of \$17.4 million, primarily in the form of pollution-control-facility costs which were reduced or elimi-

nated, and manufacturing costs, and some retained sales. Our subsidiaries overseas have contributed another 97 projects representing an additional savings of \$4.03 million.

At the same time, the 3P Program also has eliminated or reduced a wide variety of air, water, and solid-waste pollution problems. In our U.S. operations, for example, we have annually reduced air pollution by 75,000 tons, water pollutants by 1,325 tons, sludge by 2,900 tons, and wastewater by 500 million gallons.

Among the larger 3P projects is a process change at one 3M plant which eliminated an odor at another factory. The problem occurred when bulk adhesive from the first plant was coated to a variety of industrial tapes and other products at the second plant. An odor was released which wafted through nearby residential areas, causing a number of complaints.

The alternatives were to install a \$1 million thermal oxidizer to remove the odor-causing material from curing-oven exhaust vents and spend another \$50,000 a year to fuel and operate the oxidizer, or to find out whether the adhesive formula could be changed to eliminate the problem.

The problem was defined easily: The bulk adhesive was produced using a chemical process through which a simple compound (monomer) was turned into a complex compound (polymer). The process had a conversion ratio of 90 percent. During the coating process, the non-converted portion of the adhesive escaped into the atmosphere, creating the odor.

A team of engineers and scientists from the adhesive manufacturing and using plants developed a process change by which they were able to double the percentage of solids in that adhesive formula. This and other steps increased the conversion ratio to 98 percent, the maximum feasible limit. The process took about three months to plan and implement—less time than to install the thermal oxidizer—and it reduced the amount of non-converted monomers to where odor was no problem.

Dr. Joseph Ling is vice president of Environmental Engineering and Pollution Control for 3M, St. Paul, Minn. A native of Peking, China, he served as director of the Institute of Sanitary Engineering Research for the Ministry of Municipal Construction there in 1956 and 1957. In the U.S., Dr. Ling received the first Ph.D. in sanitary engineering given by the University of Minnesota. He also was a Woodrow Wilson Fellow.



Dr. John D. Crowell at work in a 3M laboratory. He has won an award in the company's pollution prevention program.

In another instance, cooling water was recycled where it previously had been collected for disposal with wastewater. This allowed us to scale down the capacity of a planned wastewater treatment facility from 2,100 gallons per minute to 1,000. It cost \$600,000 to build the recycling facility, but \$800,000 was saved on the treatment facility, for a net saving of \$200,000. In addition, operating costs were lowered, because of reduced demand for labor and treatment chemicals.

Another project involved the redesign of a resin spray booth, which had been producing about 500,000 pounds per year of overspray that required special incineration disposal as wet scrap.

New equipment was installed to eliminate excessive overspray and provide for more effective recycling of the necessary overspray. Efficiency was increased to provide a net reduction in the total amount of resin used. This saves over \$125,000 annually, a handsome return on a \$45,000 investment in equipment.

Some of our international results have included improved process controls at a plant in the United Kingdom, recycling of wastewater in West Germany, and a variety of combustion-control and heat-recovery processes in Japan.

We recognize that pollution-prevention technology is neither new nor unique to 3M. We regard our results as no more than an example of what can be accomplished in an organized program.

We also recognize that it is fairly easy for 3M to incorporate the pollution-prevention concept into technical activity, because

ours is a research-oriented company, with products and processes continuously being developed or changed.

In some industries, processes cannot be changed, or at least not easily, without disrupting or halting total production. Change-over may be too costly, or there may be no pollution-prevention technology to eliminate the pollution sources. For example, many heavy industries may not have realistic alternatives to conventional abatement methods. Hence, the 3P program concept would not be significantly effective.

We believe the goal should be to use the pollution-prevention concept where and when possible and practical. Each industry must apply its own ingenuity to develop its own know-how relating to the concept, just as each has developed its own technology to produce its own products.

These results are encouraged by providing technical employees with personal and professional recognition for pollution-prevention contributions through product reformulation, process modification, equipment redesign, or recovery of waste materials for reuse.

The name Pollution Prevention Pays was selected after debate over whether the word "pays" should be associated with the concept of pollution prevention. Four valid payoffs were defined: better environment, conserved resources, improved technologies, and reduced costs. Therefore, it was concluded, payoff not only should be equated with pollution prevention but is an essential motivating factor.

The Pollution Prevention Pays program is run by a 3P Coordinating Committee which consists of management personnel from our engineering, manufacturing, and laboratory organizations, and corporate Environmental Engineering and Pollution Control. The environmental organization provides a supervisor to carry out Coordinating Committee plans and to administer the program. The Coordinating Committee—there is one in the U.S. and each of the 14 subsidiary companies having 3P programs—establishes criteria for 3P recognition and makes award recommendations.

Recognition suggestions usually are initiated by 3M operating divisions. Only those persons who have made a direct, personal, technical contribution are eligible. To be eligible for recognition, a project must meet four criteria:

- Through process change, product reformulation, or other preventive means, the project must eliminate or reduce a pollution that is a current problem or has the potential to become one.
- It must exhibit more efficient use of raw materials, reduction in energy consumption or improvement in the use of other natural resources.
- It must involve a technical accomplishment, innovative approach, or unique design.
- It must have some monetary benefit, through reduced or deferred pollution-control or manufacturing costs, increased sales of an exciting product, sales of a new product, or other reduction in capital expenses or operating costs.

An extensive informational program for technical employees is conducted on a continuing basis to encourage pollution-prevention thinking and action in their daily work. Prizes and gimmicks are avoided, because the 3P program is a technical venture and not a contest or promotion.

3P recognition centers around a certificate signed personally by the board chairman and division general manager for whom the recipients work. I add my signature as well.

The certificates usually are presented at a special luncheon or meeting of the division's management organization. The objective is to bring 3P technical contributors to the attention of their comrades and also the bosses who sign their paychecks and can offer promotional opportunities.

Being recognized for using technical creativity to solve a pollution problem and lower costs is good for career development, our people have found. As it should be, this is the best incentive for taking the time and trouble to take the extra technical step to find low- or no-pollution answers to pollution problems. □

Pollution Cleanup Opportunities

Since the first strict Federal and State environmental pollution controls, it has been charged that cleaning up the air and water is too costly, placing an unfair economic burden on industries, utilities, and consumers.

Is this true—or can pollution control pay dividends? The four cases below,

selected from the files of the Environmental Industry Council in Washington, D.C., show that cleaning up the environment can be a definite economic plus. The Council is an association of manufacturers of pollution control equipment and systems.

The dollar and pollution control payoffs may vary from company to company. On the other hand, a cleanup technique may be successfully used by many industries. The citing of these cases provided by the Environmental Industry Council should not be interpreted to mean that EPA necessarily endorses these methods.

Peabody Air Pressure Recovery (APR) burners, developed and perfected in the early 1970's.

The super-efficient burners use special devices to send a flow of precisely regulated air directly to the fuel. The amount of oxygen mixed with fuel for burning is so exact that excess air usually is less than one percent. That compares with as much as 20 percent in conventional burners, which supply air to the fuel by less direct and less regulated means.

The importance of precision in this case is that the closer the air-fuel ratio is to the absolute ideal, the more complete is the burning of the fuel and the less waste there is to go up the chimney, either as ash particles or as smoke.

The Peabody system includes a number of sophisticated features. One of the most important is a solid-state burner management system that quickly detects and pinpoints trouble sources and also simplifies maintenance.

The Turner Plant now has an average ash level well within the State requirement, and the heavy smoke has been cut twice as much as compliance required.

Furthermore, the 10 Peabody burners are saving Florida Power about 4,000 barrels of oil a year, and the cost of both maintenance and operating manpower has been reduced. (The efficiency of the Peabody system is boosted by the relatively high quality of oil burned at the Turner plant.)

More Power to the People

Montana Power Company's problem in 1975 concerned its coal-fired electric generating plant at Billings. The plant could not operate at full capacity and still meet State air pollution standards.

Instead of producing 163 megawatts of power, the plant could turn out only 148 megawatts. That meant less electricity for customers and lower profits on the plant's operation.

Here's how the problem came about: When the plant was built, an electrostatic precipitator was installed to control

the ash and smoke. But the precipitator was designed to meet its guaranteed efficiency—removal of 96 percent of the boiler's ash particles—while the plant burned coal with a sulfur content of about 1.2 percent. That was the sulfur level anticipated in coal from a new mine being opened nearby.

As it turned out, the coal had far less sulfur—one percent or less. And the lower sulfur content meant the ash had a higher resistance to the electrical charges it needed in order to be picked up by the collector plate.

The precipitator's efficiency level plummeted to 85 percent at full capacity. The only way to get back within State emission standards was to cut power production by 16 percent.

A change in coal supply was out of the question, and Montana Power was understandably reluctant to opt for a costly additional precipitator.

Instead, the company chose a system that would chemically treat the ash, there-



Less Smoke, Less Fuel

In 1974, Florida Power Corporation had a crucial problem at its Turner electric generating plant, located near Enterprise, in the central part of the Florida peninsula.

The Turner plant's oil-fired boilers were releasing twice as much heavy black smoke and 40 percent more ash particles into the air than State environmental laws permitted. The plant would have to be shut down if it could not be brought within compliance.

Florida Power engineers had to choose between two approaches to a solution. A "front-end" cleanup would do the job by burning fuel more efficiently. Or a "tail-end" cleanup would in effect reduce the smoke and ash on their way up the chimney.

Florida Power engineers decided to try the more efficient front-end approach and concentrated on looking for a better burner system. They found one at Peabody Engineering Corporation, a division of Peabody International headquartered in Stamford, Conn.

Peabody's own engineers modified the Turner Plant's boiler to accommodate 10



by restoring its ability to hold the right electrical charge.

The system, a product of the Apollo Chemical Corporation of Whippany, N.J., is known as Coalrol LPA-LAC Flue Gas Conditioning System.

Its active chemical is dissolved in water, and the solution is injected into the flue gas in a fine spray. The water evaporates rapidly, and the chemical in effect coats the ash particles, changing their characteristics.

Principally, their resistance to electrical charges is lowered and they acquire a tendency to stick together, making larger particles that are easier to collect.

The plant now is well within the State emission levels when operating at full capacity.

An additional precipitator would have cost Montana Power about \$3,350,000. The expense of installing the Coalrol LPA-LAC system was less than \$100,000.

Precipitator installation time would have been between two and three years. Coalrol was installed in less than six weeks.

Slashing Sewer Costs

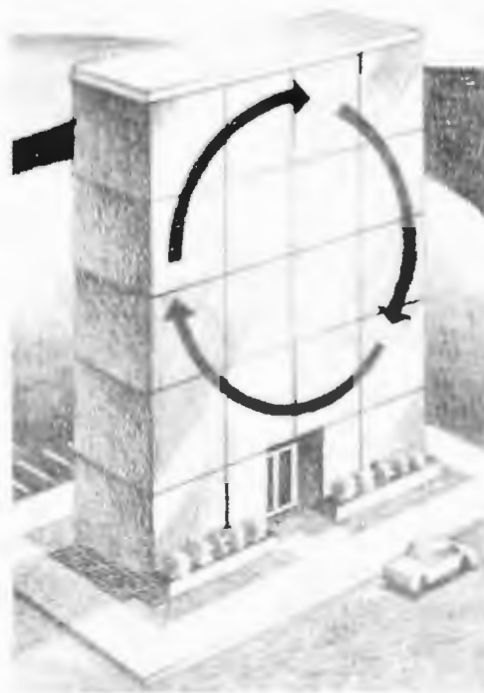
Sophisticated new sewage treatment technology holds the potential for revolutionary changes in the Nation's broad approach to sewage processing.

The technology could play an important role in a current trend away from more large central treatment plants. It is a considerable plus for the environment and could save small towns and their taxpayers millions of dollars in coming years.

The advanced technology was perfected by the Thetford Corporation of Ann Arbor, Mich., after several years of research and development. Systems using it treat wastewater virtually to the clarity of rainwater and recycle that water for flushing. Excess water created by continuing waste additions is evaporated or is so pure that it can be safely discharged either above or below ground.

Because no fresh water is needed at toilets and urinals, fresh water requirements are reduced by as much as 90 percent at a given installation. And because run-off water is of such high quality, drainfields, where they are needed, can be up to 90 percent smaller than other systems would require.

Thetford is just getting into installations as large as shopping centers and clusters of housing. But the reliability of its system, called Cycle-Let, has been established in a number of smaller installations, such as recreational facilities, service stations, wholesale distributorships, and small factories and office buildings. As currently designed, Cycle-Let is not primarily intended for use by individual homeowners.



The Thetford technology virtually eliminates the three principal sewage contaminants—biological oxygen demand, or the tendency of waste to deplete oxygen in the bodies of fresh water it pollutes; suspended solids; and coliform bacteria, originating in human intestines.

The Cycle-Let process begins by gravity-feeding wastes from toilets and other wastewater-producing fixtures to a sump, from which they are vacuum-transferred to the first of three treatment components. Here, aided by oxygen, beneficial bacteria that are always present in such wastes consume simple organic compounds.

The source of oxygen in this phase is nitrate, present in the recycled water the toilets used. In the course of doing its job, the nitrate is converted into a gas and is vented, along with carbon dioxide.

