Proceedings of

THE FOURTH NATIONAL CONFERENCE ON WASTE EXCHANGE

Sponsored by:

Southeast Waste Exchange
South Carolina Department of Health
and Environmental Control
U.S. Environmental Protection Agency, Region IV

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TABLE OF CONTENTS

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The following Waste Exchanges and their managers formed the steering committee and are responsible for creating an action-packed agenda and helping the conference run smoothly:

Canadian Waste Materials Exchange:	Bob Laughlin
Great Lakes Regional Waste Exchange:	Bill Stough
Industrial Materials Exchange Service:	Margo Siekerka
Northeast Industrial Waste Exchange:	Lewis Cutler
Southern Waste Information Exchange:	Walter Banning
Western Waste Exchange:	Nicholas Hild

The "Welcome to Charleston Reception" was a great way to start the conference thanks to the sponsorship of Aqua-Tech, Inc., Groce Laboratories, Inc., and Waste Management, Inc.

We also owe a particular note of thanks to Virginia Brien who edited these proceedings by taping the conference and compiling information on speakers, presentations, and individual Waste Exchanges.

INTRODUCTION

Mary A. McDaniel
Director, Southeast Waste Exchange

Over the past decade, Waste Exchange has proved worthwhile for material generators and users. Its benefits include energy savings, inexpensive sources of raw materials, reduced disposal costs, and potential profits from the sale of surplus goods.

On March 3, 4 and 5, 1987 environmentalists, government and regulatory officials, company representatives, and waste exchange personnel gathered in Charleston, South Carolina for the Fourth National Conference on Waste Exchange. As each of these groups continues to explore its own ideas for safe, cost-effective waste management, cooperation continues to be the hallmark of the relationships built around waste exchange, not only between industries that find uses for each other's surplus materials, but among the Exchanges themselves.

The theme of this year's conference, "Identifying Markets for Industrial Waste and Surplus Materials," offered representatives from public and private, profit and non-profit sectors an opportunity to explore many issues affecting the growth and use of waste exchanges across North America. Topics for discussion included international issues, technological advances in recycling, economic concerns, marketing strategies, and changing governmental priorities and regulations.

As you review the conference proceedings, you will find information on these topics and updates of individual Waste Exchange activities. These should prove to be of particular interest, since the updates give an overview of projects being conducted by individual Waste Exchanges and chart their probable directions for the future.

According to conference evaluations, of the 176 conference participants, 60% came from business and industry, 12% were waste exchange personnel, 10% were affiliated with the Federal government, 10% were affiliated with State and County governments, and 8% represented other groups and professions, such as education, law, chambers of commerce, and environmental groups. A total of 33 states and provinces were represented at the conference.

Built on cooperation from the outset, North America's network of Waste Exchanges will continue to work together to encourage legislative reform, educate the public about alternatives to disposal, and broaden outreach to business and industry through education, research, and information services.

If you have any questions or comments, please contact Mary A. McDaniel, Director, Southeast Waste Exchange, Urban Institute, The University of North Carolina at Charlotte, Charlotte, NC 28223 or (704) 547-2307.

FEDERAL LEGISLATION AFFECTING WASTE EXCHANGE AND RECOVERY

James Scarbrough
Environmental Protection Agency, Region IV

U.S. regulation of hazardous waste began in the late 60's and early 70's when individual states began to pass solid waste laws. Federal legislation of hazardous wastes began in 1965 with the Solid Waste Disposal Act. After this act was amended in 1970, passage of the 1976 Resource Conservation and Recovery Act (RCRA) marked the next major change in Federal policy governing hazardous waste.

While there has been some emphasis on RCRA Subtitle D, most emphasis has been placed on Subtitle C or the Hazardous Waste regulatory program. Regions and States are busily implementing the basic hazardous waste regulatory scheme laid out in the regulations promulgated by the Agency in 1980-1982.

When Congress determined that progress on hazardous waste issues was proceeding too slow, it passed several amendments to RCRA in 1984. These included imposing the following deadlines for issuing permits:

Land disposal	November 1988
Incinterators	November 1989
Storage	November 1992

The Act also placed a number of additional requirements on the EPA, for example, Corrective Action 3004(u) 3008(h) and loss of interim status. While these requirements have increased the pressure on hazardous waste producers, they also promote resource conservation and recovery. One result of the new regulations has been a big drop in the number of companies seeking land disposal permits.

New legislation also has mandated a waste minimization initiative into the regulatory program. In a recent report to Congress on waste minimization, the Agency said that it is neither desirable nor practical to research, promulgate or enforce a major regulatory program outlining specific waste minimization standards over the next four to six years. Rather, the EPA recommended conducting outreach programs to support and enhance waste minimization.

In specific, the Agency said that it needs to develop an Agency policy statement; stipulate what constitutes waste minimization under the reporting and certifying requirement of the HSWA; provide more technical and information assistance to generators; and encourage voluntary waste minimization concepts within the review of new chemicals under TSCA Section 5.

