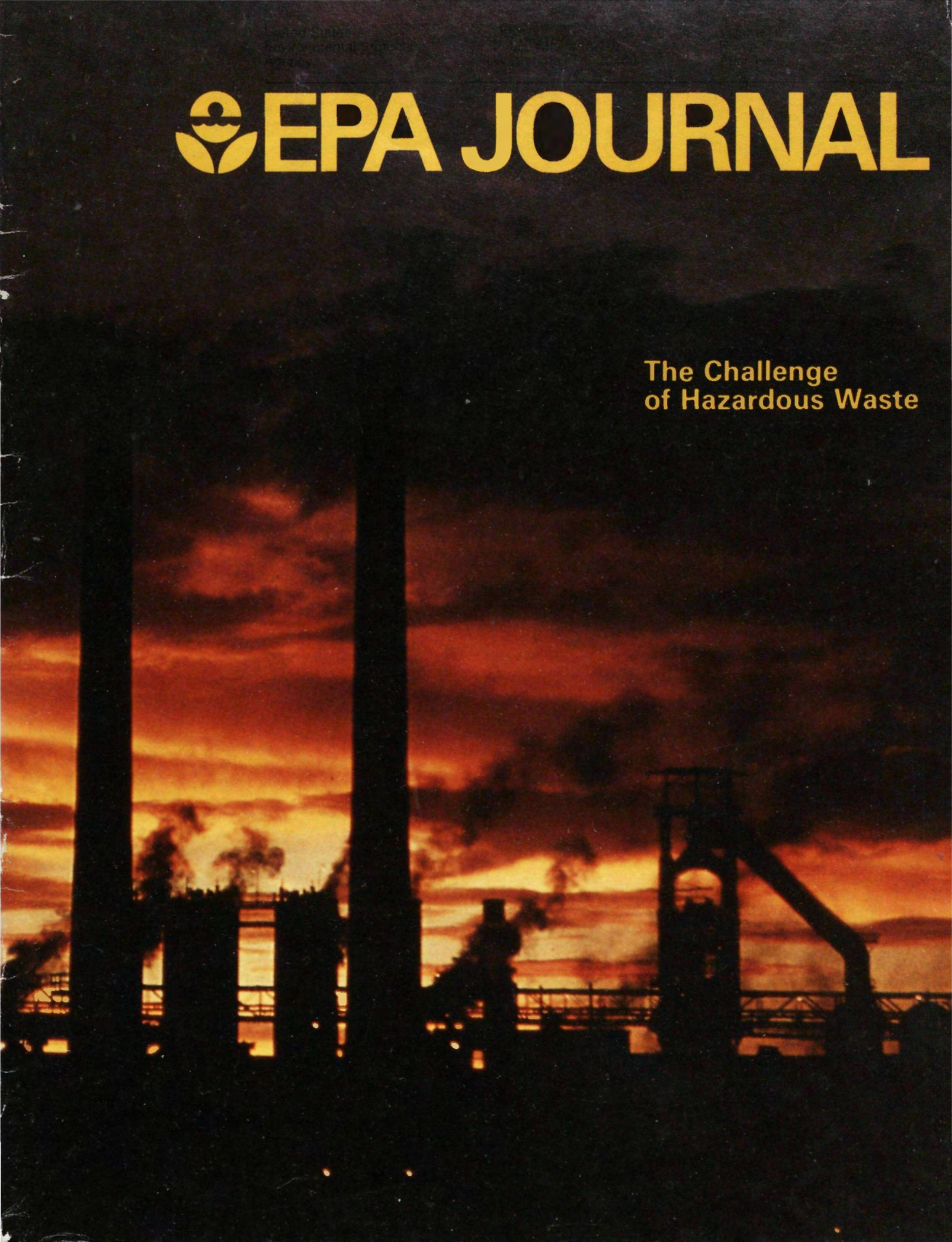
EPA JOURNAL

The Challenge of Hazardous Waste



The Challenge of Hazardous Waste

Disposal of hazardous waste in this country will never be the same again. This issue of the *EPA Journal* explores EPA's role in the dramatic changes that are taking place.

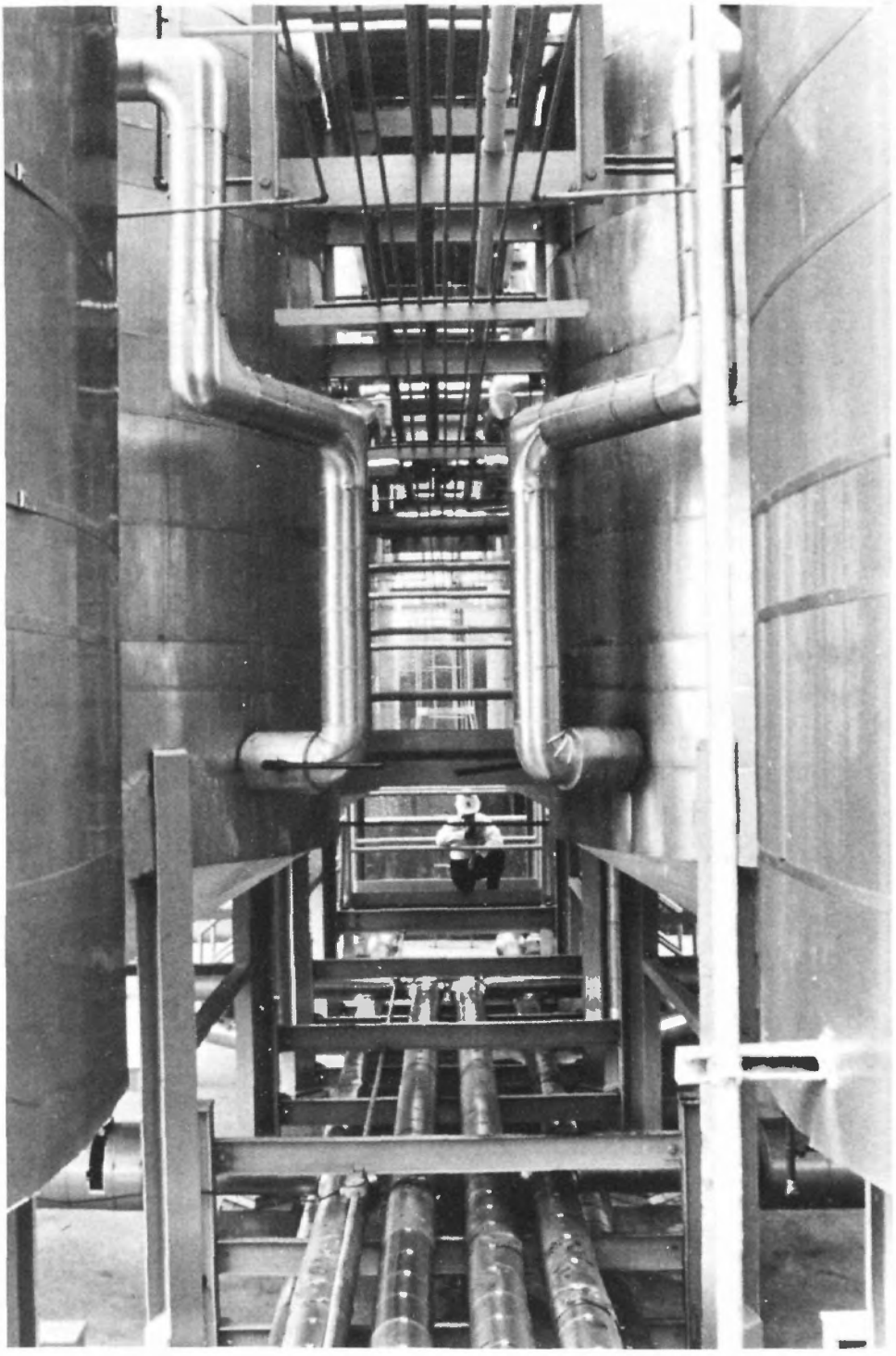
Leading off the issue is an article by J. Winston Porter, the Agency's Assistant Administrator for Solid Waste and Emergency Response. He looks at the far-reaching implications of the amendments to the Resource Conservation and Recovery Act (RCRA) enacted by Congress in 1984. Then, Marcia Williams, Director of EPA's Office of Solid Waste, explains how the Agency is carrying out its sweeping responsibilities under the 1984 amendments.

Another feature considers how EPA will handle one of the biggest jobs under RCRA: ending the disposal of untreated waste on the land. An article reports on how industry is responding as the new RCRA is implemented. The availability of treatment alternatives to ease the waste disposal crunch is described, and another article reports on EPA research under way to help the country make the long-range adjustment to a different way of handling hazardous waste.

EPA's outreach efforts to alert and inform the thousands of small businessmen now affected by RCRA are discussed. Another article explains how EPA is approaching the job of enforcing the rules under the new hazardous waste control law. An observer outside of EPA comments on the job the Agency has been given by Congress and the new directions the law is requiring.

The challenge of regulating underground storage tanks—another major responsibility given to EPA by the new RCRA—is featured. Another article describes the busy days of the members of EPA's task force on hazardous waste and ground water.

The magazine concludes with two regular features—Update and Appointments. □



SCA Chemical Services

Commercial chemical waste incinerator in Chicago. Incineration is one treatment alternative to land disposal of hazardous waste.

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A Sweeping New Law Brings Dramatic Change

by J. Winston Porter

There can be no question that hazardous waste management is a major environmental issue of this decade. It's been said, and I believe it's true, that some element of the programs we manage touches the lives of all Americans each and every day. As difficult as it may be to believe, it's only been about ten years since the federal government began to understand the scope and complexity of the hazardous waste problem. Since that time, Congress has enacted environmental legislation to deal with this problem and the Environmental Protection Agency has developed a regulatory mechanism to meet the statutory mandates. We have the tools to get the job done.

The Hazardous and Solid Waste Amendments, enacted in late 1984, reflect a radical change in the regulation and management of hazardous and solid wastes under the Resource Conservation and Recovery Act (RCRA). We must move away from land disposal of hazardous wastes. We must issue permits for some facilities and close others. We must delegate the program effectively and efficiently to the states. Existing "loopholes" in the program must be closed, and past mismanagement of hazardous wastes addressed. The amount of waste generated must be minimized. And finally, new and far-reaching requirements are now governing a vastly larger and more complex regulated community.

Let me offer a few facts to demonstrate the dramatic change brought about by the "new RCRA."

The old program cost the regulated community roughly $1 to $3 billion when fully implemented. The new RCRA will cost an estimated $20 billion per year by the 1990s, putting the cost of hazardous waste management at a level comparable to the air and water regulatory programs.

There are 72 deadlines in the Hazardous and Solid Waste Amendments, 58 requiring action within only two and one-half years of enactment. The challenge is formidable. Many requirements are imposed by statute whether or not EPA issues guidance or regulations, including requirements which go into effect automatically if EPA fails to act by a specified date. These "hammer" provisions are typically more draconian than the Agency's normal requirements as an incentive for the regulated community and others to cooperate with the Agency to expedite the development and issuance of regulations.