A follow-up activity in this first treatment component aerates the waste liquid. It converts ammonia into the nitrate that will be needed for oxidation when the treated water is recycled through the toilets.

The wastewater now moves out of the first treatment component to a stage of highly efficient ultrafiltration. That takes place when the waste water is pumped through tubes lined with filtering membranes.

Virtually all the contaminants have been removed by the end of ultrafiltration. What remains to be done is elimination of color, odor, and any surviving coliform bacteria.

This final work is accomplished in a water-polishing component by activated carbon adsorbers for odor and color removal, and ozone for disinfecting.

The most important Cycle-Let technical breakthroughs are a better technique for denitrification; use of the membrane filters to separate liquids from solids; prolonged activated carbon life; and in-system ozone manufacture, using ultraviolet light.

Installation of a number of such individual systems in new subdivisions and small towns could result in multi-million-dollar savings over installation of central sewage treatment plants with their extended sewer lines.

Resource Savings, Too

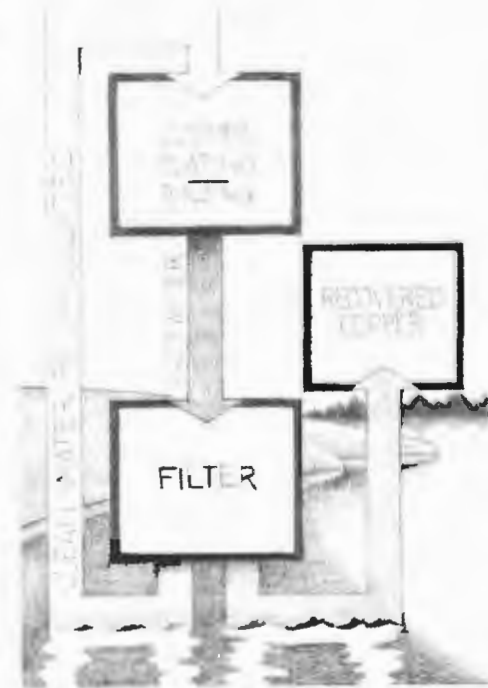
Few companies have been more successful at turning a problem into a profit than has Gould, Inc., whose Foil Division produces thin, copper-plated foil the electronics industry uses for its printed circuit boards.

Plating requires a considerable amount of rinsing, which generates wastewater, contaminated primarily, in this case, with copper. At Gould's Cleveland, Ohio, facility, copper in wastewater being discharged into the city sewer system potentially could interfere with sewage treatment chemistry, making sludge less acceptable for use as a fertilizer.

Meanwhile, wastewater from the new Gould plant at Chandler, Ariz., which was targeted for an early 1979 opening, also would be discharged into the city sewer system. But the problem that would be most keenly felt at Chandler would be fresh water, which is extremely scarce in the arid Southwest.

Engineers in the Foil Division, which had been treating wastewater all along,

Continued on page 24



Reducing Paint Pollution

By Robert Kolbinsky

The paint finishing industry, working with the technical guidance of EPA, is taking big steps to reduce fumes which contribute to smog. The effort may involve a total capital investment of billions of dollars over the next 5 to 10 years.

Also, EPA is setting a standard which will limit emissions from automobile painting in assembly plants. The standard will cover painting equipment installed in the future. The rule is scheduled to be proposed in September, 1979.

Of the pollutants for which National Ambient Air Quality Standards have been set, the most troublesome have been photochemical oxidants. They are formed from nitrogen oxides, oxygen, and volatile organic compounds (VOC's) in the presence of sunlight.

The industrial and commercial sources of volatile organic compounds are so numerous and the chemistry of the photochemical process is so complex that the problem has gotten worse while scientists were working on it. Photochemical smog, once associated only with southern California, has become commonplace in many areas around the Nation.

EPA has been working closely with the paint and coatings industry to reduce volatile organic solvents used in protective and ornamental coatings. With less solvent, less volatile organics escape to the air. With reasonably attainable cleanup, these emissions from coating operations could be reduced by more than two million tons a year. In an added benefit, the cost to coat products from furniture to machines may be cut as new, cleaner technologies develop.

Showing the extent of the cleanup program, EPA estimates that General Motors could spend more than a billion dollars to convert its auto assembly plants so that they emit less volatile organics. Ford Motor Company has been spending \$5 million a year on coating technology research.

The finishing industry is made up of a gamut of manufacturers who use paint on countless products ranging from beer cans

to automobiles. The industry's initial control approach has been to destroy volatile organics in an incinerator fired with natural gas, though incineration has been applied only where required by State or local regulations. In view of the energy situation and as a matter of common sense, burning large quantities of scarce fuel for incineration is not a desirable method of controlling these emissions. As an alternative, EPA has encouraged changes early in the production chain—long before paint leaves the spray nozzle. The aim is to dramatically reduce the amount of volatile organics needed in the coating process.

To make this big cutback possible, paint composition is being changed to increase solids and reduce solvents, application equipment is being modified or sometimes completely replaced to handle new types of coatings, and application methods are being adapted to match the new equipment and coatings with the job. Most important, the attitudes of a lot of people have had to change to accept unfamiliar concepts rather than insisting on "the way we always did it." To join coating manufacturers, application equipment makers, and users into this common cause has not been easy, but it is well on its way to happening.

EPA has relied heavily on the people who make and use industrial coatings to solve these problems. But at the same time, the Agency has supplied leadership and a strategy for success. For instance, to begin EPA's campaign to control emissions, Don Goodwin, Director of the Emissions Standards and Engineering Division in Research Triangle Park, N.C., established the Chemical and Petroleum Branch. Robert Walsh, manager of the new branch, initiated a study to scrutinize the so-called "exempt" solvents, long thought by some authorities not to contribute to the photochemical oxidant process. Common solvents such as mineral spirits had been exempted from regulation by many State and local control agencies following the lead of the Los Angeles County Air Pollution Control District.

In an intensive investigation enlisting some of the most knowledgeable people in the country, engineers in the Chemical

and Petroleum Branch concluded that the "exempt" solvents really do react with other chemicals. They merely require longer exposure to sunlight to react like other solvents and, in fact, are contributors to the formation of photochemical oxidants. A study conducted by Basil Dimitriades of EPA's Office of Research and Development and S. B. Joshi of Northrup Environmental Services produced much of the information to support EPA's so-called "Reactivity Policy," which was published in the *Federal Register* in July, 1977.

In an effort to identify "reasonably available control technology" for principal VOC sources, EPA in 1977 began issuing guideline documents to State and local governments. The reports covering industrial surface coatings were written mostly by Bill Johnson, Vera Gallagher, and Jim McCarthy in the Chemical Application Section of the Emission Standards and Engineering Division. These EPA engineers soon gained knowledge that covered the whole paint and coatings field. Their technical leadership has been crucial in providing a cooperative and creative research environment, an atmosphere that is now bringing about changes involving a large capital investment by industry.

The recognition gained by EPA through these employees is shown by a letter to James Berry, Chief of the Chemical Applications Section, from Louis LeBras, Divisional Technical Director of PPG Industries, Industrial Coatings and Resins Division. LeBras said, in part, "Many of our most experienced personnel in the coatings industry have been amazed at the ability of your group to do such a professional job over a wide breadth of coatings technology and in a short time period."

Johnson, Gallagher, and McCarthy kept abreast of the emission reduction potential of new techniques, equipment, and materials. To keep others' interest high, they participated in meetings with industry and trade associations and wrote articles for journals in the finishing field. They became



Robot paint machines, like the one shown here, are being used to simplify the painting process and improve control of pollutants.

an information clearinghouse for whatever was new and potentially useful. The result has been the creation of an unusual sense of responsibility among members of industry.

A look at any industrial coatings trade journal will show that EPA's efforts are paying off. Coating suppliers are featuring water-borne finishes, powder coatings, and high-solids paints in their advertising. Water-borne finishes, which primarily use water instead of volatile organic solvents, pose a minimal air pollution threat. Powder coatings applied electrostatically and then cured with heat that melts the powder into a continuous, smooth surface have almost no volatile organic emissions. In many cases products with a high solids content have been found to be acceptable substitutes for conventional coatings.

Equipment being marketed to apply the new coating materials includes heated spray guns, better electrostatic equipment, improved spray booth designs, and even programmed robots.

Application methods are also being revised to improve the efficiency of spray painting. Whereas 50 percent or more of paint solids are lost in the air in a typical industrial application, the use of the latest electrostatic techniques can cut the loss to less than 10 percent. The benefits are twofold—reduction of volatile organic compounds and elimination of paint sludge built up during spraying, a complicated solid waste problem.

Industry representatives such as Raymond Connor, technical director, and Larry

Thomas, executive director, National Paint and Coatings Association, have become familiar figures around EPA's, Durham, N.C., offices. Industry faces the multiple problem of realigning its painting operations and assuring that such changes are economically feasible and compatible with its energy resources. In addition to pollution control, benefits will include using less petroleum-based solvents, a savings in both energy and money.

The automobile industry, one of the largest consumers of coatings and finishes, is deeply involved in paint research. Most American automobile makers use enamels for their finishes, except for General Motors, which has preferred to use lacquers.

The spraying of lacquers results in the highest emissions of volatile organic compounds from an application process. The lacquer is made up of as little as 11 percent solids and 89 percent solvent, and only half of the solids stick to the object being coated. A 4-pound lacquer job on a car could, therefore, cause the release of 40 pounds of volatile organic compounds to the air.

General Motors has recently announced a plan to reduce its volatile organic emissions 66 percent by 1982 and 85 percent by 1987. Although GM management has not firmly decided on the ultimate coating system to be used in its 42 paint lines at 28 plants in 13 States, the 1987 goal is "water-borne equivalent." In Los Angeles County, where stringent air pollution laws limit these emissions, GM has been operating plants that apply water-borne finishes on cars for the past three years.

A General Motors spokesman says, "The company feels it has a realistic plan and schedule. We have been able to put a technically sound program of emission reduction into motion because of the professional approach of technically competent people in EPA and in State governments with whom we have been working."

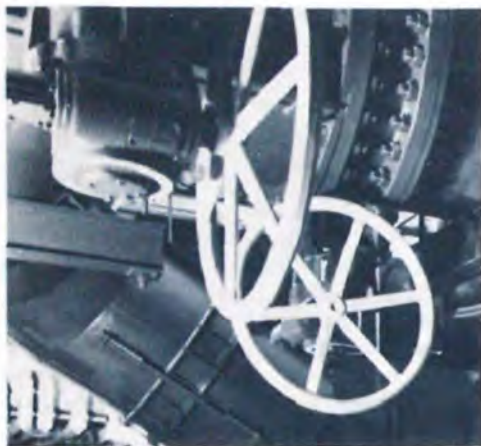
Meanwhile, the Ford Motor Company has the largest company research program on low-solvent painting in the world, according to the company. The studies are done at Ford's St. Thomas, Ontario, Canada, plant.

EPA is also working closely with manufacturers to reduce emissions from furniture finishing. At the request of the Office of Air Quality Planning and Standards, EPA's Cincinnati Industrial Environmental Research Laboratory is coordinating a project with eight manufacturers to apply water-borne finishes to wooden furniture. The project will give coating suppliers and furniture manufacturers a chance to evaluate the salability and durability of water-borne finishes on wooden furniture. To date, manufacturers have been reluctant to deviate from volatile organic-based coatings with proved market acceptance. If the new coatings are found to be satisfactory, using them would provide the added incentives of saving solvents and reducing fire hazards in furniture and manufacturing plants.

EPA engineers are convinced that, if given clear goals, the Nation's paint manufacturers and users can continue to provide colorful and durable products while cutting the use of valuable petroleum-based solvents and saving energy. □

Kolbinsky is an environmental protection specialist in EPA's Emission Standards and Engineering Division, Office of Air Quality Planning and Standards, in Durham, N.C.

Co-disposal: A New Technology



By Betsy Goggin and
Michele Hodak

Two communities are the first in the United States to adopt a technique pioneered in Europe for simultaneously disposing of garbage and sludge. The technique is called co-disposal and responds to the Nation's continuing energy crisis, the growing contamination of the land and water, and the decline in waste disposal sites.

The plants, now nearly completed, are the Harrisburg Resource Recovery System in Pennsylvania and the Western Lake Superior Sanitary District Co-Disposal Facility in Duluth, Minn.

In the early 70's, the city of Harrisburg faced a growing problem. The city had used sludge—the solids in commercial and residential wastewater—to fertilize farmland. As innovative as this disposal practice appeared to be, it suffered from some shortcomings. Area streams became polluted and the amount of harmful chemicals in agricultural soil began to increase.

In Minnesota municipalities and industries for years had discharged wastewater into the St. Louis River at 12 different points. The pollutants flowed from the river into Lake Superior, threatening the largest body of fresh water in the world.

Both the Harrisburg and Duluth communities are solving their waste management problems with co-disposal. Basically, thermal co-disposal is the integrated processing of garbage and sewage sludge through combustion. Garbage is used as fuel to dry sludge so that it can be burned. The volume of wastes left for ultimate disposal is greatly reduced. The system designed for use in Harrisburg operates with garbage incineration equipment such as a waterwall

furnace. This specially designed incinerator is surrounded by water-filled tubes that recover heat in the form of steam. The Duluth system uses refuse-derived fuel, the combustible portion of garbage, as fuel for sludge incinerators.