In Fiscal Year 1987, the EPA is committed to the following goals:

- Develop non-binding guidance on what practices constitute waste minimization;
- Develop a new waste minimization biennial report form;
- Develop technology transfer documents from existing information;
- Develop a computerized waste minimization information/ data bank which is accessible by states and industry;
- Continue research and development on waste audits; and
- Incorporate waste minimization in TSCA premanufacturing notices.

In summary, we have come a long way in the last twenty years, but we still have a long way to go. The best way to protect the public health and environment is not to generate hazardous waste, but if you do generate it, treat, recycle, or destroy it to render it non-toxic.

IMPLEMENTING RECYCLING WITHIN THE REGULATIONS: REDUCING THE UNCERTAINTY OVER LIABILITY

John Adams Hodge I

Introduction

Recycling and the use of waste exchanges has the potential to assume a major role in the management of hazardous wastes. The economic cost associated with disposal of wastes is creating a greater market for the recycling, reprocessing, and exchange of solid and hazardous waste materials. When properly handled, waste exchange and recycling can reduce some of the volume of waste that is landfilled, incinerated, treated, or otherwise reduced to an unusable byproduct of the manufacturing process. Uncertainty over the issue of liability associated with improper disposal practices has inhibited many potential users from participation in waste exchange or in utilizing recycling options. Three major areas of liability associated with hazardous waste include liability to the government under the Resource Conservation and Recovery Act (RCRA: 42 U.S.C. 6901 et seq), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA: 42 U.S.C. 9601 et seq), and liability to the public at large from "toxic tort" lawsuits claiming injury from exposure to chemical substances. The current uncertainty over liability can be traced to a number of factors such as the rapidly evolving interpretation of RCRA and CERCLA through appellate court decisions, the technical nature of the RCRA regulatory system, the potential liability of a generator of hazardous waste for improper disposal of that generator's waste by third persons, and a lack of understanding as to the application of environmental laws toward the recycling industry.

In order to increase the level of participation in waste recycling and exchange programs, government and industry should act to reduce the uncertainty over potential liability and both should strive to create economic and legal incentives that would attract additional users toward waste exchange and recycling.

This paper does not in any way attempt to suggest that current RCRA, CERCLA, or civil tort laws should be changed, weakened, or otherwise altered in such a manner that would create additional environmental hazards or would terminate the rights of injured parties to pursue civil remedies.

DISCUSSION

During the Fiscal Year 1985-1986 the Piedmont Waste Exchange, now known as the Southeast Waste Exchange, conducted market surveys in North and South Carolina designed to increase the effectiveness of the waste exchange and to expand its services to potential users.2 In both states, some of the concerns expressed as most important were the question of legal liability, government regulations, and handling transportation costs. Industries regulated under RCRA expressed a greater

concern about liability than non RCRA regulated industries; nevertheless, opinions regarding the exact nature of liability were characterized as polarized. These surveys indicated that very few firms recycle their wastes, and that most waste is disposed of offsite rather than by recycling. Based upon the conclusions of the North Carolina and South Carolina market assessments, one may conclude that the uncertainty over liability constitutes a serious deterrent to many potential waste exchange participants. Generators of hazardous waste are particularly concerned that should they list and exchange their wastes, they could be subjected to liability under CERCLA should the party receiving these wastes dispose of the material improperly. In a statement to the Board of the Department of Health and Environmental Control, a representative of the South Carolina Chamber of Commerce expressed that its members are reluctant to use a waste exchange for fear of liability associated with handling of hazardous wastes once they leave their control. "Waste exchange has become a more common topic because of the costs and shortage of treatment and disposal. However, the liability the generator has for the waste that he produces cannot be handed over to the firm receiving the exchange waste. Few managers are willing to risk their careers and their corporation's assets when the permanent destruction of a risk is available".3

It is not surprising that RCRA regulated industries would have a greater concern over liability that non-RCRA regulated businesses. Those companies who have experience under RCRA realize the technical nature of the regulations, the high cost of compliance, and the exposure to civil penalty action and the additional costs of remedial action for violation of the regulations. Even when industry attempts in good faith to comply with RCRA, unintentional violations are still a realistic possibility. Thus the mind set of many RCRA regulated businesses is that of walking through a mine field of potential environmental violations.

Since the issue of liability is a nebulus deterrent to many potential users of the waste exchange concept, an effort must be made to understand the nature of liability associated with hazardous waste, and sufficient information must be available to businesses such that corporate managers may make intelligent decisions regarding the risk associated with waste exchange and recycling.

Three types of liability are often associated with the handling of hazardous waste: RCRA liability, CERCLA liability, and toxic tort liability. A very brief description of each is included below.