Finally, the "new RCRA" greatly expands the regulated community, adding over 100,000 small generators of hazardous waste. These generators, which produce between 100 and 1,000 kilograms of hazardous waste per month, were previously exempt from federal regulation. The amendments also cover more than a million underground storage tanks and a few thousand additional facilities burning waste as fuel. Compared to our pre-amendment regulated universe of 35,000, it is not difficult to see the enormity of the task ahead of us.

What are the implications of the "new RCRA" for the future of hazardous waste management?

The increase in the cost of waste management will induce firms to modify their production processes to make waste less toxic, reduce the total amount of waste residuals, and recycle wastes.

Waste treatment will become more popular, requiring siting of new facilities, training of new personnel, and greater public acceptance. Conversely, many wastes will be banned from direct land disposal.

More than 1,000 land disposal facilities will close; about 500 others must ensure that wastes are being responsibly managed in order to obtain permits necessary to continue operating.

The corrective action program will present unique problems. We will need a cadre of experts who can address many policy issues, including "How clean is clean?" and the establishment of priorities.

Finally, we will continue to focus on effective communication with the newly regulated community, simplifying where possible and consciously striving to avoid what I call "guidance overload." Generators and operators will require training, assistance, and incentives to comply. Together with state and local governments and representative associations, we will look for innovative approaches to meet our objectives.

The Agency is already moving rapidly and responsibly to implement the new amendments. We're setting out to "get the job done." We're writing regulations and guidance, identifying the permitting universe, writing permits, and reviewing closure plans. We're working to more effectively involve interested parties in the decision-making process to assure reasonable, achievable, and enforceable regulations.

The "new RCRA" is an exciting challenge, requiring full commitment. I will look forward to working with the states, others in EPA, Congress, and the public in meeting this challenge. □

(Porter is EPA's Assistant Administrator for Solid Waste and Emergency Response.)

"Some element of the programs we manage touches the lives of all Americans each and every day." — J. Winston Porter

Steve Delaney

Making the New RCRA Work:

An Interview with Marcia Williams

Steve Delaney

The Office of Solid Waste in EPA is responsible for implementing the Resource Conservation and Recovery Act (RCRA). For this special issue focusing on RCRA, the Journal interviewed Marcia Williams, Director of the Office.

Q You became Director of the Office of Solid Waste a few months ago as part of an Agencywide rotation of senior executives. How has the experience been for you?

A Excellent. I've worked in various parts of the agency for 15 years, and I bring the experience of those years to the hazardous waste program. This kind of exchange facilitates cross-media and cross-program considerations, which I think is one of the things that Lee Thomas hoped it would do.

For example, the Toxic Substances Control Act (TSCA), which I helped administer in my previous role, is an extremely powerful tool for gathering information. The solid waste program, however, doesn't have the same ability to collect information. So I've structured a joint project where toxicological and environmental fate data collected or generated by manufacturers under TSCA can be used in writing regulations for the Resource Conservation and Recovery Act (RCRA).

Q What do you hope to achieve in your new position?

A I have four goals. One is to implement what is obviously a very challenging statute and to be responsive to the Congress in doing so.

My second goal is to make RCRA a more implementable statute. RCRA is very complex. People may have a hard time understanding it, and they can't very well comply with something that they don't understand. Making RCRA easier to implement will, I believe, lead to improved environmental protection.

The third goal I have is to take a proactive look to the future, and explore how one might structure a hazardous waste management program ten years from now. This could help us develop a more implementable solid waste program.

My final goal is to prioritize our workload to get the most bang for the buck. In this program, there is so much to do that we've got to prioritize. I'm hoping to bring a more risk-based approach to the program, so that we spend our time on things that maximally reduce environmental risks.

Q How would you describe the significance of the 1984 RCRA amendments?

A They are extremely significant, because they set a precedent in reducing flexibility and increasing specificity for the Agency. One can speculate on whether that's good or bad, but there's no question that it's precedent-setting.

Furthermore, the 1984 amendments mandate activity in a number of areas that had not received high attention in the past: small quantity generators, for example, and leaking underground storage tanks.

One of the most significant aspects of the statute is that it really makes it crystal clear that Congress wants the Agency to move away from land disposal to other forms of disposal. The statute pushes us in that direction quickly.

The last point of significance regards ground water. Some people might call the 1984 RCRA amendments the Ground Water Protection Act. The statute puts down in black and white a whole series of steps to require stronger ground-water protection.

Q Many people both in and out of EPA have criticized the 1984 amendments for imposing "hammer clause" deadlines. Are these unreasonable? Are they impossible?

A Congress set something on the order of 72 deadlines over the next few years for the Agency. The question is how do you prioritize properly, so that the deadlines you make sure you meet

are the ones that are, in fact, the most important?

The down side of deadlines is that they make it very difficult to respond to legitimate changes in priorities that occur after the statute and the deadlines have been put in place.

Q What will you do if you don't meet some of the deadlines?

A Again, my goal is to make sure that I prioritize deadlines so I meet the ones that have the most important environmental consequences.

Q Is America going to have to stop disposing of waste on land?

A America is going to have to stop disposing of most untreated waste on land. We may, however, find that we can treat waste first and render it essentially nonhazardous, after which time land disposal would be satisfactory.

Q How do you answer the criticism that EPA's proposed regulations for land disposal of hazardous waste are weak?

A We believe the proposed rule on land disposal is a landmark move forward in the handling of hazardous waste. We think the proposal will ensure that no waste will go to the land unless public health and the environment are fully protected.

We're soliciting comments on the proposal. So far we've had three public hearings. Based on the comments we've received to date, there are a high number of positive responses to our general approach for dealing with this extremely complicated problem. We are continuing to meet with Congress and environmental groups to fully explore the concerns they have raised.

Q Recently, an environmental research group, INFORM, said that industry is not doing a good job of reducing the hazardous waste it generates. Do you think that industry should be doing better?

A I'm not sure I'm in a good position to answer that yet. We're preparing a report to Congress, due in October, on waste minimization. The report will include recommendations on appropriate strategies to reduce waste. I don't want to speculate now on whether I think industry is or is not doing enough until I take a look at the report's conclusions and recommendations.

Q Will there come a time when most waste will be recycled, or when waste will no longer be produced at all?

A That would certainly be an ideal situation. I think we can get a lot closer to that situation than we are today, but I suspect we will never reach that ideal of zero waste or 100 percent recycling.

In the past, there was no economic incentive to reduce the production of waste. Dumping brought no repercussions. But as handling waste becomes more and more expensive, people will put more effort into avoiding waste production in the first place, and into recycling waste.

Q In view of the fact that Superfund wastes may themselves be contaminating ground water near central disposal sites, doesn't hazardous waste control sometimes seem a thankless task?

A We don't want to put ourselves into a situation where we're solving a Superfund problem but creating a RCRA problem. That's why the Agency has developed a strong policy in terms of where Superfund waste is allowed to go. Essentially, Superfund waste cannot go to a RCRA facility unless that facility, or a unit of the facility, is in complete compliance with all RCRA provisions.

Q Are you optimistic that the states can do a good job of implementing RCRA?

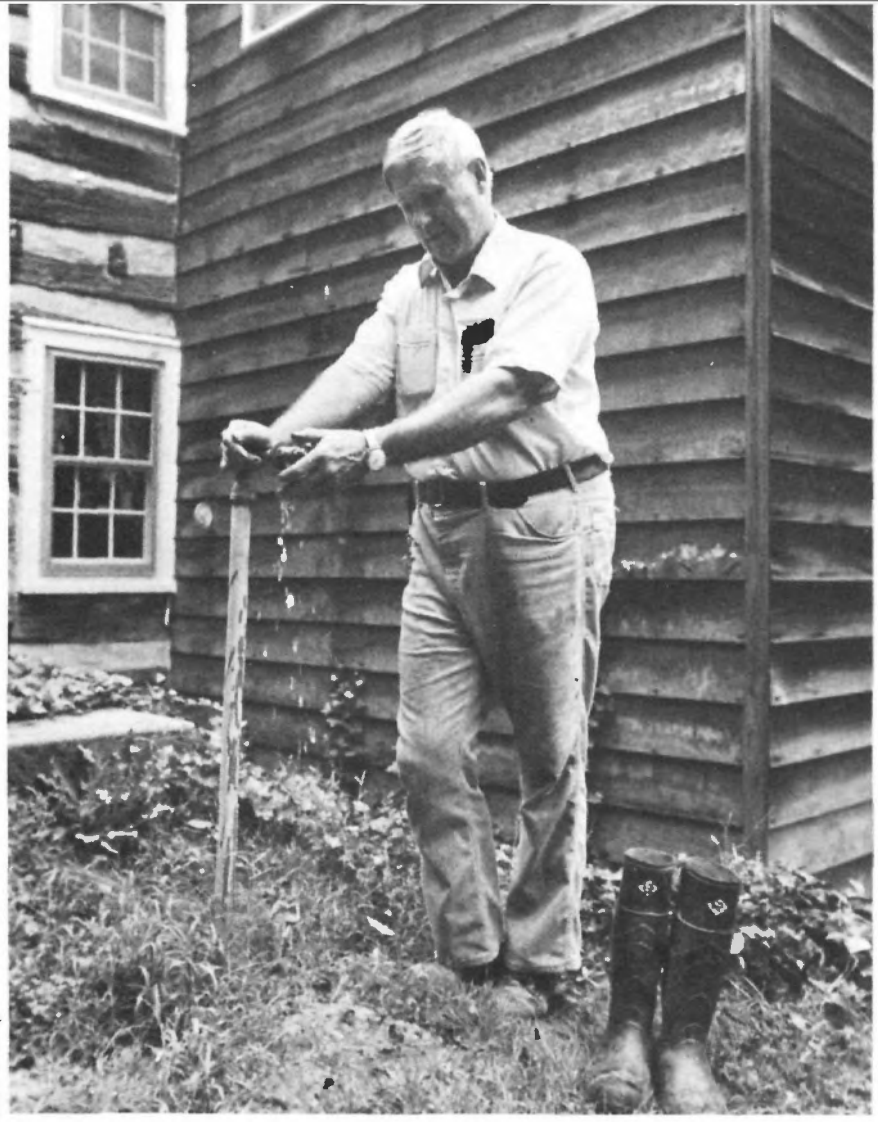
A The success of RCRA depends on our working out a strong federal-state partnership for the program. I believe we're headed on that track.

Q What is EPA doing to address the problem of household hazardous waste?

A That's an interesting question because, for the first time, the issue of managing hazardous waste has the potential to affect every family in this country. Presently, we are addressing this issue as part of our Subtitle D (municipal landfill) report to Congress. We are encouraged by the fact that many communities are holding Amnesty Days, when individuals bring their household waste to collection points. Managing household hazardous waste is an educational issue that deserves further attention.

Q What's the Office of Solid Waste doing to improve disposal of hazardous waste at federal facilities across the country?

A When RCRA was reauthorized, Congress wanted to make sure that federal facilities were fully covered by the new amendments. The law specifies frequent inspection requirements for federal facilities, and required federal facilities to submit an inventory to EPA of all their various units by January 31,



Steve Delaney

George Butler washes up at a well on his Maryland farm. RCRA amendments require strong ground-water protection.

1986, and every couple of years after that. One of our important priorities is to provide enough technical assistance to the members of the federal family to enable them to fully comply with these and other provisions of RCRA.