In 1972, officials of the Western Lake Superior Sanitary District hired Consoer, Townsend & Associates Ltd. to design a sludge disposal system. The firm's original plans called for the construction of oil-fired multiple hearth sludge incinerators. Because of the 1973 energy crisis, however, that proposal was dropped in favor of a fluidized bed sludge furnace design which burns refuse-derived fuel. This change should conserve three million gallons of oil costing \$1 million per year.

The Western Lake Superior Sanitary District Co-Disposal Facility, partially funded by the Environmental Protection Agency, will service a residential and industrial area of 500 square miles, including the cities of Duluth and Cloquet, and will incinerate daily 66 tons of sludge and 460 tons of refuse at full capacity. The facility will reduce the amount of solid waste and sludge—the latter by 95 percent—that now must be disposed of at landfills or used for land treatment. Burying only the residues of the wastes remaining after incineration is expected to conserve an estimated 1,000 acres of land during the next 20 years.

The energy for operating the Duluth co-disposal facility comes from the 45,000 pounds of steam per hour generated by the simultaneous burning of municipal refuse and sludge. The facility has three distinct operations: wastewater treatment, the processing of refuse derived fuel, and the incinerating of sludge and solid waste.

Wastewater is pumped into the treatment plant at a rate of 8,333 gallons per minute and screened to remove large particles. At the plant oxygen is extracted from the air and bubbled into the wastewater, creating an environment for bacteria. The bacteria eat organic wastes in the water. The sewage is then physically cleaned for a second time. Chemicals are added to the wastewater to remove phosphorous pollutants. The sewage water is passed through mixed media filters into chlorine tanks where bacteria are killed. Next the water is dechlorinated. The solid content of the wastewater is increased by various treatment processes called flotation sludge thickeners.

Municipal garbage is trucked to the facility and dumped into the receiving pit. Primary shredders reduce the garbage to four to six-inch pieces and ferrous metals are separated magnetically. Fourteen to 25 tons per day of these metals valued at \$35 per ton will be reclaimed and resold.

The refuse is then shredded into 1½ inch particles. The light, combustible material, or the refuse-derived fuel, is sorted from the heavy, noncombustible matter such as glass by an air stream. This material is then stored in silos until it is incinerated.

The dried sludge and the refuse-derived fuel are burned in fluidized bed incinerators, where a sand bed with temperatures of 1,400 to 1,600 degrees Fahrenheit serves as a heat reservoir. Wet scrubbers—a combination of water and filters—are used to control particulate emissions from the incinerators. The dirty scrubber water is circulated with the wastewater through the treatment plant. Boilers are operated by heat which otherwise would escape from the system. Any surplus of this fuel will be sold as will any unneeded hot water provided by burning this substance.

The Duluth thermal co-disposal plant is the first commercial facility to combine refuse-derived fuel and sludge incinerator technologies. When completed this fall, the facility, built at a cost of \$21.7 million, will demonstrate the feasibility of the fullscale operation of this design.

In Harrisburg officials hired Gannett Fleming Corddry and Carpenter, Inc. to design a sludge disposal process that could be incorporated into the existing solid waste incinerator. In effect, this combined the city's wastewater treatment plant with the garbage incineration facility, and the total system was named the Harrisburg Resource Recovery System.

The city's sewage treatment plant, located within one half mile of the incinerator, processes all commercial and residential wastewater. The liquid sewage sludge from this plant is pumped into the sludge drying building at the incineration facility and dried. It is then burned along with the city's refuse, generating steam. Adding sludge incineration to Harrisburg's waste disposal system, when completed early next year, will cost \$4.7 million. The Environmental Protection Agency is helping fund the project.

The Harrisburg Resource Recovery System is considered a forerunner of the innovations needed to solve the Nation's growing waste disposal problem, according to Steffen W. Plehn, Deputy Assistant Administrator for Solid Waste. The system involves the generating of power, the recycling of ferrous metals, and the conserving of land. It generates up to 92,500 pounds of steam per day. In a year, this is the equivalent in energy of 8.4 million gallons of No. 2 fuel oil or one million barrels of crude oil. Some steam is used to power the sludge drying equipment, and the rest is sold to the Pennsylvania Power & Light Company for heating and cooling area buildings. Harrisburg will receive an estimated \$1 million in steam revenue for 1979. Ferrous metal sales should total



about \$15,000 this year. During the next 50 years, the city expects to conserve at least 50 acres of land that otherwise would have been used as landfills.

The Harrisburg system combines several proven technological processes, specifically designed to solve the area's waste disposal needs. One is the purifying of sewage water at the city's wastewater plant, where it is then released into the Susquehanna River. The sludge is pumped to the incineration facility.

Another process is the dewatering of sludge in steam drying equipment, proven effective in other industries. The steam for this is derived from the process described earlier—the co-incinerating of shredded solid waste and dried sludge in waterwall furnaces. The resulting residue is either buried at a landfill or used in experimental pavement.

Air pollution is controlled by electrostatic precipitators, which reduce the amount of particulates in furnace emission to comply with State and Federal standards. Noxious odors from sludge drying are destroyed in the incinerator's intense 1,400 degrees Fahrenheit temperature.

Europeans have used co-disposal technology successfully for many years.

There are now plans to construct three additional co-disposal plants in the U.S.

Economic and environmental and health effects must be considered when choosing among the technological options for the disposal of solid wastes and sludge, and the new facilities will make available for the first time operating cost data on co-disposal. The initial capital investment for a facility is large, although costs can be defrayed if the area's present wastewater

treatment plant and/or garbage incinerator can be incorporated into the co-disposal system.

The costs of building a co-disposal facility can be partially met through EPA funding. New policy guidelines for funding under the Construction Grants Program are now being developed by the Office of Water and Waste Management. The Office is recommending that municipalities be given partial grants for building solid waste facilities that will be used for co-disposal, but not solid waste disposal projects alone. These guidelines should encourage municipalities to investigate the benefits of co-disposal.

Co-disposal facilities should do less harm to the environment and public health than the separate disposal of solid waste and sludge since the residue from co-disposal does not contain as many harmful substances, such as organics and pathogens, as are found in raw garbage and sludge. Leachates from the raw waste would also pollute surface and ground water more than those from co-disposal residues.

"Many of the initial efforts to use co-disposal in the United States failed," Plehn said, "because they attempted to incinerate sludge in garbage furnaces not designed for this purpose. Today after extensive research and development, the process of co-disposal is becoming commercialized. This innovative technology is proving itself." □

Betsy Goggin and Michele Hodak are interns for the EPA Office of Public Awareness.



This complex houses the co-disposal plant in Duluth, Minn.

A technician takes sample from vacuum filter in co-disposal plant at Duluth, Minn.

Research and Pollution Control

By Steven Reznek

Modern societies have developed immense skill in inventing and using technology for processing natural resources into marketable goods. This has been rewarded by economic growth and has improved our living and public health standards.

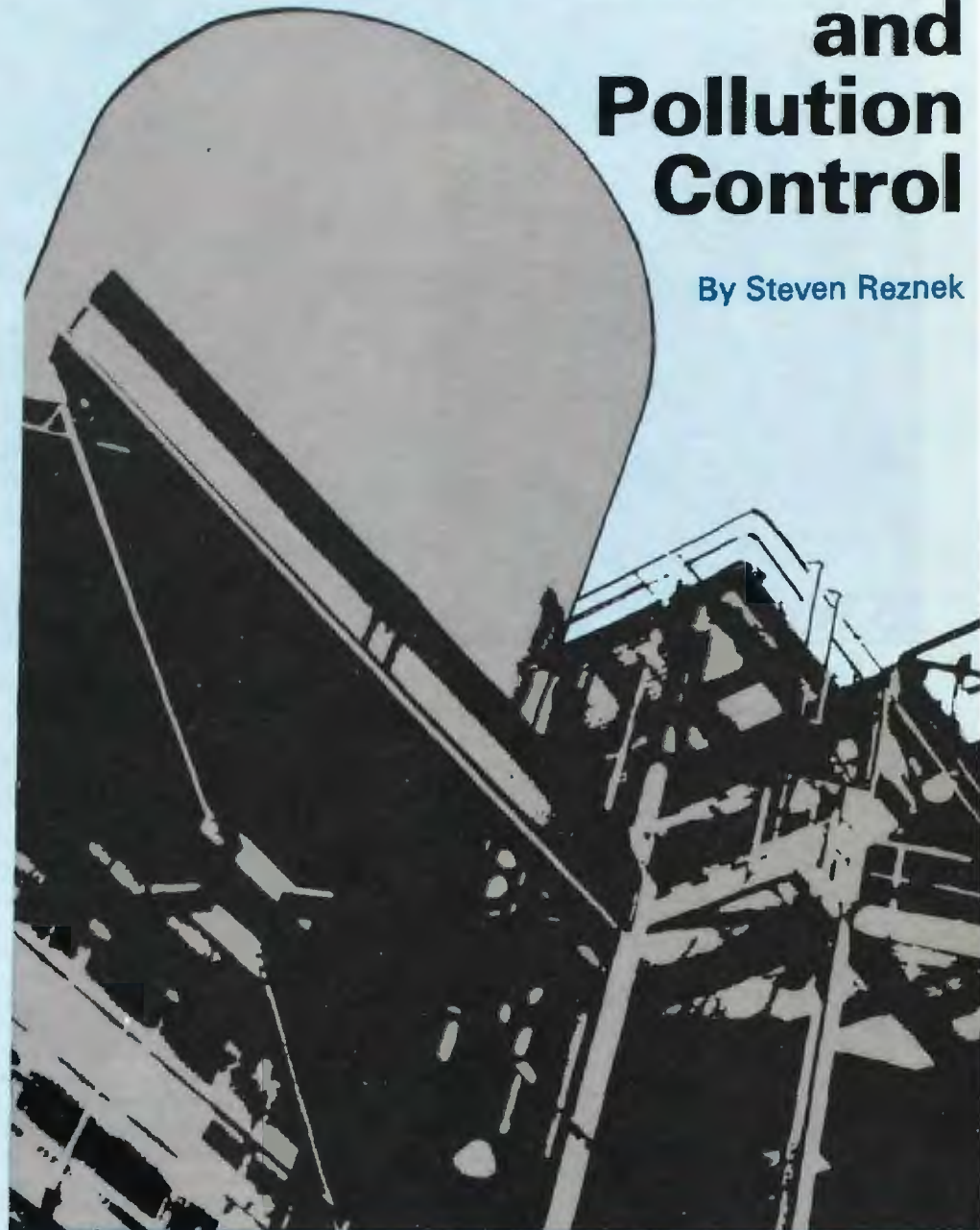
Since the mid-1960's, however, we have been experiencing the consequences of constantly increasing our use of natural resources. Some of the results of overuse of our air and water resources are deterioration of public health, lowered productivity of our land, and degraded environmental quality.

Improvements in control capability are the only way of improving the tradeoff between continued use of natural resources and further environmental degradation. EPA invests in pollution control research and development to provide the Agency with up-to-date information in this field. Following is a summary of some of the achievements thus far.

Improving the Tradeoff

Air Pollution Controls: EPA's role in flue gas desulfurization has been one of the most successful and cost-effective research efforts of any Federal agency. Past projects such as the three one-megawatt lime/limestone pilot units at the Tennessee Valley Authority's Shawnee Power Plant have produced most of the data for designing more than 60,000 megawatts of scrubbing capacity now being planned and installed. Our participation in the funding and evaluation of other systems, such as forced oxidation of limestone sludge and the Wellman-Lord system, have helped bring advanced processes into commercial reality, creating other alternatives for controlling sulfur pollutants.

Three current developments will improve the capability and reduce the cost of desulfurization—adipic acid buffering of lime or limestone scrubbing, spray dryer reactors, and direct combustion of pow-



dered limestone and coal in controlled combustion burners. EPA personnel or contract researchers shared the initial discoveries in the first and third technologies. EPA's resources will help speed commercial availability of all three.

TVA estimated that adipic acid modified limestone scrubbing will improve overall system reliability and lower costs by about seven percent. We evaluated adipic acid at the Shawnee Test Facility burning a high sulfur coal and found that sulfur removal efficiency increased from 80 percent to between 95 and 97 percent.

In a spray dryer reactor, a concentrated lime or limestone slurry is sprayed into the hot flue gas. While the water is being evaporated from the droplets, sulfur dioxide

reacts with the hydrated lime. The sulfur oxides become part of dry particles and these, in turn, are collected by conventional control technologies. The economics of spray dryers limits their use to low sulfur coals. However, for these coals, the spray dryer system will reduce the total annual cost of desulfurization by about 30 percent.

The national emissions of nitrogen oxide at the end of the century may be twice as large as the 1977 total. The increased emissions from uncontrolled coal combustion could far exceed the reductions achieved for mobile sources. EPA research has made real progress in developing the design of a staged combustion coal burner



that can reduce nitrogen oxide emissions by 85 percent. A long term demonstration is now in progress and will provide the data for revising the new source performance standard for coal combustion.