1. RCRA LIABILITY

RCRA liability for improper transportation storage, treatment and disposal (TSD) of hazardous waste generally takes the form of civil penalty actions imposed by the government, and on occasion citizens suits to abate "imminent hazards". RCRA was passed in 1976 and it was later amended again in 1978, 1980, and

1984. RCRA originally grew out of the Solid Waste Act of 1965. RCRA was designed to provide grants to states for the purpose of operating hazardous waste programs that were substantially similar to that mandated under the law. Most state hazardous waste laws parallel RCRA and design; however, other states have adopted requirements more stringent than that annunciated under the federal law. RCRA created a system for recording and following the movement of hazardous waste from its generation to the place of ultimate disposal. Through a system of manifests, waste regulated under RCRA is tracked from "cradle to grave". In addition, the Act also provides a detailed regulatory mechanism that is designed to prevent the escape of hazardous waste into the environment. Furthermore, RCRA set up a complex enforcement mechanism that is designed to assure compliance through a system of civil and criminal penalties, administrative review, and judicial review where appropriate.

RCRA defines hazardous waste as such due to its potential to harm human health and the environment or by some characteristic of toxicity, ignitability, corrosivity, or reactivity. Those entities regulated under RCRA are subjected to a very detailed permitting system. RCRA excludes from its definition of hazardous waste certain broad classes such as agricultural wastes, household wastes, drilling fluids, cement kiln dust waste, mining and mineral processing waste, radioactive waste, waste in irrigation return flows, domestic sewage waste, several other categories of exemptions. RCRA regulates the generators of hazardous wastes through a system of identification of waste, manifest requirements, labeling, and record keeping and reporting of hazardous waste activities. Generators also assume liability for improperly disposed waste or for imminent hazards. RCRA governs transporters of hazardous waste through a series of requirements regarding manifest, transportation requirements, and spill response measures to be taken in the event of an accident. EPA regulation of transporters is in addition to requirements imposed by the Department of Transportation. RCRA includes detailed regulation of facilities that treat, store, and dispose of hazardous waste. Through a series of regulations, a permitting system was created for the licensing of TSD Facilities. Standards are set for those facilities undergoing the licensing process. In addition, RCRA requires groundwater protection through a series of monitoring requirements and groundwater quality assessment plans where appropriate. TSD Facilities are required to have liability insurance for sudden and nonsudden releases into the environment, and financial mechanisms must be available for closure and post closure responsibilities once operation of the facility has ceased. RCRA imposes standards of performance for different types of TSD facilities such as land disposal, incinerators, ignitable and reactive wastes stored in containers or tanks, and underground storage tanks.

In addition to enforcement by state and federal agencies, RCRA also includes a citizen's suit provision (Section 7002) that allows citizens to bring an action to force the government to enforce a regulation, order, standard, condition, or to abate an eminent hazard.

Several areas of RCRA regulation directly affect those involved in recycling and waste exchange. Some of those areas are outlined below.

A. Determining which regulations apply depends upon whether the substances that are to be exchanged or recycled are solid waste or hazardous waste. The definitions of each are found at 40 CFR 261.2 and 40 CFR 261.3 respectively. Particularly, materials may be considered to be solid waste if they are recycled or accumulated, stored, or treated before recycling in a manner that constitutes disposal, burned for energy recovery under certain conditions, the materials are reclaimed, or if they are accumulated speculatively. Considerable interpretation exists in the definitions stated above.

B. Certain materials are not solid waste and are thus not governed under RCRA when they are recycled. Regulation 40 CFR 261.2 (e)(1) states that materials are not solid waste when they can be shown to be recycled by being; (1) used or reused as ingredients in an industrial process to make a product, provided the materials are not being reclaimed: (2) used or reused as effective substitutes for commercial products; or (3) are returned to the original process in which they are generated, without first being reclaimed. Certain exceptions to this regulation exist where recycling involves materials used in a manner that constitutes disposal or are used to produce products that are applied to the land, are burned for energy recovery, used to produce a fuel, or are accumulated speculatively for recycling, then such waste may in fact be considered to be a solid waste under the regulations.

C. If certain hazardous wastes are intended to be used, reused, recycled, or reclaimed, the wastes are subject to regulation 40 CFR 266 subparts C through G regarding standards for the handling of specific hazardous wastes and specific types of hazardous waste management facilities.

The basic approach that EPA has adopted for used, reused, recycled, or reclaimed materials is that such materials are regulated under RCRA unless EPA has decided to exempt that particular group.4 In short, recycled hazardous wastes are regulated under RCRA provisions governing generators, transporters, and TSD facilities unless they fall in one of the categories of waste that EPA has specifically exempted from regulation.5 Recycled materials are governed primarily under 40 CFR 266.

D. Many potential users of a waste exchange do not know what paperwork is required by state and federal regulators to avoid violations of RCRA in the transport and delivery of exchanged material. Since most managers have to make a choice as to whether a waste exchange could be a suitable business decision, subjection to an exhaustive review of the regulations will certainly inhibit use of a waste exchange option. The risk of a civil penalty action and violation also constitutes a risk that many managers would rather avoid.