Q You appointed seven task forces to map hazardous waste goals. Have you gotten any feedback yet that we can discuss?

A I have gotten draft reports from a number of the task forces, and I'm consolidating them into an overall strategy for the RCRA program. There will be two strategies, actually: a short-term strategy, for the next two to four years, and a long-term strategy, for the next five to ten years.

We completed a working version of the strategy in March. My intent is to use that draft as a catalyst for discussion about what is really important and key in the implementation of RCRA.

Q We've had laws on the books for years about solid waste. Why haven't we solved the problem up to now?

A It may sound like a flip answer, but this problem wasn't created overnight, and it's not going to be solved overnight either. Over time, we've come to realize that the problem is more complex and more difficult than anyone originally thought. I don't think we had any concept of just how serious some of our past problems were until investigations under Superfund began.

And the problem has become even bigger. For example, under the 1984 amendments, RCRA not only addresses future generated waste, but also requires a cleanup of past waste mismanagment in every facility that currently manages hazardous waste.

Having said all this, I must say that we have also made progress. In fact, one of the things I'm doing right now is looking for better ways to explain to the public what that progress has been. While we still have a long way to go, we need to articulate the significant progress we have made in certain areas.

Q Are people overreacting to hazardous waste problems?

A I would answer the question in this way. I think EPA has a real challenge and obligation to let the public know about real risks and real choices in dealing with hazardous waste.

In the past, we have not always been successful in communicating this information to the public. As a result, there have certainly been instances of overreaction. The only way we can overcome this is through a better job of communication.

Q What's the state of our knowledge about solving waste disposal problems? In its infancy? Maturing?

A Over the last ten years, we've learned a tremendous amount about the nature of the waste constituents we're dealing with—how they move through various pathways, how their toxicity can be reduced.

But at the same time, there are tremendous gaps in the information we have. For example, what happens when you mix different wastes together? Is the toxicity of the resulting mixture worse than the toxicity of the individual waste streams? How effective are the new technologies in treating waste? Can we develop reliable procedures for determining the health effects from exposure to hazardous waste?

So the answer to your question is that we know a lot more about hazardous waste than we used to, but we still have a lot to learn. □

Banning Untreated Waste from the Land

by Eileen Claussen

Approximately 33 billion gallons of untreated hazardous waste are currently deposited on the land—some of it in surface impoundments like this.

When EPA was first created in 1970, the prevailing wisdom suggested that toxic waste could be safely disposed of in or on the land if land disposal facilities were properly engineered. In fact, so the story went, toxic wastes and pollution control residuals from the air and water *had* to be disposed of on the land. The only question to be decided was how and where.

We've come along way in the ensuing 15 years. We've learned, often the hard way, that engineering isn't enough; that the best design doesn't prevent the migration of hazardous constituents from the land disposal site. And the public has learned, too. The result of this education can be found in the Hazardous and Solid Waste Amendments of 1984 (HSWA), and in EPA's bold new effort to restrict the disposal of untreated hazardous waste in or on the land.

What does HSWA tell us to do? The new statute is clear in its assessment that land disposal is the least desirable method of managing hazardous waste. It is also clear in its direction to the Agency to protect public health and the environment by banning untreated waste from land disposal. And finally, it is clearest of all on the schedule EPA must meet. Some wastes are to be restricted as early as this November—and if EPA fails to act in a timely manner, the wastes will be banned by statute.

Can EPA meet the challenge? Over the next four years, the Agency will have to assess the risks from the land disposal of 450 listed wastes containing over 300 separate toxic constituents. The waste streams themselves come in many different physical forms, and their chemical compositions vary tremendously. Questions about the toxicity of these chemicals are, at best, difficult to answer. Questions about the toxicity of mixtures of these chemicals are even harder to deal with. The state of the art of chemical assessment will be stretched again and again as we move through the process of analyzing wastes and toxicants.

Over the next four years, the Agency will have to assess the risks from the land disposal of 450 listed wastes.

But assessing the risks from land disposal is only a small part of a complex task. EPA will be spending a great deal of time looking at alternative treatment technologies: how they work, what forms of waste they can handle, and how effective they are at rendering the waste less hazardous. Under this program, the standards that EPA will be setting must reflect not only what has a negligible risk, but also what can actually be achieved by technology—a difficult task in a world of changing know-how.

What will the next several years bring for EPA? By November of 1986, EPA must restrict dioxin and solvent-containing waste from land disposal. By July of 1987, the "California list," so named because it represents a list of wastes that the state of California indicated should be banned from land disposal, must be restricted. Looking forward to 1988, EPA will be restricting one-third of the 450 listed wastes: those that are most toxic and disposed of in largest volumes. By 1989 and 1990, we must close the loop on the remaining two-thirds, and on all wastes designated as hazardous because they "fail" one of the hazardous waste characteristics (i.e., those that are corrosive, ignitable, reactive, and toxic by virtue of a leaching test).

The statute requires that the bans take effect immediately unless EPA can demonstrate that there is not sufficient treatment capacity for handling the restricted waste; in that case, an extension of two years is allowed.

While treatment standards will be set for all the nation, individual sites will be able to petition EPA if they can demonstrate that disposal of a particular waste at a particular site is safe. It is likely that many individual sites will attempt petition showings, so they can avoid the ban and pretreatment of their wastes prior to land disposal.

As EPA makes its decisions to restrict wastes from land disposal, how will waste managers react? It is our expectation that implementation of the land-disposal restrictions program will result in landmark shifts in the way in which hazardous waste is managed. At the present time, approximately 33 billion gallons of hazardous waste are disposed of in landfills, surface impoundments, land treatment units, and waste piles without prior treatment. Of this amount, it is likely that 90 to 95 percent will have to be treated prior to land disposal when the new program is implemented. For waste with organic content, the Agency will probably require incineration. Only the

(Claussen is Director of the Characterization and Assessment Division of EPA's Office of Solid Waste.)

incinerator ash will be allowed in the land. In some cases, the ash may still be high in contaminants (probably metals that are not destroyed by the burning), and it may have to be stabilized prior to placement in or on land. For wastes with high metal content, the best available technology may be stabilization. In these cases, only treated, stabilized wastes will be allowed in or on the land. Other forms of treatment that may be acceptable include wastewater treatment, carbon absorption, steam stripping, and distillation.

In addition to the 33 billion gallons of waste now going to landfills and impoundments, another 37 billion gallons of hazardous waste are injected into deep wells. These wastes will also be subject to ban decisions, although the statutory time frame for underground injection is October 1988 for dioxin wastes, solvent wastes, and the "California list." The EPA Office of Drinking Water has responsibility for this portion of the land disposal restrictions program.

The land-disposal restrictions program will result in landmark shifts in the way hazardous waste is managed.

For the waste now placed in landfills, surface impoundments, land treatment facilities, and waste piles, the Agency estimates that the cost of restricting land disposal and requiring treatment is $1.3 billion per year. Other costly improvements to land disposal mandated by the Hazardous and Solid Waste Amendments include location standards; requirements for the use of double liners in landfills and surface impoundments; and restrictions on all liquids, hazardous and non-hazardous as well. As contemplated by the statute, these controls will be in place to safely handle the treatment residues that will continue to be land disposed even after the new RCRA program is fully effective. Once all these changes are made in the way we manage hazardous waste, we may finally be able to say that land disposal is acceptable (even if only for the residuals of treatment technologies) and the circle—which began by removing toxicants from air and water, only to redeposit them on the land—may finally be closed satisfactorily. □

Industrial Responses to RCRA's Rules

by Robert J. Griffin, Jr.

In the public mind, protection of the environment from hazardous waste is perceived as a job for EPA. And indeed, EPA *does* have the statutory responsibility for ensuring that requirements of the Resource Conservation and Recovery Act (RCRA) are met. But, in truth, preventing future environmental damage from hazardous waste must also be considered a job for *industry*.

Since August 5, 1985, amendments to RCRA have greatly enlarged the scope of industry's participation in the program, to include not only large-scale generators of hazardous waste, but also firms that generate smaller amounts of hazardous waste—quantities of 220 pounds or more per month.

How well is industry able to meet its responsibilities under RCRA? What are its successes? What problems remain? The answers to these questions are important for EPA, for industry, and for every American who has a stake in seeing that RCRA achieves its goal of a cleaner, healthier environment.

At the time the RCRA amendments were passed, concern was voiced by some that small-scale hazardous waste generators would have relatively greater difficulty meeting requirements of the Act than would large-scale waste generators. This concern was based upon the fact that larger firms, almost by definition, have a greater capacity to handle administrative requirements of the Act, and often have greater in-house technical capabilities as well.

Although there is some truth to this point of view, experience to date has shown that many small-waste generators are able to meet their RCRA responsibilities without undue handicap related to size of operation. In fact, the fundamental issues to be dealt with, if RCRA is to be successful, apply to industries that generate hazardous waste on a large scale and to smaller waste generators alike. It is also apparent that certain industries are finding it somewhat more difficult to comply with RCRA than others, regardless of the size of their waste stream.

(Griffin is a Washington-based science writer.)

Most industry experts agree that several factors, often interrelated, have an important bearing on the cost and relative ease of disposal of hazardous waste from a given firm. Virginia Bliss, Associate Washington Representative of the Automotive Service Industry Association, representing service station wholesalers and distributors throughout the United States, cites transportation cost as an especially important factor. "Obviously," Bliss notes, "the nearer a waste-generating firm is to an acceptable disposal site, the more favorable the transportation economics are likely to be." Similarly, with larger quantities of waste to be removed, it is usually easier to achieve economies of scale, thus lowering the cost per unit of waste that must be hauled.

Certain industries are finding it somewhat more difficult to comply with RCRA than others, regardless of the size of their waste stream.

The character of the waste stream itself can be of critical importance in determining the economics of disposal. For example, the cost to dispose of waste materials with potential for reclamation or recycling may be offset to some extent by the proceeds from sale or use of the reclaimed product. By the same token, the nature of the processing required for a particular waste prior to disposal—whether by incineration, chemical treatment, or other means—can also be an important cost factor.

Wastes that are non-homogeneous or mixed—and, indeed, those whose exact chemical composition is unknown—pose special difficulties. Bliss notes that such diversity in the waste stream—and uncertainty as to its content—is characteristic of many small hazardous waste generators, including service stations.

"There is no way for a service station manager to know the chemical content of all materials used in his business," she explains. "In addition, many customers rely on service stations to take used oil off their hands—and there's no way of knowing whether used crankcase oil has been mixed with poisons, household chemicals, or other hard-to-get-rid-of materials." Open dumpsters at many small business locations similarly invite homeowners to discard hazardous wastes that they would hesitate to place in household garbage.

According to Dr. Geraldine Cox, Vice President and Technical Director for the Chemical Manufacturers Association, a major problem facing all hazardous waste generators is the virtual impossibility of getting liability insurance. "Insurance companies feel that they cannot really estimate the risk involved in handling and disposing of hazardous waste," she says. A possible solution to this problem, Cox suggests, is establishment of a legal maximum award, or financial liability, in cases arising from the generation or disposal of hazardous waste.