Learning how to control combustion led to the development of a very promising technique for reducing sulfur dioxide. Dry, powdered limestone is mixed with the coal prior to combustion. In well-controlled combustion, sulfur is trapped on the limestone, and in pilot tests, sulfur oxide emissions have been reduced 85 percent. Preliminary estimates are that the cost of achieving control may be reduced by 80 percent. The process will be applicable to both high and low sulfur coals.

The ability to control other air pollutants such as fine particles and hydrocarbons is also improving as new technologies are discovered and applied. New methods of particle precharging before electrostatic precipitation, for example, have appreciably improved performance. Four methods also are known for controlling the emissions of volatile hydrocarbons—high temperature combustion, catalytic oxidation, carbon absorption, and surfactant enhanced scrubbing. No single vendor offers all of these technologies, and engineering information on their costs and performance is limited, but research is creating the data necessary to understand them. **Water Technology:** EPA is continuing to make improvement in this field. One of the most productive areas is the treatment of drinking water supplies. Research has generated the information necessary for systems to increase removal of heavy metal and pesticide contaminants.

Chlorinated and other organic compounds can be absorbed on carbon. However, minimizing chlorinated organic compounds in disinfected drinking water has proved to be a complex engineering problem. Although carbon absorption technology is capable of removing drinking water and wastewater contaminants to very low levels, it can be quite expensive. EPA researchers are finding ways to reduce the costs and hence extend the use of carbon absorption to minimize the risk of potentially carcinogenic organic materials. One technique used in Europe is to add ozone to the water. The ozone will oxidize some of the organic material absorbed on the carbon and extend its useful life. Another technique dramatically lowers the cost of reactivating used carbon. Instead of the very high temperature oxidation normally used, the carbon is immersed in high pressure carbon dioxide, which dissolves the organic materials, leaving the

carbon structure intact. This technique is being demonstrated on carbon used in treating wastewater from pesticides manufacturing.

Other contributions in water pollution control include new use of the old technology of electrically-enhanced coagulation of small particles. The finely divided organic solids in many wastewaters, such as those from dairies, fish, processing plants, and petroleum refineries can be agglomerated and efficiently removed. The material recovered from the dairy and fish processing wastewater can be used as animal feed.

In improving the efficiency and effectiveness of conventional treatment processes, the most important change in biological treatment has been the use of pure oxygen, activated sludge systems. The first research application of the technology occurred in 1968, but by 1980, over 150 systems with a combined capacity of over five billion gallons per day will be operating. This rapid development would not have occurred without Federal investments in research and demonstration.

The increasing cost of energy and the problems of disposing of municipal solid wastes and wastewater treatment sludges have prompted the engineering research program to explore how these two waste streams could be combined. Minneapolis-St. Paul was the first locality to propose using this approach, and EPA helped support the research and design necessary for a system in the Twin Cities. Today several other metropolitan areas are exploring the concept. (See story on p. 20)

The need to contain and decontaminate spills of oil or hazardous materials has created a separate new industry. A few years ago, specific spill control techniques did not exist. Today a capability exists for deploying quite sophisticated technology, much of it developed and demonstrated by EPA. The Agency's National Response Team is now equipped with mobile units to isolate contaminated surface or ground water, to treat it with biological and carbon absorption systems, and to incinerate haz-

ardous wastes. Firms are now using those methods in spill response.

New Processes and Ideas: End-of-the pipe pollution controls will only improve to a degree. Industry must use new and cleaner manufacturing processes. EPA is discovering ways of operating complex facilities to eliminate pollution, use waste as products, and reduce the cost of environmental protection.

We have designed a system for an integrated iron and steel plant to reuse its water, and if the design proves feasible, iron and steel production need not discharge toxic wastewater.

Other applied research in iron and steel production has documented the costs and performance of dry quenching and continuous coke-making processes used in Japan and Russia. These processes have energy and economic advantages and could eliminate toxic air pollutants.

Perhaps the most important trend in water pollution control is the use of less energy and technology-intensive approaches. The Clean Water Act Amendments set aside 10 percent of the construction grant funds to be used for innovative or alternative processes, and the Office of Research and Development (ORD) has produced guidance manuals defining them. Such systems include solar heating, the use of wastewater in agriculture or aquaculture, and treatment by land application.

Improving Environmental Regulations

EPA controls environmental pollution by regulation. The engineering skills and expertise built up in the research program make very valuable, and often vital, contributions to accomplish that job.

Much of the technical information on which construction grants are based has come from EPA's research and development projects in wastewater treatment. The manuals for drinking water supply systems also are the results of EPA's research.

ORD's personnel are being tapped to help supply expertise in the preparation of the Resource Recovery and Conservation Act's hazardous waste regulations.

Engineering researchers are helping to develop effluent guidelines defining the performance requirements for "best available control technology" for toxic water pollutants. In a few areas, ORD personnel are managing projects that could supply

the basic engineering data for the formulation of the effluent guidelines. ORD and regulatory personnel also are creating new concepts to help the Agency formulate an approach to regulation.

Organic chemical manufacturing is an extremely complex industry that makes over thirty thousand chemicals. To help establish effective regulations, a group of professionals from EPA's research and effluent guidelines programs are creating a system to describe the generic types of chemical process and the toxic pollutants each creates. If the concepts prove practical, effluent discharge permits could limit toxic pollutants based upon the generic reactions used at a facility and the material processed through each type of reaction.

Another concept is a method of estimating the effectiveness of alternative treatment technologies for specific chemical components in wastewater. The result will be a manual for permit writers evaluating how well each technology removes toxic pollutants.

EPA energy research has been instrumental in the Department of Interior's regulation of coal mining and EPA's regulation of air pollution from fuel combustion for electricity generation. Research engineers are now helping to assemble information necessary to regulate disposal of coal ash and desulfurization sludge and regulate air pollutants from industrial combustion sources.

To assure that the coming changes in our energy systems are compatible with protecting public health and the environment, we must evaluate the ability and cost of technologies to control solid waste and air and water pollution from new synthetic fuel technologies. Our goal is to have pollution control guidance documents developed in 18 months for oil shale processing, industrial coal gasification, solvent refining of coal, and indirect coal liquification. This will provide the basis for establishing new source performance standards for these facilities.

The challenge is a difficult one. Incomplete combustion, fundamental to processing oil shale and coal, will produce toxic and carcinogenic compounds. Effective control requirements and designs must be available as the new oil shale and coal refineries are planned and constructed. EPA's role must be to see that as new energy technologies are developed environmental quality is preserved. □

Steven Reznick is EPA's Deputy Assistant Administrator for Energy, Minerals, and Industry, in the Office of Research and Development.

Pollution Cleanup Opportunities

realized that the existing processes would not provide the most cost effective method for meeting EPA's proposed pretreatment standards. But they now decided to do an even better job than EPA and Ohio required. They set their sights on a zero copper discharge.

By 1977 they had achieved their goal at the Cleveland, Ohio, plant, and the new processing system they had perfected was so efficient it had been scheduled for installation in the Arizona plant.

The new system's basic method is to clean and recirculate most of the rinsing water and to recover its copper for further use. To make that possible Gould engineers embarked on a different approach—involving a process known as reverse osmosis.

First, however, the company had to overcome operating problems which in the past have severely limited the use of this technology. In particular, the division developed a unique automated monitoring and buffering system which significantly extends the lifetime of the reverse osmosis unit, reducing high downtime and replacement costs.

With the improved cleanup technology, facilities use less fresh water a day than would otherwise be needed. Significant amounts of copper are being recovered, and there are by-products savings of reduced consumption of energy and reclaimed sulfuric acid, among other resource and economic benefits.

In another benefit, the change paid for itself in less than two years, and the financial, resource, and environmental improvements continue. □

Explaining New Technology

A key part of EPA's research program is technology transfer, communicating the facts about new pollution control ideas and equipment to those needing the information. The goal is to speed the acceptance and use of these innovations.

More than 60 publications have been produced in EPA's technology transfer program over the past seven years. These are available from the Center for Environmental Research Information, Cincinnati, Ohio 45268. To receive one of these reports, write to the Center with the title and identifying number. There is no charge.

A list of the publications, with their title and number, follows:



Process Design Manuals				
Phosphorus Removal	1001	Efficient Treatment of Small Municipal Flows at Dawson, MN	2015	Air Pollution Aspects of Sludge Incineration Land Treatment of Municipal Wastewater Effluents (3 Vols.)
Carbon Adsorption	1002	Double Alkali Flue Gas Desulfurization System Applied at the General Motors Parma, OH Facility	2016	Alternatives for Small Wastewater Treatment Systems (3 Vols.)
Suspended Solids Removal	1003	Recovery of Spent Sulfuric Acid from Steel Pickling Operations	2017	Sludge Treatment and Disposal (2 Vols.)
Upgrading Existing Wastewater Treatment Plants	1004	Fourth Progress Report: Forced-Oxidation Test Results at the EPA Alkali Scrubbing Test Facility	2018	Benefit Analysis for Combined Sewer Overflow Control
Sulfide Control in Sanitary Sewerage Systems	1005	Control of Acidic Air Pollutants by Coated Baghouses	2020	
Sludge Treatment and Disposal	1006			Brochures
Nitrogen Control	1007	Industrial Seminar Publications		Environmental Pollution Control Alternatives—Municipal Wastewater
Land Treatment of Municipal Wastewater	1008	Upgrading Poultry Processing Facilities to Reduce Pollution (3 Vols.)	3001	Forest Harvesting and Water Quality Irrigated Agriculture and Water Quality Management
Wastewater Treatment Facilities for Sewered Small Communities	1009	Upgrading Metal Finishing Facilities to Reduce Pollution (2 Vols.)	3002	Forest Chemicals and Water Quality
Municipal Sludge Landfills	1010	Upgrading Meat Packing Facilities to Reduce Pollution (3 Vols.)	3003	Environmental Pollution Control Alternatives—Economics of Wastewater Alternatives for the Electroplating Industry
		Upgrading Textile Operations to Reduce Pollution (2 Vols.)	3004	
Technical Capsule Reports		Choosing the Optimum Financial Strategies for Pollution Control Systems	3005	Handbooks
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Appropriate Technology

By William K. Reilly

Nothing has so altered society or affected daily life in the modern world as advances in technology. Technological progress has been so rapid and remarkable, and living standards have been so directly improved by new technologies, that most people quite naturally have come to identify a nation's technological sophistication with its level of advancement.

Only within the past 10 years or so has there arisen a body of opinion which rejects unqualified affirmation of technology and draws attention to the dark underside of technological innovations. Writers in several countries have pointed to the unanticipated environmental degradation caused by some technological developments as reasons to rethink our attitudes toward new technologies. The environmentalist critique coexists alongside a conservationist critique, which points to the waste of natural resources associated with some modern technologies. Finally, there is a social critique of technology, associated particularly with writers in developing countries, which questions the societal consequences for poor countries of industrial processes that require large amounts of capital—which poor countries lack—and require few workers—which most poor countries have in abundance.

According to the technological skeptics, innovations in technology tend to move along one of two pathways. The first, characterized by ever-more complicated, capital-intensive, and automated processes, includes such items as minicomputers, agribusiness combines, SST's, automated automobile assembly factories, huge chemical complexes, and nuclear power plants—in short, the technological baggage of the world's industrialized nations.

The second pathway calls for no less creativity than the first, but seeks to develop simpler, smaller, more flexible technologies which require less capital and generally place less of a burden on an area's natural environment and societal framework. Products of this technological track—which have been called small-scale,



light-capital, intermediate, or socially-relevant technologies—can include everything from windmills, bicycle-powered pumps, and hollowed-bamboo irrigation systems to highly sophisticated, small-scale paper recycling factories and solar-heated homes.

In recent years, the latter pathway has attracted increasing attention and support. Indeed, it has given rise to a new movement which goes under the banner of *appropriate technology*.

Appropriate technology (or AT for short) has grown in importance primarily because the more common "high technologies" of the industrialized world sometimes create more problems than they solve. A massive hydroelectric dam or highway system or oil refinery may actually aggravate problems such as unemployment, shortage of capital, maldistribution of income, urban migration, and environmental deterioration, particularly in developing countries.

Appropriate technology follows closely on the heels of another recently evolved concept: "technology assessment." Once a technology has been assessed and found wanting for whatever reason—pesticides because of their effects on wildlife, for example—other more appropriate technologies must be developed. AT ensures that these new technologies take account of a region's human and natural resources.

According to David Elliott, a lecturer at Britain's Open University, "It's a matter of selecting the technologies to fit the political process and social ends you happen to have in mind." Amory Lovins of Friends of the Earth says that appropriate energy technologies are "matched in *scale* and in geographic distribution to end-use needs." And according to the late E. F. Schumacher, the British economist whose book *Small is Beautiful* helped energize the appropriate technology movement, technology should be "gentle in its use of scarce resources."

The appropriate technology movement got its start in developing countries where the gap between low-level technologies and the marvels of the modern world was so great. Schumacher and others recognized that modern, large-scale technologies were unsuitable for most developing countries and set out to develop "intermediate" options. They found, to their surprise, that options abounded in all fields: transport, building, medicine, manufacturing, water resources, energy, agriculture.

One example of an AT solution involved metal bending or, specifically, how to get a metal rim around the wooden wheel of an oxcart. The least expensive modern equipment cost about \$1,400 and required electricity. Research in France turned up a pre-industrial machine operated by human power. The machine was upgraded using modern engineering principles and now can be produced by a blacksmith for only \$14.