In some cases where the state has the authority to run a hazardous waste program sponsored by the federal government under RCRA, dual enforcement capacities may exist. Depending upon the agreement between the state and federal government, the federal government may have oversight of state enforcement decisions, and the state and federal government may take independent enforcement actions against a regulated industry. Confusion may result from dual enforcement, thus confusion might occur regarding a party's responsibility to two regulatory agencies.

2. LIABILITY UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA OR SUPERFUND)

The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA); 42 USC 9601 et seq. imposes liability to the government for cleanup costs, response costs, and damages to natural resources on those persons who release or threaten to release hazardous substances into the environment. CERCLA or Superfund as it is more popularly known was passed in 1980 and was amended in 1986. CERCLA is the primary law that has been used by the Unites States EPA to clean up uncontrolled hazardous waste sites and to seek compensation from those parties who are adjudged to be liable under the Act.

Section 106 of the Superfund Act provides that the government may bring a lawsuit to obtain "appropriate relief" to abate an imminent and substantial endangerment to public health, welfare or the environment because of an actual or threatened release of a hazardous substance from a facility. Section 106 applies to response and cleanup of inactive hazardous waste sites as well as active hazardous waste sites. A strict liability standard exists under CERCLA that does not require proof of negligence. Furthermore, where multiple parties are involved as potentially liable entities, joint and several liability may be imposed for cleanup costs. Section 106 of Superfund authorizes the court to order responsible parties to undertake remedial action as well as to refrain from actions complained of by the government. After a period of time, if the responsible parties have not complied with a court order or an EPA Administrative Order, a civil penalty of up to Five Thousand Dollars per day may be imposed.

Section 107 of the Superfund Act imposes strict liability upon four groups of parties when attempts fail to have responsible parties sponsor cleanup of an uncontrolled waste site. Those classes of parties liable include:

(1) owners and operators of a facility including past owners and operators, innocent owner lessors, and lessees who sublease facilities to third persons. The courts have given great latitute to the definition of whether one is an owner or operator.

(2) Section 107 of CERCLA includes the generators of waste as potentially liable parties. Also included as generators are any persons who "arrange for disposal and treatment by another

person", those who owned or possessed a hazardous substance, those who " arrange with a transporter" for transport or "for disposal or treatment" of hazardous substances by any other person at a facility containing such hazardous substances. In one case the court held that a generator may be liable under Section 107 of CERCLA if the government can prove that (a) the generator's hazardous substances were at some point in the past shipped to the facility; (b) the generator's hazardous substances or hazardous substances unlike those of the generator were present at the site (during cleanup); (c) there was a release or threatened release of a hazardous substance at the site; (d) the release or threatened release caused the occurance of response costs.6

(3) Transportors may be liable under CERCLA when they are given discretion to select a disposal or treatment location by the waste generator. Generator liability cannot be contracted away, nor does generator liability cease when hazardous materials are given to a transporter.

(4) Finally, in some cases corporate officers have been found to be liable as individuals under CERCLA where a person owns an interest in a facility and is actively participating in its management.

Some cases interpreting CERCLA have held that a transfer of ownership of a generator's waste does not absolve the generator of liability.7 In another case a person who arranged for disposal or transportation for disposal of a hazardous substance was adjudged to be liable even though that person neither owned nor possessed the waste.8

Since CERCLA is a relatively new statute, appellate courts are still interpretating and refining the meaning of the law. One may infer from the previous discussion regarding CERCLA that the types of persons that may be liable include many different classes of actors and the interpretation of liability as joint and several means that any one party may be liable for the full amount of cleanup costs at a hazardous waste site. At many facilities the response costs can run into the millions of dollars.

For a party listing at a waste exchange, interpretation of Section 107 indicates that a company that sells a hazardous substance to another entity for a purpose other than disposal or treatment would not be liable under Superfund if the purchaser of the material disposes of the substance.9 For a lister of hazardous wastes, whether Superfund liability may exist revolves around the question of whether waste was transported offsite for some purpose other than disposal.

In order to accomplish cleanup of uncontrolled hazardous waste sites, CERCLA has been given broad application and has involved litigation against a broad group of parties alleged to be potentially responsible. Litigation is often times complex and expensive, and the liability can result in millions of dollars. Few companies are willing to turn their waste today

over to organizations to whom they are not familiar. Given the costs involved in defending a Superfund action, the conservative approach of American business dictates that it avoids many new ideas for managing its waste for fear that it may end up as a Superfund defendant.

Unfortunately, many of the early Superfund sites were formerly chemical recycling plants that were improperly managed. Because of the lessons that many companies learned when they were judged liable as generators of waste at these recycling facilities, one can understand the reason for avoiding legitimate recycling facilities or waste exchanges. As the law in CERCLA is more well defined and as the recycling facilities receive RCRA permits, many businesses may be inclined to realize the economic advantages of recyling and waste exchanges.