Despite these difficulties, American industry is forging ahead, searching for ways to meet its responsibilities under RCRA. Dr. Cox indicates that most member firms of the Chemical Manufacturers Association maintain their own in-house disposal capability. Although such firms certainly possess the necessary technical expertise and

Solid waste management is our oldest environmental problem. This woodcut depicts a basic sanitation method in the Middle Ages: dumping the garbage out the window.

to handle, and so many possible treatment technologies, that no single technology stands out. But it is possible to make some generalizations.

Treatment can only do three things to a waste: destroy it, immobilize it, or prepare it for destruction or immobilization through chemical or physical changes. (See related article on hazardous waste research on page 12.)

If a waste cannot be eliminated or recycled, destruction is clearly the next preferred option. Destruction implies alteration to make a waste nonhazardous under RCRA's definitions, most often by reducing its toxicity. Thermal treatment, such as incineration in a properly operated rotary kiln, is probably the most versatile and reliable way to destroy many organic wastes.

Biological destruction is another approach. It relies on microorganisms to break down hazardous materials into simpler, nonhazardous compounds. Another solution is to change those properties that make the waste hazardous. While it may still need disposal, at least the waste is no longer hazardous. Indestructible wastes such as metals can be treated by immobilization—a process that uses physical and chemical means to bind such materials into solid blocks. Properly handled and disposed of, they can remain stable and isolated for a long time.

Putting the Options Together

In most cases, the key to successful waste treatment is to put the right processes together in treatment trains. Combinations of processes are often essential both to prepare wastes properly for an end process and to compensate for the inefficiencies of the end processes.

Even the most efficient treatments produce their own residuals. Incineration requirements for RCRA wastes are very demanding, but even so, one-hundredth of one percent of the waste will typically escape. Immobilization can lower the leaching of metals by factors of 100 to 100,000, but a measurable amount is still lost over time.

We have to decide which options produce the best environmental result. Given a particular waste and the available treatments, where is the preferred place for it or its byproducts? We try to answer this question when we identify the treatments that qualify as "best demonstrated available technology" (BDAT) for each class of waste. BDAT is used as the basis for setting performance goals for waste treatment.

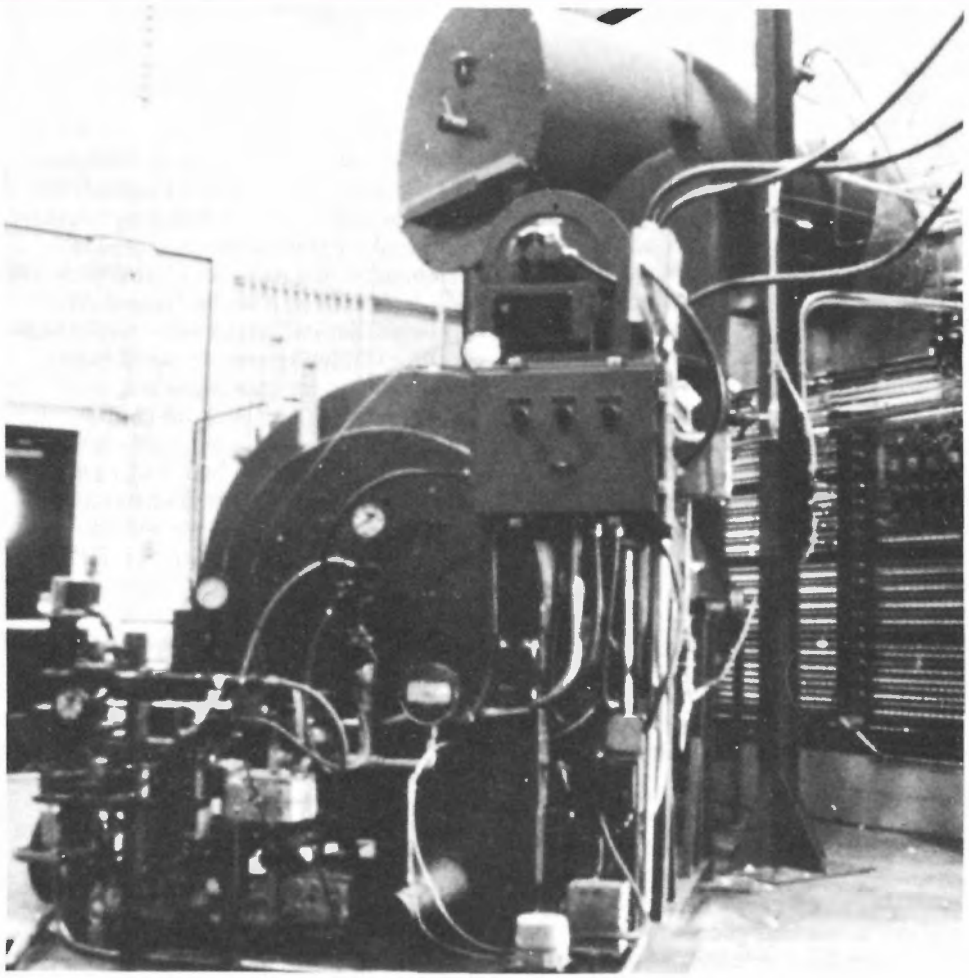
The most difficult part of defining BDAT is designing formal criteria for determining what we mean by "best." An ideal treatment process would produce no residues at all and pose zero risk to health and environment. We know realistically that such perfection is impossible. Moreover, until better waste treatment processes are demonstrated and become commercially available, the ones we already have may fall short of what we would like to achieve, which is a level of risk from hazardous waste management that we can safely consider negligible. Defining the "best" treatments from among the available options entails determining whether they must produce negligible levels of risk, or at least significantly reduce the risks we already incur from disposing of waste on land. At the very least, we want to avoid making matters worse than they are now.

Experience has taught that there is no such place as "away," especially for hazardous wastes.

As new technologies are developed, they can be incorporated into this approach to designating best demonstrated available treatment without disrupting its underlying structure and logic. We believe that the regulations provide the final link that will allow us to construct a system that can take all segments of the industrial pollution cycle into account to create the most advantageous balance between effective management of waste and protection of health and the environment. □

Research to Break the Land Disposal Habit

by John H. Skinner



Liquid injection incinerator at EPA's Combustion Research Facility in Jefferson, AR.

(Dr. Skinner is Director of the Office of Environmental Engineering and Technology in EPA's Office of Research and Development.)

Superfund is one of EPA's biggest, most visible, and most controversial programs. With 852 sites on the National Priorities List alone, it's probably safe to predict that the program will be around for a long time to come. And EPA is doing its best to implement it.

EPA is also doing its best to carry out the Resource Conservation and Recovery Act (RCRA). When fully successful, RCRA will put Superfund out of business—by ensuring that new Superfund sites are not generated. To help accomplish this, Congress has mandated that the RCRA rules ban land disposal of most hazardous wastes, thus forcing treatment as an alternative.

Breaking the land disposal habit won't be easy, but EPA's Hazardous Waste Engineering Research Laboratory is working to foster increased use of four major alternatives: waste reduction; materials recovery; energy recovery; and waste treatment and destruction.

Waste Reduction

The 1984 amendments to RCRA stress waste minimization, reuse, and recycling, and direct EPA to report to Congress by October 1, 1986, on the feasibility of standards for encouraging or requiring waste generators to adopt waste minimization strategies.

Many companies are already heavily involved in programs to generate less waste. At a recent conference on waste reduction, co-sponsored by EPA's Office of Research and Development, the League of Women Voters of Massachusetts, and Tufts University, participants heard representatives of 21 large corporations describe their largely successful programs to reduce hazardous waste generation. Such projects as removing trace contaminants from waste streams and separating hazardous from nonhazardous waste streams have led to significant savings in waste disposal costs. In the future, as disposal standards become more stringent and liabilities for improper disposal mount, it will become more economical for generators to modify production processes so as not to generate waste in the first place.

Materials Recovery

The metal finishing industry is well on the way to developing systems for recovering a host of potentially valuable metallic compounds. Already, current technology allows for selective precipitation and recovery of metals, as well as blending acidic wastes with other industrial components that produce alkaline discharges. Another innovative technique on the horizon offers the potential of metal recovery from a mixed hydroxide sludge through hydro-metallurgical techniques. Designed to remove iron, copper, zinc, chromium, and nickel from mixed sludge, the recovery system processed 100 pounds of sludge per day during testing and shows promise for economical recovery in a full-scale (50 ton per day) plant.

Another approach uses living cells to capture metals that are essential to the cells' nutrition. EPA's research has identified and even synthesized some of these metal-capturing molecules. These metal-binding organic materials can be used to recover hazardous materials, such as removing copper from mine drainage.

Energy Recovery

An estimated 25 million tons of hazardous wastes produced each year are combustible, and a substantial percentage can be used as a fuel. Many hazardous waste streams contain spent solvents and waste oils that have significant value as supplemental fuel in boilers and in industrial furnaces.

EPA's research has found that large industrial boilers can successfully use wastes as fuel, but smaller boilers appear to be less effective because of incomplete destruction of the wastes.

In properly operated cement kilns and other such high temperature furnaces, using hazardous waste as a supplementary fuel appears quite attractive both environmentally and economically. The commercial viability of the concept is demonstrated by the fact that waste is used as a fuel in 12 large cement kilns across the country. EPA has been involved in evaluating four of these cement facilities, some of which can consume 25,000 gallons of organic wastes per day.

Waste Treatment

Biological, physical, chemical, and thermal treatment processes are also alternatives to land disposal. EPA research has shown that incineration can destroy in excess of 99.9999 percent of the organic constituents in some wastes, and that properly operated incinerators can provide a permanent solution to certain hazardous waste problems with minimal long-term ecological burden.

The use of ocean-going incinerator ships has also been proposed as a means of destroying hazardous wastes in a location far removed from people. While there are some advantages to this approach, there are drawbacks, such as the possibility of a spill at sea or during loading operations. In order to respond to some of the concerns in this area, we are conducting further research into the effects of ocean incineration on the marine ecosystem.

EPA has participated in the development of new thermal treatment processes. Among these are a plasma arc torch designed to destroy organic wastes at temperatures in excess of 10,000 degrees Centigrade, and a high temperature fluid-wall reactor that uses radiant heat to decontaminate solid particles, such as soil.

EPA is also looking at physical and chemical processes such as precipitation, solid-liquid and liquid-liquid separation, neutralization, and chemical oxidation. Biological processes more advanced than activated sludge are being investigated as well.

The innovative physical and chemical treatment technologies currently under development range from advanced separation techniques to total chemical destruction. With newly developed low pressure, composite reverse-osmosis membranes, it appears feasible to concentrate a variety of organic and inorganic hazardous wastes from aqueous streams, thereby greatly reducing the volume of hazardous waste that must be further treated. Similarly, gel materials have been developed that can absorb and then release water from hazardous waste streams, leaving behind a concentrated brine or hazardous waste mixture of smaller volume.

Solvent extraction, which uses a fluid into which the hazardous contaminants readily dissolve, can also serve to remove and concentrate wastes from aqueous or nonaqueous streams.