I think it is very encouraging that the World Bank, U.S. Agency for International Development, the Inter-American Development Bank, and dozens of private voluntary organizations have attempted to incorporate AT principles in their foreign aid projects.

It would be a mistake, however, to limit appropriate technology to developing nations or somehow to equate it with quaint or out-of-the-ordinary life-styles. AT might call for radical rethinking but it need not lead to radical restructuring of a person's—or a nation's—way of life. In fact, AT should apply to many aspects of modern industrialized societies. Some examples:

• **Agriculture**—The large-scale agricultural operations that created the "green revolution" in America depend heavily on petroleum-based fertilizers, pesticides, and herbicides, and expensive irrigation equipment and farm machinery. Indications are that over the long term yields may diminish because of erosion, soil compaction, lowered water tables, and loss of soil nutrients. Many farmers are returning to organic farming techniques—including use of natural fertilizer, crop rotation, and soil conservation strategies—and finding that their yields stay relatively high and their operating costs decrease. Others are distilling alcohol from grains and using it to power tractors and other machinery.

• **Mass Transit**—Many medium-sized cities are ill-adapted for highly technical, expensive mass transit systems such as Washington D.C.'s or San Francisco's subways. Instead, flexible transit strategies using bus routes, streetcars, and bicycle paths should be explored.

• **Energy**—The energy field holds perhaps the greatest promise for the application of AT principles. Nuclear power plants, oil supertankers, coal-fired industries, and the like have wrought environmental havoc and are extremely complex and expensive energy systems. The development of alternative energy sources such as solar photovoltaics, windmills, biomass, tidal and wave power, geothermal, and solar space heaters could lessen our dependence on foreign oil supplies while also protecting the environment. In addition, a wide range of energy conservation technologies—in homes, industries, and automobiles—are particularly appropriate in today's energy-starved industrialized world.

Appropriate technology suggests a multitude of applications to communications, marketing, housing, work places—and even environmental protection. One expensive lesson of the clean water program was that many localities didn't want or need large tertiary sewage treatment plants and could have gotten along much better with upgraded septic or land-application systems.



Appropriate technology need not exclude large corporations or established research institutions. In fact, big business may be particularly suited to the development of new, creative, decentralized technologies in many fields. Grumman Aerospace, for example, manufactures one of the Nation's best solar heat collectors; and Sears and Roebuck now markets collectors. The best cogenerators are made by Cummins Engine and Fiat. There is little doubt that the research laboratories of our major corporations can contribute much in the field of appropriate technology if given the chance.

I do not subscribe to the malign, anthropomorphic view of technology looming menacingly over civilization like King Kong—out of control and destructive. All technology, big or small, is subject to human control and direction. The point of appropriate technology is to prompt an inquiry into the long-term human consequences of technological innovations, and to adopt the most appropriate—i.e., least wasteful—system to do a given job.

Unfortunately, people often are unable to agree on which technology is appropriate. One possible solution is mediation. All parties involved—businessmen, environmentalists, government officials, scientists, engineers, and consumers—should discuss with each other proposed technologies *before* irrevocable commitments of capital, land, and other resources have been made.

The mediation process operates on the premise that some people know what society needs and others know what is technologically feasible. Only by working together can technologies be developed which are truly appropriate. □

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Small Business and Pollution Control

An Interview With Milton D. Stewart



Milton D. Stewart is Chief Counsel for Advocacy in the Small Business Administration. He was a small businessman, as Chairman of the Board, Terra California; founding director, vice chairman, and president of a major venture capital small business investment company; and director and/or counsel to numerous small companies.

Your position, Chief Counsel for Advocacy, is a new one within the Federal Government. Why was it created?

The last three Congresses have been particularly concerned with small business, largely through the increased efforts of House and Senate Small Business Committee members. In their view, small business wasn't getting enough help through existing programs. As it stood, the programs were good, but they only reached a fraction of the enormous number of small businesses in this country. What was needed, they felt, was an office in the executive branch of the government,

which would work for the benefit of all small business people. What eventually evolved was the Office of Advocacy and my position as Chief Counsel. Even though the post had been created well before his Administration began, President Carter is the first President to have filled the position.

How does an individual small business person see environmental regulation in the EPA?

To be candid, as one of too many sources of burdensome regulation. He doesn't think of EPA as any more his enemy or problem than Occupational Safety and Health or wage regulations or any other kind of rules by Federal, State and local government.

In some *particular* industries EPA is the big regulatory burden. If you are in the chemical manufacturing business, or are in any kind of finishing business involving the use of chemicals that are pollutants, EPA is at the top of your laundry list.

How much actual impact does environmental regulation have on small business? How many firms have actually been forced out of business?

The right answer is far more than government regulators believe and far fewer than small business people believe.

I know of at least one business that is subject to 42 public agency regulators, Federal, State, and local. We are doing a study of just the paper-work side of this. I remember one person, one little firm, which is in the undertaking business, which received 486 agency forms, Federal, State, and local in one month.

To the small businessman it looks like the world is made up of over-zealous, pettyfogging regulators who unnecessarily increase the burden of complying with more and more regulations.

To the regulator it looks like the world is made up of conniving, deceiving, and whining small business people who try to undercut proper regulation.

While everyone in each group is not an angel, there are sin-

cere, sensible people on both sides who should be talking far more and much earlier about regulation than they now do. There is common ground here and it can be found.

What can be done to ease the regulatory impact on small business?

The turnaround, I hope, is here. The President has clearly made the turnaround possible with the idea of weighing the costs of regulations against the benefits. I hope we will help with some things we would like to accomplish with the cooperation of the regulatory agencies and the Regulatory Council.

One example is a multi-tiered regulatory standard which we think makes great sense. In areas where EPA is dealing with terribly toxic pollutants, for example, the beginning of wisdom is to say there must be some small firms which pollute so little we can forget about them. If you have small firms which add little to pollution, it is only reasonable to say, well, look, don't burden them at all. If they are polluting so little, we don't have to worry about it.

Then if we do have to worry about it, give them more time to comply. Give them simpler regulations. Let there be larger tolerances for them.

Finally we are developing a "fairness code" for small business which we want Federal agencies to follow in the voluntary way. We are asking, for example, that agencies not make the assumption that if they put something in the Federal Register ten million small business people are going to know it automatically. If you want to inform a half a million people, you have to take the trouble to really do it.

Do you see economic benefits and opportunities flowing from regulatory reform efforts?

Absolutely. There are plenty of entrepreneurs who make money out of translating regulations, helping people to comply. There are some interesting things going on in technology; new

devices, new instrumentation to enable people to monitor pollution. The company I headed helped to finance a couple of businesses when I was in the venture capital field that are in this area and those firms are doing very well.

Have you in your SBA research activity taken a look at how small business has responded to requirements, regulations of all kinds, particularly environmental?

We may shortly sponsor a study in the energy field to see about responses there. The people who have proposed it have already done some preliminary work. It indicates that larger firms have been much more effective and successful in responding to shortages of energy by using other fuels, than were the very small ones.

What troubles us most is that the small companies, while they are innovative, have less economic capacity to adjust to regulation and innovate.

We also have a major study underway on paperwork. That is only one part of the regulatory burden, but it is an important one. When the study is finished we believe we will have the first definitive log of Federally required small business paper work. We think that will be of great help to regulators, letting them know what everybody else in the government is asking in the way of information, questionnaires, that kind of thing.

Perhaps we can then begin to cut down the number of inquiries and the resultant paper work.

Why is it more difficult in some ways for a small business to innovate?

There is less free capital for it from within or outside than there is for a large firm. Yet the studies that we have indicate that small firms are four to 24 times as cost effective in innovating as big ones. That is based on studies financed by the National Science Foundation.

By the time this interview appears we will have made public a new report on small business innovation. We had 20 presidents of small science-

based firms and nine venture capital managers in for four days to review their situation. These are innovative companies and innovative people. They simply think the regulatory burden isn't warranted by the goals to be served, in the way we are now regulating.

They were all confident that most of our problems can be dealt with by innovative technologies. Out of every Federal R&D dollar though, small business gets only four cents.

What can EPA do to encourage new technology from small business?

We think EPA should be doing much more in a direct effort. For example the NSF has modeled a program we like very much. It is a competitive effort for innovative research transferable to the marketplace. A small firm submits in a letter, 20 pages or less, a proposal for an idea it has but can't fund. The subject must be one of a list proposed by NSF as needed by the Nation.

The agency then chooses, using scientists and technicians, the proposals which seem the most promising and funds them very minimally for a feasibility study. They give them \$25,000 to start with.

The business comes back in six months and says, "Here is what we found. We think the project will work and here is why. Now we are going to need \$200,000 to take it through prototype."

Now the agency says, "We will give it to you as a grant, but we want you to get \$200,000 from somebody in the private sector for a third stage of research if you are successful in the second with our money. We want to know the business market prospects are good."

That is where the innovations are going to come from that will modify our pollution-creating technology. Those are the people who are going to come up with the breakthroughs. We are just not investing enough in them yet, nor doing it very well.

Some firms have probably already found part of the cleanup solution, but others in a similar field may not know. How do we get information to them?

With computers and data processing. As time goes by, we are going to be able to do a better job of getting this kind of information out to the small business people in particular.

I have great hope as data processing capabilities get spread around the small business community. This will be a big revolution in the next ten years. Because of silicon chips and other technology, the cost of computer equipment is going to keep coming down, and information sharing and data processing are going to increase.

But let me remind you that many innovative breakthroughs tend to be interdisciplinary. They come from different kinds of people in different places. This is particularly true of the kinds of things that small business can contribute.

What SBA programs are available to help small business adjust to environmental standards?

Our general guaranteed loan program is the best bet a small business has. We try all the time to educate people about how to make use of it.

We now also have an important experiment under way. We are delegating to a group of banks the total responsibility for processing loans where we guarantee to reduce the time, the trouble, and the paper work.

The banks will simply, in effect, act for both themselves and for us. We have 25 banks certified to experiment with this now and the project has, I guess, two or three months more to run. There is every reason to think that our Administrator will then extend it for six months more, perhaps with an additional group of banks and we will move still further in the process of delegating much of this activity.

Some other forms of support in lending are necessary. We guarantee pollution control bonds issued by State facilities. I don't think that that program

has been used at all as much as it should.

Each State can set up what is in effect, a lending agency, and that agency can issue paper guaranteed by SBA to make pollution compliance loans. And those loans, because they carry government guarantees, are long-term and low-cost. That is a program which really should be pushed very hard in the States.

Are there areas where EPA and SBA can cooperate more fully?

The two agencies really should be working more closely to encourage establishment of the State lending agencies. Their loans are based on money borrowed in the private sector through investment banks. That means no addition to the Federal budget. This is terribly important in this inflationary time. We may be able to do more on our side now that we have some Regional Advocates in the field.

What do you expect from the White House Conference on Small Business?

If the conference is successful, it will lead to three to five years of legislative, regulatory, and executive branch progress; new legislation, new imperatives, new impulses by raising the priority, the level of concern with small business problems.

Do you have a special message that you would like to give EPA regulators and small business?

Small business people often complain again and again. They summarize their own views by saying, "Just get the government off my back. I don't want it to do anything for me. Just get it off my back."

Regulators, on the other side, will say, "Just get them to obey the regulations and stop whining and complaining."

We've got to say to the entrepreneur that what you really mean is you are willing to put up with regulation if it is sensible. It is your government still and we know it will listen.

We've got to say to the regulator, "Listen, the small business person out there puts on his or her clothes just the way you do. He or she is a citizen of this republic just as you are. Nobody wants children growing up in polluted environments any more than you do. But the small business person has got a problem doing what you want him to. Now, you guys have got to work out more reasonable ways to get it done."

An EPA official should sit down with a small businessman and say, "Look, we have to hurt you, how can we do it least?" And the small businessman should have confidence that if he is willing to make a sincere effort to clean up his wastes he will get fair treatment including a fair deadline from EPA. □

White House Conference

A White House Conference on Small Business is scheduled for January 14-17, 1980. The theme is "Small Business: The Next Twenty-five Years." The goal is to provide small business and the Federal Government with new ideas and options for cooperation.

EPA's role in the Conference and followup is to find innovative ways to help business comply with environmental laws while lessening the burden of the Agency's rules.

To prepare for the meeting, Regional Conferences and Open Forums are being held across the country. Through these sessions, delegates are being chosen for the January Conference in Washington, D.C.



River Walking

Splashing on foot along the pebbly and rocky bottom of a breeze-swept shallow stream under arching trees is one of the most delightful ways to spend a warm Autumn day.

Sloshing through water may be slow but as Thoreau, a man fond of "fluvial walks," pointed out in his journals a stream is often "the coolest highway" and always offers fresh scenic rewards.

In many rural areas the people who often can't afford country club pools or visits to distant ocean beaches flock to their nearby rivers.

A visitor to a stream in the countryside near Washington found the waterway being used by several families on a recent scorching weekend.

Some people drove their cars into the river and proceeded on the rocky bottom to one of several small islands where they parked.

Children jumped out in their bathing suits and began tossing frisbees back and forth as they staggered through the knee-high water, whooping and laughing.