3. TOXIC TORT SUITS

Toxic Tort lawsuits involve private litigation that arises from the exposure of toxic substances to private citizens. The facts giving rise to these lawsuits vary but they generally include some sort of accidental spill or release of toxic chemical into the environment and a subsequent exposure to third parties. The lawsuits may involve such causes of action as common law nuisance, wrongful death from lethal exposure to chemicals or future risk of cancer. The perceived involvement and liability in toxic tort lawsuits is highly speculative and depends upon a number of facts and circumstances. Use of a waste exchange probably involves no more risk than use of any traditional means of treatment storage and disposal of hazardous waste. In fact, use of a waste exchange may involve less risk than traditional methods. Generally speaking, many toxic tort actions begin when a specific accident or chemical leak creates an awareness of the potential hazards of such hazards in the community. Other cases may involve a nonsudden chronic exposure to a substance or group of substances over time. Generators, transporters, or users of hazardous substances in the waste exchange or in the recycling industry may reduce their exposure to toxic tort litigation by employing effective employee training regarding the handling of waste and materials, by maintaining their equipment in good repair so as to avoid catastrophic failure of their equipment and by public education in the community to reduce the misrepresentation of the scope of the operations being conducted. In addition, activities that demonstrate that a facility that has a good environmental record and goes beyond the minimum requirements of regulatory agencies in protecting the environment will demonstrate to the public that the operation is a good public citizen.

Should one involved in a waste exchange or recycling business become involved in toxic tort litigation, these lawsuits are generally time consuming, complex, may involve multiple plaintiffs, take a long time to come to trial, and are always very expensive.

REDUCING THE UNCERTAINTY OVER LIABILITY

In order for waste exchanges to play a more significant role in the management of hazardous waste and for the recycling industry to assume a greater role in accepting wastes that were formerly disposed of, the uncertainty over liability must be reduced and incentives must be created to encourage additional users. Without changing existing laws, government and industry separately and together can take action that would encourage the use of waste exchanges and recycling. A number of general concepts briefly discussed below could be employed to involve more industry in the recycling and exchange process:

1. A government established policy that encourages the use of waste exchanges and recycling facilities would draw attention to the advantages of this industry. Creation of guidelines by state and federal agencies that outline and approve procedures and provide a checklist for participation in a waste exchange would explain the steps appropriate for exchange activities.

2. Creation of tax incentives that provide economic benefits for use of a waste exchange or a particular recycling process.

3. Regulators could establish a waste exchange permit system, or in the absence of a permit system, EPA or its state designee might require participation in a waste exchange or use of a recycling technology as a condition placed upon a RCRA or other related permit. Under both RCRA and CERCLA, federally permitted releases into the environment exempt parties from liability. If use of a waste exchange or a recycling process involved a release, compliance with a permit would provide the exchange or recycling users with insulation from CERCLA or RCRA liability. The key concept in using the existing permit system or creating a new system is that the permit condition requiring recycling or waste, exchange activity must be equivalent to a federally permitted release.

4. Establishment of an advisory office by state and federal regulatory agencies could provide real time letter opinions of an advisory nature that would interpret regulatory questions and desiminate technical assistance to waste exchange users. Such advisory opinions could be analogous to the letter opinions issued by the Internal Revenue Service for tax questions. While the letter opinions in the environmental field may not have the force of law and bind the agency interpretation of the law, these letter opinions could assist businesses and in particular smaller businesses in pursuing the waste exchange and recycling option. In the absence of a government sponsored advisory office, the private sector through trade groups and associations might consider forming an advisory counsel to provide its members with information regarding recycling and wastes exchanges. Quite possibly, a joint public/private sector initiative could accomplish the creation of an advisory system.

5. Regulatory agencies could grant "real time" variance to regulations where it can be demonstrated that the use of a waste exchange or a recycling facility is preferable to traditional means of disposal, and the additional risk to human health and

the environment is minimal. A good example of this situation would occur when a user and lister in a waste exchange need time to identify each other and to determine whether the waste material is in fact compatible for the user. In such cases, storage of the waste may need to be in excess of 90 days. In order to comply with the storage requirements under RCRA, an entity would need a permit for storage. If an entity can establish that storage of the waste may be in excess of 90 days for the purpose of determining compatibility for waste exchange, the regulatory agency could in some circumstances grant a variance for longer storage without requiring a permit. Obviously each variance would have to be considered on its own after considering all facts and circumstances.