In a prime example of applying new technology to solution of a persistent environmental problem, EPA scientists have developed a chemical process to detoxify the pesticide fumigant ethylene dibromide (EDB). EPA canceled the registration of this chemical in 1985. Under the terms of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Agency is required to dispose of existing stores of cancelled material. Conventional techniques for disposal of EDB, including incineration, would be extremely costly and have not been proven to be effective. Through the use of a mixture of potassium hydroxide and tetraethylene glycol (TEG), EPA researchers demonstrated rapid and economical destruction of EDB and produced a by-product, potassium bromide, which has significant commercial value. Use of the TEG method for EDB destruction could save EPA millions of dollars.

Biological treatment of hazardous waste also shows tremendous promise. EPA researchers are experimenting with bacteria, yeasts, and fungi in a program to extend the capabilities of biotechnology for hazardous waste treatment. Current information indicates that the rather common white rot fungus, *Phanerochaeta chrysasporium*, can destroy DDT, dioxins, and related compounds at various concentrations. Commercially developed strains of microorganisms are also currently on the market for degradation of organic compounds.

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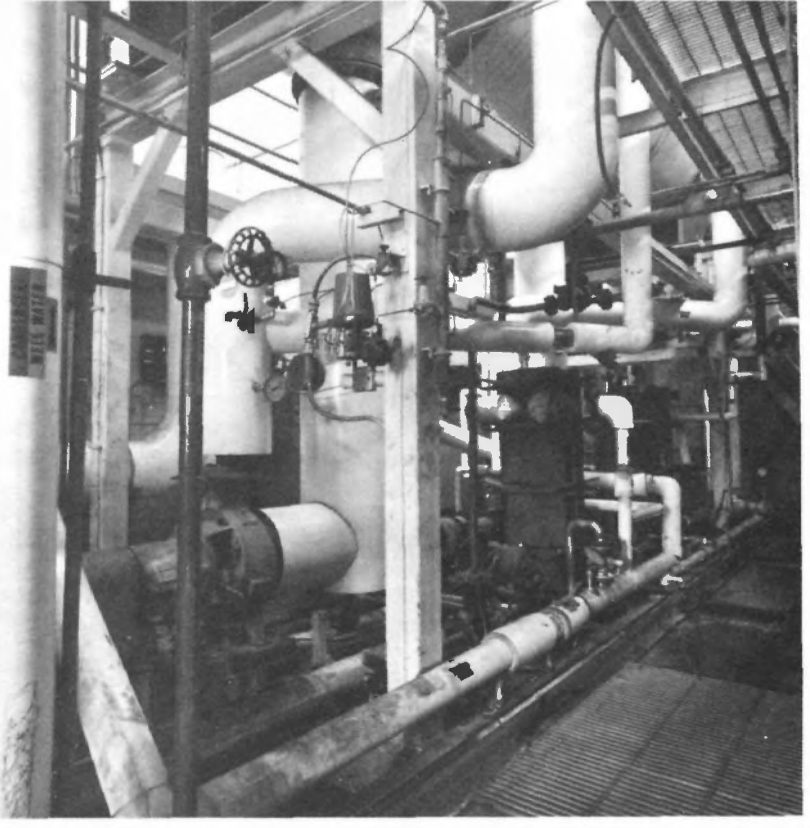


In this vapor compression evaporation system at a 3M plant in Minnesota, dilute ammonium sulfate—a waste byproduct of the manufacture of magnetic tape—is concentrated to a level where it can be sold as fertilizer.

3M Company

Ultimate Disposal

Even with adoption of all these treatment and destruction measures, however, some waste derivatives will still require land disposal. To improve the security and efficiency of land disposal systems, EPA is addressing two important issues: selection criteria for new sites and containment technologies for exisitng sites.

In the past, little thought was given to the physical characteristics of disposal sites and their capacity to buffer or absorb hazardous wastes. While we've learned that some places simply cannot hold toxic materials, it's possible that other sites *are* suitable. To develop better site selection criteria, EPA is studying the effectiveness of cover materials such as vegetation, soils, and membranes to minimize moisture and gas movement; the use of leachate samples or mixtures to predict the composition of field leachates; and the effectiveness of chemical stabilization or encapsulation processes to modify wastes.

EPA is also seeking better waste containment with improved liners and leachate collection systems. With effective materials, seaming techniques, and cover materials, potential leakage can be minimized. In addition, nondestructive leak detection systems are available now that can locate a leak within one foot of its actual location. Mathematical models allow engineers to predict water flow through a site under various conditions. EPA is evaluating all of these technologies.

Monitoring, Process, and Health Research

Another important focus of EPA research is environmental emissions from hazardous waste facilities. Agency investigators are advancing our understanding of how these emissions migrate and are transformed in the environment as well as their potential impact on human health.

At the Environmental Monitoring Systems Laboratories in Las Vegas, NV, and Cincinnati, OH, work is under way to improve EPA's ability to sample and analyze ground water around hazardous waste facilities. The labs are investigating the use of fiber optics and lasers, as well as formulating generic analysis procedures that will simplify and reduce the costs of analyzing ground-water samples.

At the Environmental Research Laboratory in Athens, GA, researchers have developed a mathematical model which predicts the fate and transport of hazardous contaminants discharged from hazardous waste landfills. This research received an EPA Gold Medal and is the keystone of the Agency's program to restrict and prohibit the disposal of certain hazardous wastes in landfills.

Researchers at the Robert S. Kerr Environmental Research Laboratory at Ada, OK, are recognized worldwide for their work in advancing the science of ground-water processes and are EPA's experts in understanding the ability of soil to treat and destroy hazardous waste. They have recently installed two experimental underground injection wells to test the performance of systems that inject hazardous wastes deep into underground formations.

The Health Effects Research Laboratory at Research Triangle Park, NC, has developed a biological assay screening procedure to quickly identify new hazardous wastes and evaluate the hazardous nature of effluents from various facilities. Research in the Office of Health and Environmental Assessment enables EPA to make the key link between exposure to hazardous wastes and its impact on human health.

All of this work is instrumental in improving our ability to monitor hazardous waste facilities and reduce their potential adverse impacts on health and the environment.

Conclusion

EPA is working under the provisions of RCRA to develop and evaluate improved technologies to help solve hazardous waste problems. The 1984 amendments direct the country toward alternative treatment and disposal processes, and toward the upgrading of existing land disposal sites. With waste reduction, recycling, and treatment, we can reduce the volume and toxicity of those hazardous wastes that must go ultimately in the land. EPA is conducting research and development along with professional societies, trade associations, and other organizations to advance state-of-the-art technology in this field. Technical advances to minimize waste production and develop properly engineered treatment, storage, and disposal facilities will ensure that future generations won't be saddled with dangerous hazardous waste dumps because of our waste management practices. □

Spreading the Word About the Job Under RCRA

by Edgar Berkey
and Karen V. Brown

How can you get people to listen to you when they really don't want to? How do you communicate effectively to people so they're motivated to take actions they might not otherwise take?

The search for answers to these questions has commanded the attention of such noted institutions and fabled people as . . . mothers, Madison Avenue, Rodney Dangerfield, Dr. Pavlov, and Sigmund Freud, among others. Now, as a result of the 1984 amendments to the Resource Conservation and Recovery Act (RCRA), the search has also intensified at EPA.

Why? Because enactment of the 1984 RCRA amendments brought hundreds of thousands of small businesses under federal hazardous waste regulations for the first time and presented EPA with a fundamentally different community to regulate. In addition to new requirements for small quantity generators and underground storage tanks, there will also be new regulations on used oil and the kinds of materials that can be sent to landfills.

Successful implementation of the amendments with the small business community is likely to be a long-term process, and difficult to accomplish without first overcoming historical barriers, real or imagined, between small businesses and EPA.

Traditional forms of communication, regulatory development, and enforcement won't work. The small business community is too large and diffuse. New procedures for leveraging resources and encouraging voluntary compliance must be sought.

(Berkey, a consultant to EPA, is President of Synco Consultants, Inc., and Brown is EPA's Small Business Ombudsman.

There are definite signs that some barriers are cracking.

The newly regulated community comprises many diverse small business sectors that generate different kinds of hazardous waste or operate underground storage tanks containing petroleum products or chemicals. This community is not experienced in understanding or complying with EPA regulations. It knows very little about environmental laws, has a generally negative view toward all types of regulators, is suspicious of their intentions, and fears the economic consequences of their regulations. On the other hand, EPA also lacks experience in understanding and resolving critical small business issues.

During debate on the 1984 amendments, many members of Congress, and organizations and people who testified before it, agreed on the need for a vigorous education effort specifically designed for small business. The final amendments included specific language directing EPA to conduct educational and informational activities to help small quantity generators understand their new responsibilities under RCRA.

However, before EPA could undertake these activities, some key questions had to be considered. From whom did small business people normally get their environmental information? What forms of communication were most effective? Whom did they trust and believe? Whom were they likely to resent? What were the best delivery systems? What types of businesses would be affected and what information did they need?

EPA's most commonly used means to communicate regulatory information—the *Federal Register*—was found to be an ineffective resource for small business operators. They tended to shy away from detailed technical information and to rely on their trade associations to keep them informed. They feared identifying themselves with regulators but liked the idea of confidential telephone Hotlines where they could call for assistance. They wanted practical "how to" answers to their problems.

EPA's Office of Solid Waste (OSW) was given primary responsibility for the initial outreach effort to small quantity generators—the most far-reaching and intensive outreach program ever conducted by EPA on a single set of regulations.

An OSW survey estimated that more than 650,000 businesses generate hazardous waste in the U.S. Of these, over 100,000 produce over 220 pounds per month, the amount required to come under federal regulation. Over 18 individual industry categories affected by the new requirements were identified—each with its unique set of wastes.

EPA recognized that to reach the small business audience, material would have to be "eye-catching," appealing, and different from other information produced by the Agency. It would also have to be offered by organizations and delivery systems trusted by small business.

Several approaches were developed:

- A colorful, oversized brochure, entitled "Does Your Business Produce Hazardous Waste?," discusses the new federal requirements for small quantity generators and can include any one of 18 industry-specific inserts so readers can obtain answers to their particular questions.

- Through a cooperative effort, over 500 national and regional trade associations and small business organizations, as well as regional and state offices, distributed more than 750,000 of these brochures. For people who do not belong

to any association, EPA has made articles available to over 150 trade journals covering all 18 identified industry sectors.

- A 13-minute videotape presents information on the new record-keeping requirements. The videotape was reviewed by people from the small business community to ensure it would be understandable and meet their needs.
- A training program developed by EPA with the National Fire Protection Association (NFPA) has reached over 30,000 fire service personnel. Local fire departments are often the first point of contact for small businesses concerned about storage and disposal of hazardous chemicals and materials.
- Finally, Congress specifically allocated funds for state and local RCRA activities. A large portion of these funds has gone to assist small quantity generators. Across the U.S., over 70 projects have taken place involving education and outreach, workshops, seminars, and preparation of waste management information. Over 50,000 people have participated in these activities.

Traditional forms of communication, regulatory development, and enforcement won't work.

Is all this effort working? Is small business compliance growing? It is a little early to tell since successful outreach is not a one-time activity. However, there are definite signs that some barriers are cracking. The outreach material stresses that EPA hotlines can be used to obtain additional information. As word has spread, usage of these hotlines has grown to unprecedented levels—the RCRA Hotline (800/424-9346) is now responding to over 8,000 calls per month; the Small Business Hotline (800/368-5888) to more than 700. Small business people have also begun attending seminars on hazardous waste in record numbers, and there is greater willingness on the part of small business groups to work with EPA and contribute to the rulemaking process.