As a mother began cooking on a grill on one of the islands the aroma of barbecued chicken was wafted over the river. Her husband drove his car in-

to the river until the water reached the wheel hub caps to begin washing it.

Another man placed some deck chairs in the stream under a huge willow tree overhanging the water. Two plump, barefooted, and perspiring older women seated themselves in the chairs and let the water flow over their feet as they began to spend the long hot afternoon fanning themselves and talking quietly.

The peace of the river scene was harshly interrupted when a sports car with a radio blaring rock and roll music roared up, dipped down the river bank and showered water high into the air as it swooshed down the stream bed.

Suddenly the car slowed and came to a halt as the rear wheels sank in a soft gravel section of the stream bottom. Boisterous catcalls greeted the red-faced young driver as he stepped from his stranded vehicle.

Finally several men gathered to help him. Shouting conflicting directions at the driver to point the wheels to the right, left, and straight ahead, the men, with much grunting and joshing, lifted and shoved the car to a firmer section of the bottom. The crestfallen driver eased his vehicle back onto the shore and disappeared with a sudden spurt of speed.

While this is not the type of river scene Thoreau was familiar with, many of the natural attractions that appealed to the famed naturalist-philosopher can also still be found.

There are miles and miles of quiet river stretches far from the blacktop roads which are rarely visited. Here a river walker can see small schools of fish weaving their way upstream through riffles where the water foams over a rocky bottom.

In quiet shoreline pools whirligig beetles race across the water surface. Sometimes you can find the Great Blue Heron, one of our tallest native birds and a frequent river walker, striding along using its long sharp bill to eat crayfish, salamanders, frogs, and practically anything else it can find in the water.

One of the glories of Autumn days spent river walking is the spectacle of such late blooming plants as the asters and the red cardinal flowers which dot the banks.

One of the last flowers to bloom is the rare and exquisite fringed gentian. This lavender gem is usually found in moist locations along streams or swampy areas. It continues displaying its beauty until it

is nipped by the first frost of approaching winter.

Whatever your interests—fishing, boating, nature watching, swimming, wading—rivers have much to offer. The mounting use of a stream by individuals could have a beneficial effect if each visitor will assume a responsibility to help guard the waterway.

Neither the Federal, State or local governments ever will have enough employees to protect all the thousands of miles of rivers in this country. However, if all visitors served as scouts to report the presence of pollution, the cause of preserving environmental quality would be greatly advanced.

For people interested in such an approach the Izaak Walton League has a national program entitled "Save Our Streams" which encourages citizens to adopt a section of waterway in order to protect it not only for recreation but, in addition, for vital municipal and industrial needs.—C.D.P.

Regulation and Technical Innovation

By Nicholas A. Ashford and George R. Heaton

Environmental, health, and safety regulation and technological innovation are related concerns because: (1) past technological growth has resulted in problems that created the need for regulation; (2) regulation may affect the future rate and direction of technological innovation, thereby affecting economic growth; and (3) technological innovation is an important pathway to the solution of environmental, health, and safety problems.

The characteristics of regulation, the firm, and its technology principally determine how regulation affects technological change. Regulation is a complex stimulus. It may have different purposes, control different aspects of development or production, rely on different policy instruments, and have differing legal authority to "force" the development of new technology.

Informal government actions, which usually occur well in advance of formal rulemaking, also provide important signals to firms and often result in significant technological change. Uncertainty in the signals given the firm to meet environmental, health, and safety goals—particularly about the level of, and time frame for, compliance—may play a crucial part in the firm's response and may either stimulate or retard innovation. The uncertainty associated with regulation results from both industry and government action and may be a necessary consequence of the administrative flexibility in the U.S. political system.

It is useful for analytical purposes to separate the impacts of regulation into those affecting: (1) innovation for ordinary or "main business" purposes, and (2) abatement/compliance responses. In the first case, regulation affects a traditional, although slowly evolving, activity; whereas, in the second case, regulation demands technological changes which would not have been previously considered within the ordinary scope of business activity.

Regulation may cause changes in main business innovation by affecting profitability. Increased costs have been reported in

the pharmaceutical industry, but the unusual character of both regulation and innovation in that sector may make its experience unique. The effect of cost increases on rates of return throughout industry has not been demonstrated. These costs may be passed on. Increased commercial risk may occur as a result of regulation; however, regulation may also decrease risk as compared to, for example, the threat of products liability suits. The number of new products in the pesticide and pharmaceutical industries has been shown to have decreased; however, it is neither clear that the level of significant innovations has declined, nor that the decline is attributable to regulation.

Regulation may increase the number of technically successful innovations that fail because of environmental, health, or safety concerns. On the other hand, regulation may reduce the number of products that would have ultimately failed for environmental, health, or safety reasons by discouraging their development. Even if failures do increase, there will be a compensating effect from increased safety, health, or environmental quality. Moreover, any change in the failure rate is likely to be a transitional, rather than a permanent, effect.

Because regulation can increase market risk, it changes the nature of investment opportunities. Increased risk may deter investment, especially in low-volume products. New applications for demonstrably safe technologies may be preferred to investments in environmentally unproven products and processes. Regulation is also likely to direct resources away from conventional R&D activities into compliance. To the extent that R&D diversion exists, it may tend to reduce main business innovation. There is substantial evidence of a change in corporate R&D, including overall decreases in some industries and a shift from basic to applied research. Whether this results from other factors or from regulation is not clear. Moreover, marginal decreases in R&D have not been shown to lead to a corresponding decrease in innovative output.

Some research has shown that the change in R&D patterns may actually

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result in more overall innovation, especially in areas "ancillary" to compliance efforts. This phenomenon may occur predominantly in industries which were relatively uninnovative before regulation, but which have responded creatively to regulation. In addition, R&D induced by regulation can often lead to general process improvements. Although these benefits (e.g., greater output, smaller energy costs) do not usually outweigh the cost of compliance, they offset compliance costs to some extent. Finally, new organizational structures and skill mixes have been found in firms as a result of regulation. This can rechannel firm creativity.

Because regulation has different impacts on differently situated firms, it tends to change industry structure. Regulation creates barriers to entry when compliance measures are expensive and subject to economies of scale. On the other hand, many new entrants have solved regulatory problems that established firms were not successfully addressing. In addition, because regulation can increase the need to compete and the difficulty of survival in the market, it may lead to more innovation by established firms.

Regulation obviously encourages technological change for compliance purposes. However, these changes will not necessarily be new or novel technologies; indeed, regulation often prompts compliance through new uses or diffusion of existing technologies. In regulated industries (in contrast to the pollution control industry), the adoption of compliance measures may result in health and safety benefits only, with little or no benefit to the firm. On the other hand, even though most compliance technologies appear to be developed within the regulated firm for its own use, many compliance technologies are also saleable. In some industries, the relationship between suppliers and producers has been altered by regulation, with suppliers often developing innovative compliance technology. It should be recognized that the division of industry into regulated segments and the pollution control industry

Regulation and Technological Innovation

may not be a real one, especially in the chemical industry. There, the regulated firm and the creator of new compliance technology are often one and the same.

Over a period of two years the MIT Center for Policy Alternatives conducted a National Science Foundation-sponsored study of the effects of environmental, health, and safety regulation on technological change in the U.S. chemical industry.

The study involved both the construction of a model of the effects of regulation on compliance technology and an investigation of the characteristics of regulation, the technologies employed by the regulated or responding firms, and the resulting technological responses. Data were obtained from interviews with about 50 firms subjected to the principal regulations on lead, mercury, PCB's, and vinyl chloride.

The study concluded that the character of the technology in use is a major factor determining the response to regulation. Most firms in a given industrial segment responded very similarly. Moreover, their response was often what would have been expected, given the history of innovation in the segment. We therefore concluded that compliance responses to regulation are usually predictable.

On the other hand, there were some surprises. Particularly when regulation precipitated "crisis" conditions, industry responded creatively, changing its historical patterns. Sometimes innovative responses arose from firms outside of the regulated group. The responding firms saw the development of compliance technology as a way to capture new markets.

Most compliance technologies used were actually modifications, or sometimes even simple adoptions, of existing technologies rather than new ideas. Very few radically new technologies arose in response to regulation and very few required much development time. There are significant exceptions to this pattern, however, especially in the case of recent regulations concerned more directly with chemical process technology or product safety.

Perhaps our most important findings concerned systemic changes in the innovation process and the ancillary responses traceable to regulation. The principal systemic change observed was the establishment of environmental or regulatory affairs

units in 65 percent of the firms in our sample. The environmental affairs units maintained liaison with regulatory agencies and often established in-firm environmental safety standards and review procedures for new and existing products and processes. Thus they are likely to provide a continuing incentive for safer products and processes. We also saw a change in personnel skill-mixes as a result of regulation. For example, regulation has greatly increased the need for analytical chemists. Companies often reported that the addition of such new skills allowed them to find more and better uses for their products.

Ancillary or "spin-off" changes were evident as well. These changes occurred as a result of the need to comply with regulation but were not necessary in order to meet regulatory requirements. Twenty percent of the firms interviewed remembered or readily admitted to the existence of ancillary improvements, but we believe that more would have been revealed had we interviewed several persons in each firm. Many ancillary changes arose when companies took advantage of the opportunity created by regulation-related changes to institute other changes—long-desired but postponed. Thus, we saw regulation accelerating new developments. Other ancillary changes arose directly out of compliance R&D—for example, several new catalysts for petroleum refining were developed as part of the effort to switch to lead-free gasoline. Although these ancillary responses were often unforeseen at the time compliance efforts began, our experience shows that they are not rare events.

In the past, the chemical industry has been resilient in its response to significant regulatory efforts. It has reached or surpassed the technological requirements of regulation. In part, this is because the previous standards imposed appear to have been based on present technological feasibility or best available technology. But, in addition, the industry has been able to accelerate the development of new process technology needed for compliance—for example new polymerization techniques for vinyl chloride. There is strong evidence that regulation can change the overall character of product and process innovation in the industry, providing that the regulations are stringent enough and properly designed.

The industry might well be viewed as being in a transition period between a past history of little emphasis on environmental and health concern and a future pattern of much greater activity. This is evidenced by increasing managerial attention to these issues via both the formal establishment of environmental affairs units and shifting emphasis in the nature of chemical product design and production.

The newer regulatory efforts, especially

those concerned with workplace hazards, consumer products, and new activities by EPA under the Toxic Substances Control Act, may be particularly important for innovation both in compliance technology and in process or product redesign. This is to be contrasted with past efforts at air and water quality control, which focused on single pollutants as emissions or effluents at the end of the production process.

The most important effect of regulation on technological innovation may be its potential for restructuring the nature of industrial production. Over the longer term, industry may adjust to environmental, health, and safety demands with changes in the nature of production that will be more basic and can be accomplished with far less disturbance.

Regulations should be designed to elicit the best possible technological response from the industry. The past pattern of basing standards on existing technology must be altered by promulgating regulations which are "technology forcing." In addition, the overall stimulus for change must be made strong enough to effect a shift in the general management approach to all possible hazards associated with production. The adoption of generic regulations or regulation of classes of chemicals would provide a stronger impetus for change than a substance-by-substance approach.

In the past, one of the impediments to the design of "technology forcing" regulations has been the fact that the agencies have relied on the regulated industries as the source of their information about the potential for technological change. Accordingly, compliance has been largely the adoption of "off the shelf" technology and has resulted in less protection of health and the environment than might have actually been possible. Our research suggests that important changes in technology can be encouraged by regulation. This will be the case especially if, in the future, both the agencies and the industry develop an appreciation for the complexities of the regulation-technological change relationship. The regulatory agencies should be aware of the fact that it is possible to design regulations to stimulate the development of new technologies whose performance exceeds the expectations of both industry and government. □



New Lab Opens

The Environmental Protection Agency last month dedicated a new regional laboratory occupying more than 17 acres at Clam Bay on the shores of Puget Sound west of Seattle, Wash. The facility will utilize chemical, biological, and microbiological expertise to support the full range of the Agency's activities.

Senator Warren G. Magnuson (D., Washington), Representative Norman D. Dicks (D., Washington), and Donald P. Dubois, Administrator of EPA Region 10, were scheduled to

participate in the opening ceremonies. Dr. Arnold Gahler is laboratory director.

The laboratory staff will provide analyses needed for EPA's programs in regulating hazardous and toxic materials, to protect drinking water, detect contamination from solid waste disposal, improve air and water quality, and control water pollution from nonpoint sources. Scientists also will provide technical assistance and analytical support to State, Federal, and local agencies involved with pollution control and the management of natural resources.



Jeffrey G. Miller

He has been named to head a National Hazardous Waste Enforcement Task Force, which reports directly to Deputy Administrator Barbara Blum. Under his direction the new Task Force will coordinate Federal clean-up activity with the Regional Offices and with the States. It will supply technical, scientific, and legal support. The Task Force also will keep a running report of the number of sites containing hazardous waste and their clean-up status. Miller has been Deputy Assistant Administrator for Water Enforcement since 1975. He joined EPA in 1971 as Chief of the Enforcement Branch in the Agency's Boston Regional Office. He later became Director of the Enforcement Division and served in that post for two years. Before coming to EPA, Miller practiced law. An honor graduate of Princeton University in 1963 and Harvard Law School in 1967, Miller was a Research Fellow at Harvard for a year following his graduation.