6. Lastly, education of potential users in the waste exchange and recycling market as to the specific nature of the liability involved in participation will create a greater understanding of the real liabilities. It is apparent that the perceived risk of exposure to liability to the government and to third parties for improper management of hazardous waste has effectively chilled many potential users from involvement in the waste exchange and recyling industry. If fact could be separated from fiction, business will realize that many of the perceived liabilities associated with waste exchanges and recycling can be eliminated. As the cost of treatment and disposal of waste increase, the economic advantage of listing and using a waste exchange may be realized; nevertheless, the uncertainty created by liability issues regarding hazardous wastes must be reduced if this industry is to grow. If liability questions are not answered, the current perception regarding liability may offset the economic advantage afforded by waste exchanges and recycling companies.

FOOTNOTES

1. John Adams Hodge is an attorney in private practice in Columbia, South Carolina. He is a graduate of the University of South Carolina Law School, and also holds a Masters Degree in Marine Science/Geology from the University of South Carolina and a Bachelor of Science Degree from Duke University in Geology. He is a registered Professional Geologist in the state of North Carolina and formerly worked as counsel to the South Carolina Department of Health and Environmental Control. His law practice and consulting activities involve hazardous waste matters, environmental legal problems, and environmental geology. He is a member of the Natural Resources Section of the South Carolina Bar.

2. Piedmont Waste Exchange Annual Report, 1985-1986, pp.5-6.

3. Comments on the Proposed State Policy and Plan for Permitting of Hazardous Waste Management Facilities, statement by B.N. Buck, Chairman, Solid Waste Sub-Committee, South Carolina Chamber of Commerce Technical Committee, November 20, 1986.

4. So Fed Reg. 614 (1-4-85)

5. 40 CFR 261.6 (a)(1)
   40 CFR 261.6 (a)(2)

6. U. S. v. South Carolina Recycling and Disposal, Inc. (1984, D.C. S.C.) 20 ERC 1753; 14 ELR 20272.

7. U.S. v. Wade (1983, ED PA) 577 F Supp 1326, 20 ERC 1277, 14 ELR 20696

8. U.S. v. Mottolo (1984, DC NH) 22 ERC 1026, 14 ELR 20497; U.S. v. Northeastern Pharmacentical and Chemical Company, Inc. (1984, DC MO) 579 F Supp 823, 20 ERC 1401, 14 ELR 20212.

9. Stever, Law of Chemical Regulation of Hazardous Waste, p.6-104, Clark Boardman Company, Ltd. (1986)

TRADE AGREEMENTS WITH OTHER COUNTRIES IN INDUSTRIAL WASTES

Michael T. Kelley
Deputy Assistant Secretary for Basic Industries
U.S. Department of Commerce

It is a privilege to be with you today to discuss the future of resource recovery and waste management--and I include waste exchanges under the heading of "waste management". The future looks bright and should become even brighter, especially if market forces can be made to be more influential in increasing the recovery and recycling of used materials and products. But at present, such market forces are being constrained by several forces, including liability considerations.

This important economic trend towards resource recovery affects all U.S. manufacturing and service industries because all industries produce waste of one type or another. Even fast food restaurants use quantities of paper and plastic goods which are subsequently discarded. Resource recovery's effect is positive and will be a factor in improving the competitiveness of U.S. industry.

Our aim is to work with all segments of industry and government to foster this trend. Our basic approach is not to try to invent the wheel, but rather to seek guidance from other federal and state agencies, industry, and knowledgeable organizations such as the National Academy of Sciences (NAS) and the Office of Technology Assessment (OTA). We seek their advice about which already-invented wheels will make resource recovery and recycling "wheels" spin faster, longer and more efficiently.

Following this approach, we met with about 25 trade associations some months ago. We have also exchanged ideas with various federal executive agencies which have an interest in this topic, and with NAS and OTA. I will cover the major points of those meetings later, but will mention now that we intend to host a second meeting, presently planned for late spring, with appropriate trade associations and federal agencies.

My industry and government careers have been associated with many industries that have been in the forefront of resource recovery. From this first-hand experience, I am acutely aware of how the costs associated with the disposal of manufacturing wastes influence profitability and competitiveness. This awareness also extends to disposal costs of products, when their useful life is ended. From this experience, I have concluded that direct governmental intervention in the market place, however well-intentioned, is infrequently misplaced. An example of this is the energy crises of the 70's, caused by sharp increases in energy prices. Government controls on natural gas prices encouraged consumption, not conservation. On the other hand, industry responded with energy efficiency moves—a response to a "bottom line" issue. For instance, on the basis of usage in 1972 (the year preceding the first OPEC oil embargo), the chemical industry by 1985 had improved its energy efficiency by 36%, as a cost control measure.

There are some parallels between the escalating energy costs of the 70's and escalating waste disposal costs of the 80's. Again I cite the experience of the chemical industry. The Chemical Manufacturers Association (CMA) reports that hazardous waste generation among a sample of its members has been cut by 16% from 1981 to 1984, in response to escalating disposal costs. But there are also differing circumstances from which other parallels should be not drawn. For instance, in the short term view, the

energy crises and their consequences were brought about by circumstances and decisions outside of U.S. control--decisions made by OPEC. In the case of escalating waste disposal costs, the causes are internal to our nation, embodied in its disposal and liability laws, and presumably subject to change if the body politic is so inclined. One final point: more stringent (and therefore more costly) disposal methods presently used represent an attempt to avoid or minimize even larger future remedial costs, should present disposal methods later prove to be inadequate. I believe this observation has no parallel with the energy crises of the 70's.