Will this be the end? No. Additional regulations for small quantity generators were published in the *Federal Register* on March 24, 1986, and will go into effect September 22, 1986. To maintain momentum will require further outreach. But now, EPA will be more experienced with small business and have a better handle on answering those tough "how to" questions. □

Steve Delaney

Vehicle maintenance operations such as this bus repair garage may produce small quantities of hazardous waste and come under the new RCRA regulations.

Making RCRA Stick

by Jacqueline Tenusak

If breaking in a pair of hiking boots can be painful, try breaking in a costly new program. That can be excruciating.

EPA's RCRA enforcement program is now well broken-in, but its beginning was no exception to the adage, "No pain, no gain." With industry waiting to take its cue, the Agency conducted its first enforcement "sweep" in 1980 to monitor compliance with the new hazardous waste regulations. Many of the inspectors had to be pulled from other EPA programs. Most of them had only just read the regulations they were supposed to enforce, and guidance was extremely limited. But the effort paid off; the Agency made its point. Serious enforcement was here to stay.

Since that time, monitoring and enforcement has become a sophisticated, integrated process. It has to be. Intended as a cradle-to-grave management system for hazardous waste, RCRA is one of the most complicated regulatory programs in the government.

One of RCRA's major components is the permit program for treatment, storage, and disposal facilities. To receive a final permit, a facility must demonstrate that it meets stringent final operating requirements, including double liners and a leachate collection system for some kinds of land disposal systems. It's these land systems—about 1,500 of them—that have become the focus of EPA's RCRA enforcement activities.

Land disposal systems include landfills, land treatment, surface impoundments, waste piles, and certain disposal wells. Ninety-five percent of land systems are associated with industrial operations; the remaining five percent are the so-called commercial, or off-site, facilities. RCRA legislation allows existing facilities a qualified "grandfathering" known as interim status until their permit applications are resolved. But even interim status facilities have to comply with requirements to monitor ground water and ensure their financial ability to close down operations properly.

The monitoring rules require that hazardous waste facilities install systems to detect leakage to ground water from land disposal units. If leaks are found, the facilities must install systems to track and characterize the contaminants. Under the financial assurance requirements, facilities must also prove that they have the financial capability to continue monitoring those wastes that may remain after closure. In addition, firms owning hazardous waste facilities must have liability insurance covering bodily injury and property damage to third parties caused by sudden and non-sudden accidental occurrences arising from facility operations.

RCRA is one of the most complicated regulatory programs in the government.

By 1984, however, only seven of the 1,500 land systems had received final permits, and a little under 200 were going through closure proceedings. The rest were in interim status, and a Congressional survey found that only 43 percent of them were complying with the ground-water monitoring requirements. The permitting process was taking considerably longer than originally envisioned.

Congress lost patience. The Hazardous and Solid Waste Amendments of 1984 included a provision for what EPA now calls "loss of interim status." Facilities were given one year—until November 8, 1985—either to certify that they were in compliance with interim requirements and apply for a final permit, or to begin closure proceedings.

The effects of this provision were immediate. Since the November cutoff, a resounding two-thirds of land disposal facilities have lost their interim status, either because they could not certify compliance with requirements, or because they chose to close rather than comply with new and more stringent requirements to be imposed over the next two years.

Most of the closing facilities are disposal units for small, on-site manufacturing firms that may now store their wastes for no more than 90 days. After that, they must treat or recycle the waste on-site or ship it to a commercial or off-site facility.

The overwhelming majority of these firms will remain in business, but because their disposal units are closing down, they must still be inspected to determine whether their ground-water monitoring system adequately detects contamination. Many will require corrective action—a process that can range from removing a few tanks to conducting a major Superfund-type cleanup to bring waste releases under control so that they no longer create a potentially dangerous situation for the surrounding community.

It's a tremendous challenge for the Agency to inspect and clear these facilities before they leave the RCRA system. Their compliance with monitoring and financial responsibility requirements as of November 8 must be verified, and their closure plans reviewed. EPA must also make sure that those who lost their interim status do not continue to use their disposal units for hazardous waste.

The challenge posed by those facilities remaining in the system will be just as great. The new requirements are stringent and demanding. There are extensive technical standards, and many of the remaining facilities will also need to take corrective action.

It's up to EPA's permitting and enforcement teams to shepherd these facilities through the process—monitoring compliance and using enforcement authorities if necessary, but also providing advice and assistance. Congress wants far better compliance with RCRA regulations, and so do those who work in the hazardous waste program. It will be difficult, but the first steps have been taken. □

(Tenusak is an Environmental Protection Specialist in the EPA Office of Waste Programs Enforcement.)

RCRA's Challenge: A View from the Outside

by Richard Fortuna

"Human kind cannot bear very much reality," said T. S. Eliot, and the reality of hazardous waste is no exception. But, in the 1984 amendments to the Resource Conservation and Recovery Act (RCRA), we have finally begun to face the grim fact that without change, the RCRA program itself could be the leading cause of future Superfund sites. The 1984 amendments challenge EPA, the regulated community, and the nation as a whole to institute the most profound series of changes in hazardous waste policy and practices that this or any nation has ever attempted.

It was in the late 1950s when the nation began to realize that post-war progress carried a price. Spurred by fires on the Cuyahoga River, the near death of Lake Erie, and smog-obscured skylines, the U.S. Congress enacted landmark legislation to control air and water pollution. The nation can be justifiably proud of this accomplishment.

But while measures to protect air and water have begun to mature, threats to the land and its ground-water resources are only now becoming understood. Despite passage of RCRA in 1976, the field of hazardous waste had little of the ingenuity and technology-forcing legislation that were brought to bear on air and water pollution.

The consequences of not closing this environmental loop are no less sobering than the dead fish I recall seeing on the shores of Lake Erie in 1958. Love Canal and the Valley of the Drums are but the most visible manifestations of our collective failure to control hazardous wastes and protect the media that we see the least.

The origins of the 1984 Congressional action are many. More waste, generators, and facilities were exempt than subject to RCRA control, and many wastes, including dioxin, were not listed as hazardous. "Recycling" was so broadly defined as to exempt virtually any reuse of a hazardous waste, including such activities as spreading oily hazardous waste on roads to control dust (Times Beach, MO).

In addition, some firms engaged in "plume gerrymandering," seeking RCRA permits for the non-leaking units at their facilities while shifting the cleanup for leaking units to an already overburdened Superfund program. Sewer disposal and evaporative emissions were hardly controlled.

For all of us, the real challenge will be to accept in practice what we know in theory needs to be done.

Finally, we learned that over 80 percent of the nation's 250 million tons of hazardous wastes were being disposed of on land by the very methods that created most of our Superfund sites. Up to this point, we have learned more about the scope and severity of the problem than we have witnessed solutions to them.

The RCRA reauthorization process, which began in January 1982 with the introduction of H.R. 6307 in the 97th Congress, taught us something about the hazardous waste industry and the marketplace realities of solving these problems. We learned the hard way that there is no free lunch in the management of hazardous waste; hazardous wastes are like water running downhill—disposed of or managed along the path of least cost or least regulatory control. We cannot separate the desire for increased protection from the increased costs of permanent treatment practices. Technologies cannot compete against unrestricted land disposal practices when costs alone dictate choices and the lack of proper regulation indirectly subsidizes the status quo.

During the reauthorization process, we discovered that RCRA's problems had far more to do with deficiencies in the statute, and the enormous scale of the problem, than with the personalities involved. No administration, no matter how well-intentioned, could institute solutions without changes in the statute and the unambiguous support of Congress.

The RCRA amendments represent the most significant rewrite of any environmental law—a rewrite that took three years and was driven by unanimous recognition of the need for change in both national policy and the structure of the regulatory process itself.

In addition to redressing gaps in cross-media coverage and closing the many loopholes for small generators, recycling practices, and waste listing/delisting activities, the 1984 amendments instituted provisions to restrict land disposal, establish minimum technology requirements for waste facilities, and require cleanups for all ongoing waste releases at all facilities as a condition of receiving a final permit.

Collectively, these provisions chart a new, more proscriptive course that puts wind into the sails of a program and a statute prone to excessive tacking. They mark an end to the beginning of the RCRA program, by establishing the beginning of the end for unrestricted land disposal.

The heart of the 1984 amendments is their approach to the decision-making process for these new initiatives. The amendments establish a presumptive prohibition against the land disposal of all hazardous wastes, and support this presumption with a statutory set of minimum controls. If the Agency does not act to selectively override the presumption for given wastes, a self-implementing total prohibition (or "hammer") goes into effect.

While it may not be readily apparent, this decision-making structure is not intended to punish the Agency, but rather to assist it in playing catch-up on the backlog of overdue decisions that lie before it. It also reflects the view that unstructured, unlimited discretion had become its own worst enemy; too much was as bad as too little.

Rather than force EPA to specifically justify each restriction under a generally permissive scheme, the structure allows it to focus on specific exceptions to a

(Fortuna is Executive Director of the Hazardous Waste Treatment Council. He helped develop many of the key amendments in the reauthorization of the Resource Conservation and Recovery Act while working as a Congressional staffer.)

Automated decanting systems such as this extract hazardous liquids from drums prior to treatment.

general prohibition. In many ways, land disposal is now presumptively guilty until proven innocent. The regulated community knows that unless it provides the Agency with good faith assistance in developing a regulation, it will have to live with a general rule that has no exceptions, legitimate or otherwise.

If the presumptive prohibitions and minimum regulatory controls (or hammers) are the heart of the 1984 changes in RCRA, then the soul is the search for certainty—certainty that future generations will not have to bear the burden of current expedience, and certainty that the transition to treatment alternatives will occur on a timely and orderly basis.

Despite the tight deadlines, the Agency has responded to these challenges with productivity unparalleled in the program's history. In 12 months, EPA has issued a land disposal schedule and ban, ended temporary de-listings and related protocols, and prepared new waste listings and new controls on hazardous waste tanks, recycling generally, and the burning of hazardous wastes.

A program that could never meet its statutory deadlines is now hitting more than it misses. This new record of accomplishment is no coincidence, and is directly attributable to the decision-making structure of the 1984 amendments.

Despite these auspicious beginnings, many challenges lie ahead. The Agency and the states must be able to summon the resources necessary for independent regulatory development and enforcement. In addition, closing loopholes and restricting land disposal are only part of the job. Unless the limits of land disposal are understood by all, and unless the permit policy can adapt to the restrictions and program expansion, we may well be all dressed up with no place to go. For generators and the treatment industry, the challenges will be similar—to assist the Agency by providing information necessary to define the limits of the land disposal restrictions, and to make timely investments in the technology of transition even when one may not be convinced such change is absolutely required. The benefit of the doubt must go to permanence rather than perpetuation of the status quo.

For the environmental community, the challenges will be to ensure that the aims of the legislation are realized in the implementing regulations. Environmentalists, however, must recognize that the current permit process can actually impede the transition away from land disposal.