Charles E. Findley

He was recently hired by the city of Seattle, Wash., to help municipal officials work with other local governments to develop coordinated control programs for a wide range of environmental problems. Findley has been a senior technical advisor and program manager at EPA's Region 10 headquarters in Seattle. The assignment was made under the Intergovernmental Personnel Act. A similar arrangement was made earlier this year with the city of Spokane, Wash., and a third agreement, with Portland, Oreg., is expected soon.

Alfred West

He received the Distinguished Career Award upon his retirement from EPA's National Training and Operational Technology Center in Cincinnati, where he was Chief of the Operational Technology Branch. During his 18 years with EPA and predecessor agencies West developed and demonstrated improved operating procedures, personnel training, and plant modifications. He received an EPA Gold Medal for Exceptional Service in 1972.



Louise P. Giersch

She has been named Director of the Air and Hazardous Materials Division in Region 9. Giersch is a graduate of the University of Colorado with a BS in chemical engineering. She has an extensive background in regional and local government. Before coming to EPA she was Mayor of the City of Antioch, Calif., and had been a member and Chair of the Antioch Planning Commission. She has been Chair of the San Francisco Bay Area Metropolitan Transportation Commission, is a member of the California Seismic Safety Commission, and is active in the League of California Cities and the National League of Cities. In addition to her public offices, Giersch has been active in the League of Women Voters.



Gordon G. Robeck

He has been honored by the American Water Works Association for his role in promoting the exchange of information regarding safe drinking water. Robeck is director of Drinking Water Research at EPA's Cincinnati Environmental Research Center. The Medal for Outstanding Service, which the Association has awarded annually since 1925, was presented to Robeck at the annual summer meeting. As a member of the technical and professional council of the Association from 1972 to 1978 Robeck served as a liaison between the Federal Government and public water works, advising on government activities on research and regulation of drinking water.

A DDT Legacy

Continued from page 11

whose average annual income was about \$7,000, on the unemployment rolls.

"I hope I live long enough for people responsible for the DDT pollution of the Tennessee River to hear and do something about what they've done to commercial fishermen and market operators in this area," said the president of one fishermen's organization.

The Tennessee Valley Authority (TVA) has made a start at doing something about the fishermen's plight. Earlier this year, the Authority provided motorboats and commercial gear for some of the area's fishermen to fish clean portions of the Tennessee on behalf of the whole community. This has put fish back in the diet of some Triana residents, but has not entirely solved the unemployment problem. In July, the fishermen filed a \$50 million suit against the Olin Corp. and the Army for destruction of their livelihood.

Other Federal efforts to aid the community took a jump forward this summer. EPA Administrator Douglas M. Costle and TVA Chairman S. David Freeman listened to the troubles of Triana residents at a town meeting there on June 6. They promised to help.

Shortly afterward, Costle obtained President Carter's permission to determine what additional relief Federal agencies involved with Triana could provide. Costle asked Science Advisory Board Director Richard Dowd to develop a cooperative plan of assistance among the Federal groups. Phone calls were made, a meeting was held, and on July 24, four agencies announced a program. As Costle said, "We've attempted to move quickly on this issue . . . EPA, the Tennessee Valley Authority, the Department of Health, Education and Welfare, and the Army

have pooled their efforts to speed economic and medical aid to this area."

The specifics of the program were:

- TVA will make \$100,000 available to fund a Triana agricultural cooperative to establish a community greenhouse so that local residents could increasingly substitute vegetables for fish in their meals. The Authority also is considering retraining local residents for jobs other than fishing.
 - HEW will grant \$22,500 to the community for "primary health care planning" to determine whether additional medical facilities are needed in the area. In addition, the Department will work with other health officials to expand diagnostic and treatment services for Triana residents. HEW will establish a "hotline" for medical information about DDT and attempt to inform all citizens within a 3-mile radius of the insecticide's possible health hazards.
 - EPA is testing more than 70 water supplies in the Triana-Huntsville area for DDT residues. Results from this monitoring should be available by October 1.
 - The Army is conducting a \$500,000 study, to be completed next year, on the extent of DDT contamination in the Tennessee River and its tributaries and on methods for cleaning up or improving the situation. (This indeed will be a worthy challenge for the Army. EPA's \$1.4 million 1978 study of Kepone in the James River in Virginia concluded that only limited clean-up was practical and that attempts at complete removal would cost billions.)
- The assistance and studies being carried out by the Federal government are hardly a cure-all for the financial woes and medical ambiguities of Triana. But they do demonstrate continuing concern on the agencies' part, and they do illustrate that the Federal machinery can respond quickly and in an organized fashion.
- Meanwhile, the Olin Corp. says it has been in contact with the parties concerned and discussed what the corporation's involvement or assistance might be. □

Larry O'Neill is an EPA Headquarters Press Officer.

Update

A review of recent major EPA activities and developments in the pollution control program areas.

ENFORCEMENT

Permits

The EPA has proposed regulations that speed up and simplify the process of obtaining necessary environmental permits. The new rules could cut red tape and reduce paperwork for thousands of industries and municipalities.

A key aspect of EPA's effort toward "permit consolidation" is the use of a single, simplified form to apply for permits under a number of different EPA programs. This standardization will make it easier to apply for EPA permits.

The proposals, if adopted following review of public comments, will streamline the regulatory process for obtaining permits to cover discharges of air and water pollutants; the treatment, storage or disposal of hazardous wastes; the underground injection of wastes; and dredge or fill operations.

NOISE

Symposium Proceedings

EPA's Office of Noise Abatement and Control recently announced that the published proceedings of the EPA Noise Technology Research Symposium are now available. Over 200 experts representing a broad range of domestic and foreign interests in the public and private sectors participated in the symposium, which focused on research needs for improving noise abatement technology.

Single copies of the proceedings, *Noise Technological Research Needs and The Relative Roles of the Federal Government and the Private Sector* EPA 550/9-79-311, can be obtained by contacting:

Documents Clerk
Office of Noise Abatement and Control
(ANR-490)
Environmental Protection Agency
Washington, DC 20460
(703) 557-7370

PESTICIDES

Use Extended

Pear growers have been given permission by the EPA to continue using the pesticide, amitraz, for four more years.

EPA said it will consider giving a permanent registration for the use of the pesticide on pears at the end of that period after receiving and reviewing additional laboratory tests of its effects on health and the environment.

Under EPA's conditions, pear growers must continue to observe restrictions in the use of amitraz, known by the trade name, Baam, as a safeguard to the health of both the people who eat the pears and the growers who mix and apply it.

To protect consumers, the agency specified that pears treated with amitraz may not be harvested until seven days after application. This precaution will reduce the residues of amitraz, a suspect cancer agent, on the fruit.

Citizen Notification

The EPA plans to require that citizens be notified in advance of broad-scale aerial pesticide spray programs.

Testifying recently before the House Subcommittee on Oversight and Investigations, EPA As-

sistant Administrator for Toxic Substances Steven Jellinek said, "To encourage informed and early participation (in pesticide spray programs), EPA will in the future be requiring more and earlier public notice of broad-scale spray programs such as has been done with Dimilin as used in gypsy moth control in the eastern U.S. this year.

"Awareness of where and when aerial spraying will take place should allow people who are in the area and concerned about the spraying to make greater use of existing legal options and enforcement procedures," he noted.

RESEARCH & DEVELOPMENT

Innovation Program

Seven EPA scientists have been selected to participate in a new "Innovative Research Program." The program relieves staff researchers of daily administrative routines in order that they may devote full time to the exploration of innovative scientific approaches.

The seven Innovative Research Program grantees are: Dr. Gary E. Glass, a chemist at the Environmental Research Laboratory, Duluth, Minn.; Dr. John J. O'Neil, a physiologist at the Health Effects Research Laboratory, Research Triangle Park, N.C.; Dr. Ronald Eisler, an aquatic biologist at the Environmental Research Laboratory, Narragansett, R.I.; Dr. James M. McKimm III, an aquatic biologist at the Environmental Research Laboratory, Duluth, Minn.; Andrew E. O'Keefe, Technical Advisor to the Director

of the Environmental Sciences Research Laboratory, Research Triangle Park, N.C.; Dr. Philip L. Hanst, Senior Research Scientist and Chief of the Atmospheric Characterization and Special Projects Group at the Environmental Sciences Research Laboratory, Research Triangle Park, N.C.; and Dr. Wayne R. Ott, senior systems analyst in the Office of Monitoring and Technical Support, Washington, D.C.

TOXICS

Chemicals Review

EPA has begun reviewing new chemical substances before they are manufactured for commercial purposes to evaluate any risks which they may present to human health and the environment. The program officially began July 1.

"Nearly 400 new chemicals are introduced into the market each year," said EPA Deputy Administrator Barbara Blum. "For the first time, the government will be able to review these substances before their exposure to people or the environment."

This program, authorized by the Toxic Substances Control Act, requires chemical manufacturers to notify EPA at least 90 days before they manufacture new substances. The notices must include information on chemical identity, intended production volumes and uses, worker exposures, and disposal plans. Manufacturers also must submit all test data in their possession or control concerning their new chemicals' health and environmental effects.

WATER

Drinking Water

In an effort to increase government efficiency, EPA and the Food and Drug Administration (FDA) have agreed on how the agencies will share responsibility for regulating drinking water.

Under the new agreement, EPA now has complete authority over drinking water served by public water supplies. This authority applies to all additives contained in the water. Some additives are chemicals such as chlorine, lime, and alum used to treat water. Other additives get into the water indirectly through leaching from paints and coatings, and from pipes, tanks, and other equipment.

FDA will continue to regulate the purity of bottled water. For this purpose, it considers bottled water a "food," the purity of which is controlled under the Federal Food, Drug and Cosmetic Act. It will also retain its responsibility for water—and substances in water—used in food and food processing.

DBCP Found

Preliminary tests by EPA have found small amounts of a partially banned pesticide in some water wells, used for drinking water and other purposes, in two Arizona counties.

Similar tests on drinking water supplies in 13 counties of four other States—Florida, Georgia, Hawaii, and South Carolina—turned up no traces of the pesticide.

EPA undertook the water testing program with State agencies in June after California officials reported finding levels of DBCP (dibromochloropropane) between

.1 and 39.2 parts per billion (ppb) in numerous irrigation and drinking water wells in the State.

In 1977, EPA stopped the use of DBCP on 19 vegetable crops believed to retain residues of it. Other uses of DBCP, including cotton, soybeans, citrus fruits, grapes, pineapples, lawns, and golf courses, have been restricted to trained users who must wear protective clothing.

"The Federal government has not set any formal safety levels for DBCP in drinking water, but the Arizona and California Departments of Health Services have advised against drinking or cooking with water containing more than 1 ppb. of DBCP," said EPA Deputy Administrator Barbara Blum. "EPA's Office of Drinking Water will work with the States to mitigate the groundwater contamination problems suggested by the preliminary findings."

Rules Proposed

EPA has proposed regulations to clean up water pollution caused by leather tanning and finishing plants. The rules proposed under the Clean Water Act are the first to be issued under the Agency's program to deal with toxic pollutants discharged by U.S. industries.

The proposals apply to plants that process animal hides and skins into finished leather. EPA has identified 188 such plants nationwide, which together discharge about 52 million gallons of polluted wastewater daily.

EPA's new rules, if adopted following public review, would require the industry to control toxic discharges by July 1, 1984, as required by the Clean Water Act of 1977. □

1

REGION

Urban Assistance Grants
Region 1 has awarded Urban Assistance Grants to New Britain, Conn., and the Massachusetts Bureau of Solid Waste Disposal for solid waste disposal studies. These grants were among the first in the nation to be awarded under the President's Urban Assistance Policy Program.

New Britain has received \$76,950 to develop a feasibility study for a curbside source separation program and to implement the program if the study is positive.

The Massachusetts Bureau of Solid Waste was awarded \$213,000 to support a resource recovery project in Central Massachusetts. The funds will be channeled to a voluntary coalition of 20 municipalities and will be used to accelerate the planning and developing of a regional resource facility in the area.

Watershed Coalition Formed

Region 1 has joined together with the Massachusetts Department of Environmental Management and local environmental organizations to form the Massachusetts Coalition of Watershed Associations. The group has been formed for the purpose of keeping public attention focused on efforts to restore and revive the Commonwealth's water resources.

2

REGION

Paper Recycling Program

EPA has started the Presidentially sponsored highgrade office paper recycling program at the Federal Plaza Office Building and Customs Court building. The Federal Plaza in New York City is second only to the Pentagon in numbers of Federal office workers. Some 8,000 employees in 34 agencies are expected to participate.

Two staffers, Drew Lehman and Jane Donheffner, are implementing the program in Region 2 and are sharing the responsibility for coordinating the involvement of all the Federal agencies. The program expects to reduce the annual cost of hauling waste by \$17,000. Apart from the cost savings to the taxpayer, recycling conserves both paper and energy. Reduction of waste relieves pressure on the Region's overburdened landfill operations. Up to 50% of the office building waste is partially recoverable under this program. According to EPA figures, paper made from secondary fibers conserves as much as 60% of the fuel oil required for paper production from virgin materials.

Donheffner said she is hopeful that a successful program at Federal Plaza will stimulate interest for similar programs in State, municipal, and commercial office buildings in Region 2.