Before continuing, let me define some of the terms I'll be using. Note that these aren't necessarily dictionary definitions, and are cast in the context of industrial and consumer activities dealing with solid wastes. Some of these terms are defined differently by others, but here's our starting point:

1). "Waste" is material without enough value to warrant recovery for any use and must be removed or disposed of. Usually disposal costs exceed any residual value in the waste.

2). "Waste management" is a method of controlling the collection, treatment, storage or disposal of wastes. Within this discussion, resource recovery is a method of waste management, as is "waste reduction," "waste elimination," or "waste exchange." The spectrum of waste management options available in a particular case could run from waste elimination (E.G., plant shutdown), through waste reduction (E.G., process changes), through waste exchange, through resource recovery (for irreducible amounts of wastes), to treatment, storage and disposal for wastes not suitable for resource recovery.

3). "Hazardous waste" is a waste that, because of its amount, concentration, or circumstances of disposal (or subsequent environmental release), presents a risk of injury to human health or the environment. An alternative definition is a waste that a regulatory agency such as the Environmental Protection Agency determines is hazardous. This is not meant as a trivial remark: an agency charged with protection of public health and welfare, environment, or worker safety should be conservative (but not unrealistically imaginative!) in determining "hazardous amounts, concentrations, or circumstances of disposal".

4). Having mentioned "risk of injury," we now need to distinguish between "hazard" and "risk." I take "hazard" to refer to the consequences of an event, and "risk" to refer to the probability of that event happening.

5). "Resource recovery" is a method of waste management in which one or more components of a mixture otherwise destined for disposal, is separated and recovered for it s material or energy values. I take this term fairly broadly, and include "recycling."

6). "Recycling" is one method of resource recovery and implies that the material is re-used in its same or purified form. In my definitions, burning of flammable wastes for heat recovery is not recycling but is resource recovery.

7)."Waste exchange" is a resource recovery method which brokers (i.e., seeks both buyers and/or sellers for others without taking title to any property) wastes for either recovery of some intrinsic value (such as acid values) or avoidance of or decrease in disposal costs.

I want to describe how the U.S. export rules work with respect to hazardous wastes, then turn to a broader topic, resource recovery, and commerce's interest in this topic.

Most of the public concern with the export of U.S.-generated waste is with hazardous wastes. Few, if any, alarms are raised when we learn that the number one export form our number one port, New York, is scrap iron and steel, or that our number two item is waste paper. But the term "hazardous waste" conjures in the minds of many in the general public, images of poisoned water supplies and the like. There is the general view that the U.S. should not export its hazardous waste to some technologically less developed nation that may not understand how such wastes should (or should not) be treated, stored or disposed of. Consequently there was widespread public support for this subject to be addressed when the U.S.'s basic hazardous waste law was amended in 1984, because the original law (the Resource Conservation and Recovery Act, or RCRA) did not cover this topic.

The Hazardous Waste Amendments of 1984 recognize the value of legitimate international trade in such wastes. For example, international shipment could lead to lower transportation costs. Resource recovery processes of a proprietary nature could be available in one country but not another, or one country may have more secure land disposal facilities because of unique geologic formations. At the same time, the law guards against exports which might result in inadequate or improper handling through lack of adequate information in the receiving country. Consequently, our statute requires notification to the intended receiving government of complete particulars as the way for that government to decide whether or not it is appropriate to receive such wastes. In fact, the statute specifically prohibits hazardous waste export in the absence of written consent from the intended receiving country. Moreover, the final regulations are compatible with the principles of the Organization for Economic Cooperation and Development (OECD) regarding the transport of hazardous materials.

Briefly, here are the major provisions. Complete details are given in the final regulations Federal Register notice of August 8, 1986.

1). At least 60 days prior to the first intended export of any U.S.-identified or -listed hazardous waste, the exporter must provide to the administrator of the U.S. Environmental Protection Agency (EPA) information which must include:

a) Name and address of the intended exporter;
b) Types and estimated quantities of hazardous waste intended to be exported;
c) Estimated frequency or rate of exports and the time period over which the wastes are intended to be exported;
d) Intended ports of entry;
e) Description of the intended manner of transport, treatment, storage or disposal in the disposal in the receiving country;
f) Name and address of the intended ultimate treatment, storage, or disposal facility in the receiving country.