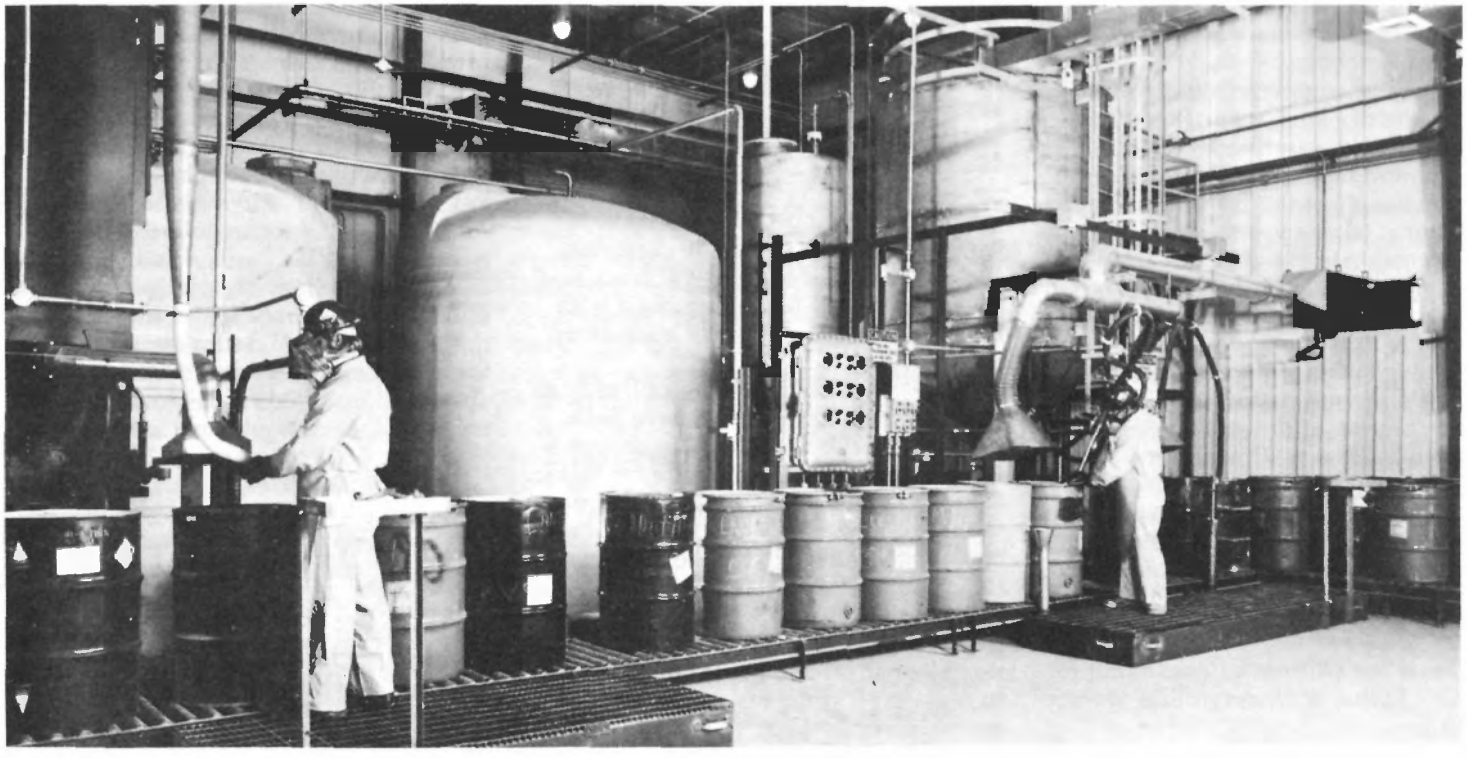
Every day, new investments and expansions are occurring and treatment needs are defined. But where land disposal is a one-step process, treatment frequently requires multiple steps, and different steps for different wastes. Restrictions on land disposal will not translate into acceptable treatment unless the permit process adapts to the transition under way. The pace of permitting is one problem; even more important is that the final permit process be flexible enough to meet the evolving and dynamic needs brought about by the new amendments.

For all of us, the real challenge will be to accept in practice what we know in theory needs to be done. Most people agree that we must move away from land disposal and use alternative forms of treatment. This philosophy, which the Hazardous Waste Treatment Council was founded on, is now the axiom of this field. But when it comes to implementing specific provisions of the legislation, consensus vanishes.

Even so, this diversity of views is a healthy sign that the program has finally come of age.

We must collectively acknowledge that the 1984 amendments are not just a repackaging of previous policies, and at the same time, that land disposal does have a role. In implementing this law and its land disposal prohibitions, we cannot forget the reasons for its enactment, or the practical limitations of conducting and "permitting" this transition.

Mutual recognition of these facts, punctuated by a high level of participation, should yield at long last a national program that is second to none, one to which we can point with pride, rather than look back to with chagrin. □



Chemical Waste Management

Tackling Pollution from Underground Storage Tanks

by June Taylor

With the temperature at 2 degrees and a wind chill of 20 below, a high school student starts his before-school job—opening a service station in Winona, MN. In the pitch black morning, he chips away two inches of ice before removing a metal plate and dropping a 15-foot pole into one of four underground tanks storing gasoline at the station. The measurements he takes will be compared to those taken by his boss before closing the previous night. At this station and thousands of others like it across the country, those numbers are the only clue telling the station owner if his tanks are leaking.

Thousands of tanks are thought to be leaking, with more leaks expected to develop in the next five to ten years.

In an era of computerized gasoline pumps, the dip stick may seem a crude way to measure gasoline left in an underground tank. It is. Temperature fluctuations affect the level of gas in the tank, and it takes several weeks of measurements to show losses. Even then, small leaks probably won't be detected. But despite its flaws, the dip stick is the only method of inventory control available for over 95 percent of America's service stations. It's cheap and any worker at the station can use it, but the diligence with which it's practiced is questionable.

Storage tanks were originally placed underground as a fire prevention measure, and underground tanks have substantially reduced the damages from stored flammable liquids. But out of sight leaks from underground tanks pose a longer term problem, sometimes causing fires and explosions and polluting soils and underground water.

The picturesque little Cape Cod community of Truro, MA, for example, discovered that its drinking water wells were contaminated with gasoline from a nearby underground storage tank. The company responsible was ordered to provide residents with bottled water and to spend millions of dollars to decontaminate the water supply. Across the country in the "Silicon Valley" south of San Francisco, leaks and spills of toxic solvents from underground tanks and their associated piping have contaminated the ground water.

EPA estimates there are from three to five million underground tanks in the United States that contain petroleum products or hazardous chemicals. Thousands of these tanks are thought to be leaking, with more leaks expected to develop in the next five to ten years.

Perhaps 90 percent of underground tanks are for petroleum. Many were installed in the boom period of the 1950s, when gas stations seemed to pop up at almost every intersection. Unfortunately, most of those tanks are bare steel, highly subject to corrosion, and at the end of their useful lives. (Even now, steel tanks improved with fiberglass coatings are only guaranteed for 30 years.)

When these old tanks are pulled from the ground, many of them have holes right where the dip stick was dropped hundreds of times to measure for leaks. (Since the late 1970s, most steel and fiberglass tanks have an extra half-inch steel plate under the test hole to prevent this problem.)

Because of the problems with older tanks and the liability posed by leaks, many major oil companies have begun to replace all company tanks with newer, safer designs.

Replacement is easier for the majors with their large financial resources and ability to command quantity discounts in ordering tanks. (Majors control about one third of all gas stations.) But for the smaller independents, the $10,000 to $22,000 expenditure for a new 10,000 gallon tank is onerous, especially considering that most stations have three to four underground tanks.

Leaks from underground tanks pose a longer term problem, sometimes causing fires and explosions, and polluting soils and underground water.

In addition to the problem of old tanks still in use, there is still the dilemma of thousands of gas stations that closed during the oil crises of the 1970s. The abandoned tanks at these stations may not have been closed properly, and ownership and responsibility for future problems may be hard to track.

A year and a half ago, Congress enacted sweeping amendments to the Resource Conservation and Recovery Act (RCRA), the law regulating hazardous wastes. The amendments provide for federal regulation of underground storage tanks, including the imposition of interim requirements for design and corrosion protection for any tanks installed in the ground. In the meantime, EPA is developing standards

(Taylor is the Outreach Coordinator for the EPA Office of Underground Storage Tanks.)

Providence Journal

Leaks from an underground tank at this gas station in Truro, MA, contaminated the town's drinking water. The company responsible for the problem built a charcoal filtration tank system, far right, to treat the water.

for new tanks, as well as regulations for record keeping, leak detection and leak prevention, closure, and reporting. These rules will take effect in 1987 and 1988.

To enable state agencies to locate underground tanks, the law requires owners to file basic information about age, size, location, and contents of their tanks. These forms must be filed by May 8, 1986, or owners face a penalty of $10,000 per tank. Tanks for residential home heating oil and small farm tanks (1,100 gallons and under) are excluded from the legislation. EPA expects the new amendments to cover about one million tanks.

Some states, notably Florida, Rhode Island, and California, have moved ahead of the federal government in registering and regulating underground tanks. But most other states are simply struggling to keep up with the federal provisions; if they fail to do so, EPA is required to enforce the law in their stead.

A key concern for EPA is assuring adequate state and local programs to address the tank problem. Clearly, a small (or big) staff in Washington and EPA regional offices cannot deal with the millions of tanks scattered throughout the United States. This is in many ways a local problem. City and county personnel now authorize the installation of new tanks. Fire departments, building and plumbing codes, and health departments also play roles in various communities—roles that will no doubt expand in the future.

Both EPA and the states are grappling with the new problem of communicating with the thousands of small businesses—principally gas station owners—who now find themselves subject to regulation. It's one thing to regulate a steel mill, chemical plant, or power plant whose staff includes trained environmental engineers. It's quite another to deal with small businesses that feel overburdened by paperwork and threatened by the potential costs of leak detection and prevention as well as by the liability implications of leaks. And finally, whatever system EPA chooses for leak detection, prevention, record keeping, reporting, and the like, it has to be understandable and "do-able" by a high school student in the freezing cold and dark of a Minnesota winter morning. Otherwise, it may look good on paper, but it won't work in the real world—and that's where the leaks are. □

EPA's Task Force on Hazardous Waste in Ground Water

by Antoinette Ferrara

It's 5:30 a.m. In anticipation of the day's heat, the Hazardous Waste Ground Water Task Force members and contractors have risen early. After a quick breakfast, they clamber into the EPA van, already packed with their safety equipment. At 6:30, the van joins a lineup at the entrance to the waste disposal facility. Ahead, there must be 40 trucks, all waiting to discharge their payloads into the facility's pug mills (mixing devices) and landfills. Many of the truckloads were picked up within the week at a Superfund site two or three states away. Their payloads are toxic wastes—noxious, and hazardous to human life.

The trucks have come to this particular facility as part of an elaborate, long-term plan for removing such wastes from an NPL (National Priorities List) site and transferring them to safe depositories.

But the question asked more and more frequently these days is—are facilities such as this one *really* safe? Is it possible that all we're doing is creating new Superfund sites? Well, most of such facilities are not in heavily populated areas, and unlike untreated Superfund sites, they have safeguards and expensive infrastructures in place to guard against unknowing exposure to the toxic wastes. Yet, the suspicion is growing within the environmental and scientific community that ground water, one of our nation's most valuable resources, is being threatened by the "safe" disposal of toxic wastes.