3

REGION

Delegation Agreement

Region 3 and Pennsylvania have signed an agreement which will provide the State up to \$7.5 million during the next two years to administer the Wastewater Treatment Facility Construction Grants Program.

Under the Delegation Agreement, certain functions of the grants program will be turned over to the Pennsylvania Department of Environmental Resources (DER). These functions include the handling of applications for amendments to grants, review of facility plans, construction plans and specifications, sewer use ordinances, user charge schedules, and industrial cost recovery systems, and inspections of plants during construction.

PCB Storage Protection

The owners of a Youngsville, Pa., warehouse used for storage of polychlorinated biphenyls (PCB's) have agreed to change PCB containers at the site and to improve the warehouse construction to comply with the Toxic Substances Control Act of 1976.

The agreement, signed by the warehouse owners, was approved by the U.S. District Court for the Western District of Pennsylvania in June, 1979.

The Department of Justice, on behalf of EPA, had filed suit at an earlier date in the U.S. District Court against the owners and operator of the PCB storage facility.

4

REGION

Task Force Created

A newly created, five-member Hazardous Waste Task Force has started its investigations of 147 sites in the Southeast reported to contain hazardous wastes. The sites have been identified by local and State officials, EPA personnel and private citizens. Some 50 inspections have been made with good cooperation coming from industries and the States.

An analysis of well water samples taken from an area near the New Hanover landfill in North Carolina confirmed earlier State findings showing contamination due to metals and organic compounds. Residents were notified that water could not be used for drinking. The landfill was closed by order of the State. Region 4 investigators sampled three other sites in and around Charlotte and Mecklenburg County. None presented an imminent health hazard but local and State officials were advised to dispose of chemical waste-bearing drums in an approved facility.

In Tennessee, sampling showed PCB concentrations of three parts per billion in water downstream from the Waynesboro landfill. At a meeting with State and local officials, it was recommended that an activated charcoal filter system be installed and a dam repaired. Tests showed elevated chromium levels slightly exceeding the drinking water standard in a stream near a Lawrenceburg landfill. An industrial discharger was urged to come up with more acceptable and

environmentally sound disposal methods.

Region 4 is preparing for enforcement actions expected to result from the investigations.

5

REGION

Pretreatment Program Proposed

Minnesota has received EPA's approval for its proposed industrial toxic substances pretreatment control program. The program will supplement the National Pollutant Discharge Elimination System permit program for facilities discharging wastes directly into Minnesota waters. The State has been administering the permit program since June, 1974.

The pretreatment program, authorized by the Clean Water Act Amendments of 1977, limits the types and amounts of industrial pollutants, particularly toxicants, that may be discharged into municipal sewerage systems. It also seeks to improve the recycling and reclamation of municipal wastewater and sludge. Regional Administrator John McGuire said, "While some municipalities have existing pretreatment programs, it is Minnesota's and EPA's intent to upgrade existing programs and to establish additional programs where needed."

Together with the permit program, the pretreatment program will help assure the control of toxic substance discharges and provide better overall wastewater control. It will also help bring some Minnesota industrial dischargers into compliance with Federal, State, and local

water, air, and sludge standards and regulations. Other Region 5 States are developing similar programs.

6

REGION

De-Designation Decision

Regional Administrator Adlene Harrison has decided to concur with former Governor Dolph Briscoe's removal of the designation of the San Antonio 208 planning area and the Alamo Area Council of Governments (AACOG) as the area-wide water quality planning agency.

After careful consideration and review of the testimony received at two separate public meetings, the Regional Administrator approved the removal of the designation and the inclusion of this area in the State-wide Water Quality Management Program. The Texas Department of Water Resources and the Texas State Soil and Water Conservation Board will serve as planning agencies.

The Regional Administrator determined that procedures for changes in designation had been followed and that the replacement agencies have the authority and capability to carry on the water quality planning.

To insure the continuation of a strong citizen voice in water quality planning, Region 6 developed a program which provides for area planning to be conducted by the City of San Antonio, the San Antonio River Authority, and the Cibolo Creek Municipal Authority through sub-agreements with the Texas Department of Water Resources.

7

REGION

Quiet Communities Program

Kansas City was selected as the third city in the Nation to participate in EPA's Quiet Communities Program. The announcement was made by Mayor Richard Berkley, adding Kansas City to this national program to study the cause and treatment of noise pollution. Kansas City signed a contract for the first year of a two-year program in which the city will receive \$40,000 annually to measure actual city noise levels, gather public opinion on irritating noises, and develop methods to control noise throughout the city. Allentown, Pa., and Spokane, Wash., are the other two cities conducting similar studies under the Quiet Communities Program.

Gasohol Production Seminar

More than 25 scientists and researchers attended the first EPA Gasohol Seminar in Kansas City. The seminar was co-sponsored by Region 7 and the Industrial Environmental Research Laboratory, Cincinnati, Ohio. Scientists and researchers from universities and various Federal and State agencies along with members of the National Gasohol Commission were in attendance. This was an early attempt to evaluate the efforts, progress, and status of gasohol and the Farm Energy Program. The environmental effects from the production of alcohol from biomass (or living matter) to produce gasohol were also evaluated.

8

REGION

Research

The Denver Regional Office recently created a special team to research and promote Innovative and Alternative (I & A) wastewater treatment technology systems. The program has identified 74 communities which have potential projects in the Region.

Two cities, Yankton and Milbank, S. Dak., have already requested funding from EPA for a project. The Region 8 technology team will be guided by the Water Programs Division with additional staff support from the Office of Public Awareness and Intergovernmental Affairs.

Consent Decree

The Public Service Company of Colorado's Cherokee Plant has decided to put in new bag houses in two units, following an engineering study by the EPA National Enforcement Investigations Center which indicated continued particulate matter emission problems for the facility. Not only is it estimated that building and maintaining these bag houses will be cheaper over a 20-year period than it would have been to continue maintaining the existing equipment, but the facility will also be able to meet standards that are 20 times more strict than present ones, offsetting \$5 million worth of potential civil penalties. Even after reimbursing the Investigations Center \$55,600 for the engineering study, the Public Service Company will still be able to realize savings for the rate payer.

9

REGION

Smog Alert

The city of Los Angeles experienced its worst smog alert in five years in June. The second stage alert reached a high of .43 parts per million. The South Coast Air Quality Management District responded with implementation of emergency smog abatement plans. These plans required companies emitting pollutants to reduce emissions by 20%, companies with more than 100 employees in one location to reduce employee driving by 65-75%, and utilities to burn low polluting natural gas, if possible. A spokesman for the District estimated that 80% of the companies had been in compliance with traffic plans and 99% of the polluting companies had held to their reduced emission plans. Smog inspectors cited 40 companies for failing to implement traffic abatement plans. In an effort to reduce oil vapor emissions, oil tankers were also prevented from discharging their contents.

Water Code Violated

California's Water Resource Control Board has requested the State Attorney General's Office to take action against the Occidental Chemical Company of Lathrop, Calif., for violations of the State's Water Code. This action stems from allegations that Occidental had been illegally disposing of pesticides (including DBCP) into groundwater around its factory in Lathrop for over four years. Violations of California's water quality laws carry a maximum fine of \$6,000 per day.

10

REGION

Compressed Work Schedules

More than 200 employees at EPA's Region 10 headquarters have begun working longer hours each day in exchange for working fewer days each year, in an experimental use of compressed work schedules by Federal agencies in the Seattle area. Donald P. Dubois, the regional administrator, encouraged other local employers to try the experiment with their workers. If the compressed work schedules were to prove successful and to catch on at other places of business, declared Dubois, it would help relieve traffic congestion to the point where harmful build-ups of air pollution would be less likely in the downtown Seattle area.

Noise Control Program

Spokane, Wash.—the second city in the country to participate in EPA's Quiet Communities program—this summer deployed crews of EPA-trained volunteers to make noise measurements around the city, in what could be a step toward the development of a community noise ordinance. The two-year Quiet Communities program in Spokane is being funded by \$80,000 in EPA funds to determine the most appropriate approach for the city to control excessive noise. In addition to training volunteers, Region 10 will loan the city sound level meters and other equipment necessary for the program. □

Resources, Technology, and the Environment

(Continued from page 3)

went out to build a new coal-fired plant, or a new nuclear plant, and that's the only electricity it had, it has to charge you an amount way above what you were paying for the older power plants, and you wouldn't be able to compete in the market place.

And now let's talk about a solar device that you want to put on your roof—say it's going to cost you \$10,000. John Q. Citizen has a hard time getting that \$10,000—maybe he's already making mortgage payments on the house, and he's got to go out and try to borrow \$10,000 to put this device on his roof. And the economics for that new kind of energy many times is higher than for the electricity he's buying from the utility.

But the cost of the solar energy could be less than that incremental energy from the new nuclear plant or new coal plant. His solar unit doesn't get averaged in with the cost of the other energy. So wouldn't it make sense for the government to require that public utilities have the responsibility for providing electricity or energy to the homeowner via the solar route, as well as via the centralized plants, so that they could go out and borrow a billion dollars from banks to put up 100,000 of these units—put up units on 100,000 homes? And charge the homeowner a monthly fee for paying off the cost of that unit, just like they charge him a monthly fee for paying off the cost of a nuclear plant, or a coal-fired plant?

And to me that makes perfectly good sense. But these arrangements don't provide for that. So the net result is, on-site solar energy is uniquely disadvantaged by our current way of doing things. I like to say that "we get carried into the future by the momentum of the status quo."

We want to keep doing things the same old way, and the mo-

mentum is so great we keep on doing it that way, even when it doesn't make any sense many times.

I'd like to ask a couple of broad, sweeping questions. One is, what is the major environmental problem facing the world today? How can we cope with it?

The major environmental problem is the growth of human population. It is the underlying cause of most of the pressures on the natural environment. And growing world population is resulting in overgrazing, over-deforestation, over-fishing, over-cropping, which in turn are reducing the Earth's capacity to produce food and fish and wood.

Increasing population is putting a much greater amount of pollution into the environment and thus interfering with our life support systems. While I was in high school, the world's population reached two billion.

So throughout all the history of humanity—for the several millions of years in which humans have been around—population had grown to two billion. Yet today it's about twice that—about 4.3 billion. In this portion of my lifetime, the world added more people than it had added in all of that previous time.

And in spite of the substantial progress being made in some of the developing countries in reducing birthrates, the world's population is still going to at least double before it will level off.

Lester Brown in a recent publication showed what's been happening to the ratio of the various important things like food production, fish production, wood production, arable land—divided by the world's population. Throughout the past, that ratio has continually increased until this past decade. And in spite of increasing population, the food per person managed to go up, on the average.

But now, in the last 10 years, one after another of these things has peaked out and

started downhill. Obviously, as the world's population increases, you have to increase the production of the things that humans need, if you're going to just stay even with the quality of life per individual. But as the population builds up, it brings pressure on the environment and reduces the capacity of the Earth to produce these things. Eventually, those two forces will get to the point where you have this downturn in the ratio of critical resources to population. That to me is the underlying cause of world inflation.

There gets to be less per person available. As demand increases, the price goes up. So we need to focus on population. Let's take the population problem here at home, out on the front range, in Colorado. They have one of the world's most serious population problems. There the population is growing at about 2.4 percent a year.

In most of the critical developing countries, they've lowered their birthrate—their population growth rate has gone to below 2 percent a year. When you add a person in the developing world, he or she comes in with little more than his or her hands and feet, but when people move into the Front Range out in Colorado, they come with their cars, and their airplanes, and their chain saws and their snowmobiles and their high-rise buildings and so on.

Each such person has a thousand-fold greater impact on the environment than a person in a developing country. Why do they come to Colorado in such great numbers? It's an immigration problem, rather than a natural birthrate problem. They come in order to enjoy the natural environment—fantastic scenery and experiences there.

But the magnet is being destroyed by the influx of so many people, and unless the leadership in that area can put a throttle on that, the quality of life of those people is going downhill, and the very magnet drawing them there is being destroyed.

Are we winning or losing the struggle for environmental quality?

We are heading toward greater and greater difficulty, but we are winning in this respect: the birthrates are being brought down in the developing world. Major efforts are being made to teach people about family planning and to provide them with the knowledge and the wherewithal so that parents can decide on the size of their family and the spacing of their children.

These efforts have really been working in a great way in China, Indonesia, Singapore, Hong Kong, South Korea, Costa Rica. They're working in countries where there are Moslems and Hindus and Catholics and Protestants.

The key to it is getting the knowledge and the wherewithal available to the poor people, and then they do practice family planning just like affluent people.

So that's a big plus. But even with that, young people already born are going to have an impact on the growth rate which will at least double the world's population before it levels off. In fact, over the next 20 or so years, we're going to be adding people in absolute numbers at a faster rate than we ever have.

So the answer is yes and no to your question. □

This interview was conducted by Charles Pierce, Editor of EPA Journal, and John Heritage, an Assistant Editor.

Opposite: Using 55-gallon barrels which have been cut in half, this vertical rotor catches the wind and generates electricity. It was part of a display on appropriate technology held recently on the Washington Mall.

Back Cover: The changing of the leaves in this scene marks the beginning of another fall.



United States
Environmental Protection
Agency

Office of
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Washington DC 20460

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