Ground-water supplies are increasingly important for drinking and agricultural purposes. Once polluted, they can be cleaned up only at phenomenal expense, and with little guarantee of success.

(Ferrara is Communications Advisor to EPA's Hazardous Waste Ground Water Task Force.)

The Resource Conservation and Recovery Act (RCRA) provides the legal framework for requiring waste disposal facilities to guard against ground-water contamination. Its implementation is primarily the responsibility of the authorized states, which are directed by the law to develop programs "substantially equivalent" to that of the federal government.

But "substantially equivalent" has turned out to mean a lot of different things to different people. The result has been varying degrees of ground-water monitoring compliance.

To encourage more consistency in handling ground-water problems, the EPA Hazardous Waste Ground Water Task Force was formed in January 1985. Composed of personnel from headquarters, regions, states, and the National Enforcement Investigations Center (NEIC), the Task Force now is expected to investigate 58 land disposal facilities (both commercial and generator-owned) in the course of its existence.

The team's goals are to examine facilities to determine their compliance with RCRA regulations; to identify problems which inhibit state and EPA efforts to gain compliance with the law; to develop and demonstrate a nationally consistent approach to evaluating ground-water monitoring at facilities across the country; and to deal with deficiencies that may be found.

The Task Force team heads first to the main office, where a meeting with the plant's supervisory team is scheduled. Together the group will go over some of the facility's records, negotiate technical support expected from the facility, and finalize the week's schedule for taking samples and interviewing company officials.

Prior to this day, members of the Task Force had received and reviewed numerous documents submitted by the facility, including its Part B permit application, all finished hydrogeological reports, and a history of any federal,

state or local enforcement actions in which the facility was involved. Additionally, they will have visited the office to peruse the company's files and request any other necessary data. That review formed the basis of the project plan for this present investigation, having allowed the team to spot potential weaknesses and lapses in compliance ahead of time.

Since only two weeks in the Task Force's busy schedule are allocated for the on-site inspection and sampling, the members must be thoroughly familiar with the facility and, in short, "have their act together." This inspection will require an all out effort involving hard physical work from the Task Force each day, as well as a nightly debriefing, and discussions of individual observations and the next day's plan.

Most waste disposal facilities are large. This one is no exception: 200 acres will be covered (many of them on foot); from 25 to 30 monitoring wells will be purged and sampled. Additional sampling sites include leachate sumps and surface-water discharge points.

It's hot, too! With the temperature in the 100s, the TYVEX suit, boots, and double-lined gloves each team member must wear as protection makes for an arduous, not to mention perspiration-soaked, ordeal. There's little or no shade out there among the disposal pools and landfills. Breaks for a drink of water—allowed only within the confines of the team's vehicle—are frequent.

First, the purging of wells begins. Depending on the depth of a well, this can take up to two days to complete, and another day and a half may be required for the well to "recover" (refill).

Then, the sampling gets under way, and this consists of several laborious steps. As the samples are drawn, they are transferred into 60 millimeter or 1 liter bottles which are labeled and packed into ice-filled coolers. Three or four coolers are needed for the approximately 60-70 samples from each well. These are carefully sealed with custody tape and prepared for overnight shipment to the analytical laboratories.

A suspicion is growing that ground water is being threatened by the "safe" disposal of toxic wastes.

In addition to the field investigators, the Task Force also includes members who are thinking about the overall condition of ground-water monitoring in the country, based on information from the field. Their analysis is expected to provide the states, regions, and facilities with clear guidelines for improving ground-water monitoring capabilities. They identify and analyze problems that could be caused by deficient guidance or regulations, uneven enforcement, or inadequate training or technology.

Next step: samples taken at the facility are shipped to the contract laboratory for analysis. Care is taken to ensure the chain of custody is unbroken in case the samples might later be needed as evidence in a court proceeding. Likewise, when the lab is finished with its work, care will be exercised to ensure the integrity of the analysis. Quality assurance and quality control studies are performed by a number of scientists in EPA. If the lab analysis proves valid, then and only then will conclusions be drawn about the quality of the ground water tested. These conclusions will be determined in consensus meetings involving the headquarters, state, NEIC, and regional members of the Task Force, and will form the core of the subsequent technical report.

While the Task Force may spend only two weeks and a few days on the grounds of a facility, the complete investigation takes close to nine months. At the conclusion, a final report is issued. This contains the technical report and Task Force recommendations for improving any deficiencies that have come to light. The remedies can range from changes in a permit application, to corrective or enforcement actions, to an actual shutdown. The option required to bring the facility into line with RCRA regulations is arrived at through consensus by all Task Force members, and will be spelled out in this final report. As of March, 1986, the Task Force had completed site inspections at 15 facilities, and records reviews at six others. The first technical report/facility management plan was expected to be released at the end of March. As this is written, it is too early to tell what those reports will say about the state of ground water near those facilities investigated. However, a critical tenet of Task Force procedure is that if, during the course of an investigation, severe, health-affecting contamination is discovered, there will be no waiting for the final report to be compiled—rather, immediate steps will be taken to ensure the health and safety of anyone potentially affected.

The inspection is finally completed. One last meeting with company officials is held. The Task Force team thanks the officials for their cooperation and explains the investigation phases still to come which will culminate in a final report. Then, it's probably off to the nearest watering hole to relax and swap tales of heat and fumes and hard work. □

On a Task Force inspection in Oregon, contractors transfer blank (clean) water from a bailer inside a storage container to a sample collection bottle. If subsequent lab analysis shows hazardous waste constituents in the water, inspectors will know that the sampling equipment is contaminated.

Update

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

AIR

Emissions Rule

EPA has proposed national work practice standards to limit radon-222 emissions from mill tailings at licensed uranium mill sites.

The Agency has made a preliminary finding that these emissions from uranium mill tailings cause a significant public health risk. The proposed rule is intended to reduce this risk.

There are 26 licensed uranium mills in the United States located in seven states: Colorado, New Mexico, South Dakota, Texas, Utah, Washington, and Wyoming.

Lead Violations

Ashland Oil, Inc., has agreed to pay $600,000 in civil penalties for exceeding federal gasoline lead content standards. The penalty amount is the largest ever received in settlement of a case involving violation of EPA fuels regulations.

The penalty agreement settles a suit brought against Ashland by the Department of Justice last May in the U.S. District Court in Kentucky after an attempted settlement of Agency administrative charges failed.

ENFORCEMENT

Aerojet Settlement

EPA and the State of California have signed a settlement agreement with Aerojet General Corp. and its subsidiary, Cordova Chemical Co., for a comprehensive investigation and cleanup of ground-water and soil contamination at Aerojet's manufacturing facility in Rancho Cordova, CA. The settlement could be worth up to $82 million, depending on the selection of the ultimate cleanup remedy.

The decree includes a $45 million financial guarantee to ensure that cleanup funds are available. Aerojet will also make payments of up to $7.15 million directly to the federal government and the state which includes reimbursement of past investigative costs and approximately $2.5 million for oversight of future work.

The Aerojet facility, classified by the state as one of its most severe hazardous waste sites, has been on EPA's National Priorities List under the federal Superfund program since the publication of the first national list in December 1982.

Appointments

EPA Administrator Lee M. Thomas recently announced the reassignment of ten senior executives as part of an ongoing management program designed to bring greater cross-media perspectives to EPA's decision-making and to build agency-wide experience in the senior management team.

The assignments were to become effective late March or early April.

Bruce Barkley, who was a member of the Senior Executive Service (SES) at the Department of Transportation (DOT), has been selected as Director of the EPA Office of Management Systems and Evaluation (OMSE). Most recently, he was Director of Management Planning in the Office of the Secretary at DOT.

Irwin Baumel, who has been Director of the Health and Environmental Review Division, Office of Toxic Substances, was named Director, Office of Regulatory Support in the Office of Research and Development (ORD). He brings to this position considerable government management experience in the area of regulatory science policy.

Thomas Devine, currently the Director, Waste Management Division, Region 4, will become Director, Office of Policy, Budget, and Program Management in the Office of Solid Waste and Emergency Response (OSWER). Aided by his broad experience, he will undertake an extensive review of the organization of the Assistant Administrator's office and the rest of OSWER, with emphasis on the provision of planning and technology support.

James Falco, who has been Director of the Exposure Assessment Group in ORD, will become the Director of the Office of Environmental Processes and Effects Research. His scientific and field experience in dealing with multi-media exposure assessments will be instrumental in leading an office whose principal responsibility encompasses advancing the state of the art in environmental risk assessment.

Gordon Hueter and **Francis Mayo** will assume the additional responsibilities of Designated Senior ORD Officials in Research Triangle Park (RTP) and Cincinnati, respectively. Hueter currently is Director of EPA's Health Effects Research Laboratory at RTP and Mayo is Director of the Agency's Water Engineering Research Laboratory in Cincinnati.

Thomas Hauser has assumed the position of Director of the Hazardous Waste Engineering Lab in Cincinnati for the Office of Research and Development. He was previously Director of ORD's Environmental Monitoring Lab at RTP. He will apply his 30 years of scientific and management experience in air pollution measurement and monitoring to seeking solutions to hazardous waste disposal.

Clarence Mahan will become the Director of the Office of Research Program Management in ORD. Previously he held the position of Associate Comptroller in the Office of the Comptroller in the Office of Administration and Resources Management (OARM). He will bring with him substantial technical and managerial experience in budgeting, financial management systems, and procurement.

Peter Preuss, most recently the Director of the Office of Regulatory Support in ORD, will become the Director of the Office of Health and Environmental Assessment (OHEA). He has significant international, state government, and federal level experience in dealing with the interface of science and policy issues as they relate to health hazard assessment and risk assessment.

Samuel Rondberg will become the Associate Director for Managment, Planning, and Evaluation in the Office of Information Resources Management in OARM. He now holds the position of Director of the Office of Research Program Management in ORD. He has been with EPA since 1974, and has been one of the Agency's major supporters of integrating telecommunications, ADP, and related applications into a management framework. □

Standards for Fluoride

Final Revised Drinking Water Standards have been set by EPA for fluoride.

Agency actions include issuing a final Maximum Contaminant Level (MCL), amending an Interim MCL, and setting new requirements for monitoring and public notification at the local level. The MCL and Interim MCL are both set at a level of 4 milligrams of fluoride per liter. EPA also announced a Secondary Maximum Contaminant Level (SMCL) for fluoride of 2 milligrams per liter.

RMCLs and MCLs are required steps in the regulation process leading to primary drinking water standards that are enforceable by law. Secondary standards (SMCLs) deal with esthetics such as taste and odor and are not mandatory.

The action announced by EPA has no bearing on drinking water fluoridation, which is practiced in many communities that have very low levels of natural fluoride in their water supplies. It deals with communities that currently have water supplies with very high natural levels of fluoride.

Gene Alexander, Soil Conservation Service

"While measures to protect air and water are beginning to mature, the full nature and scope of the threats to. . .the land and its ground-water resources are only now being fully defined." — Richard Fortuna *(See story on page 18.)*