2). After receiving the completed notification, the EPA administrator forwards the information to the secretary of state, who:

a) Forwards a copy of the notification to the government of the receiving country, as well as a description of regulations which would apply in the U.S. to the treatment, storage, and disposal of the particular hazardous waste,
b) Advises that U.S. law prohibits export of hazardous wastes, unless the intended receiving country consents to accept the wastes,
c) Requests the receiving government to provide written consent (or objection to the terms of notification) to the secretary of state.

3). EPA expects receiving country reply within about 30 days, but the statute prohibits export without written consent.

4). Within 30 days of receipt by the secretary of state of the receiving country's written consent or objection (or any subsequent withdrawal or modification of a prior consent or objection), the EPA administrator will forward such communication to the exporter. Exports may begin then, and a copy of the receiving country's consent (referred to as the "EPA acknowledgement of consent") must be attached to each shipment for export. A copy of the manifest signed by the receiving country's facility is returned to the U.S. exporter to confirm delivery of the hazardous waste to its intended destination.

5). By March of each year, the exporter must file with EPA a summary of types, quantities, frequency of shipment, and ultimate destination of all hazardous wastes exported during the preceding calendar year. Perhaps partly because the regulations were promulgated only last year, only a few notifications have been received by this date. However, the agency is set up to receive notification, and the bureau of the census has assigned a Standard Industrial Classification (SIC) code for "hazardous wastes" as defined by EPA's regulations implementing RCRA.

6). The law also provides for exceptions to these general rules in the case of bilateral agreements. For bilateral agreements, the only hazardous waste export requirements are for the export shipments to conform to the terms of the agreement, and for the shipper to provide the yearly summary of exports mentioned above. The U.S. has executed two bilateral agreements: with Canada in October 1986, and with Mexico in November 1986.

Since the final regulations and the bilateral agreements were put in place only late last year, the actual data of hazardous wastes imports and exports are sketchy, at best. In fact, the data we presently have deal only with one Canadian providence, Quebec, for the period August through October, 1986. From this information, we estimate that the U.S. exported about 14,500 tons of hazardous waste into, and imported about 60 tons from, Quebec. By next year, there should be much more information available.

I want to continue by outlining Commerce's interest in the broader subject of resource recovery. To understand the U.S. commitment to resource recovery, consider these facts:

> The U.S. manufacturing base (SIC 20-39) is restructuring, as the number of overseas manufacturing establishments and jobs continue to increase and produce products that compete with U.S. -made goods. U.S. idustries must become more efficient and innovative if we are to remain competitive in world markets. The president's program to improve our international competitiveness is a major step toward this objective.
>
> Virtually all of our manufacturing processes generate some wastes which must be disposed of at some costs--economic and/or environmental. There are particular concerns if hazardous wastes are involved, because of the public's perception of human health and environmental hazards.
>
> Consequently, there is strong public support for stringent (and

therefore costly) disposal laws and regulations for hazardous wastes. The liability and availability (or unavailability) of liability insurance associated with the generation, transport, and disposal of such wastes are also major contributors to disposal costs for many industries.

According to an EPA 1984 survey, over 14,000 installations generated over 264 million metric tons of RCRA-regulated hazardous waste in 1981. More recent data indicate this estimate could be significantly understated. However, the 1984 survey show that the manufacturing sectors (SIC 20-39) generated about 93% of this amount.

Within the manufacturing sectors, the chemical industry (SIC 28), with only 17% of the number of generators, accounted for 68% of all hazardous wastes; the metals-related industries (SIC 33-37) accounted for about 22%; the remaining 10% came from a variety of other industries, manufacturing and non-manufacturing. For the manufacturing sectors (SIC 20-39 but excluding SIC 23) the cost of pollution abatement (primarily for air, water, and solid waste including hazardous waste control) amounted to over $130 billion from 1973 to 1985.

Minimizing such wastes and associated costs is important to U.S. industries. To the extent waste disposal costs can be offset by recovery of resources from such waste, resource recovery helps decrease the cost of doing business and keeps U.S. industries more competitive. Recovered materials can be items of export in their own right, and U.S.-developed resource recovery technology may also be an item for export.

Resource recovery operations provide an alternative to illegal disposal. No one knows the extent of illegal disposal, but the Congressional Budget Office has stated that the little evidence at hand suggests that it is substantial. If most illegal disposals are also improper environmentally, such disposals represent a future public liability of undetermined magnitude. Thus, it is in the public interest to encourage the profitable operations of such facilities through timely selection of proper disposal sites and cost-effective regulation of their operations. Conclusion: Resource recovery is necessary as a cost-containment measure in industry. It is also an adjunct to environmental protection when resource recovery activities recycle a material back into products useful to society, if otherwise the disposal of that material could pose a risk of injury to public health or the environment.

Recycling of discarded lead-acid batteries to recover lead for re-manufacture into new batteries is an example. Such resource recovery is an alternative to disposal practices such as road-side abandonment or even legal landfill disposal, either of which would risk leaching lead into water supplies. Such water supplies, if used for drinking water, would be a public health hazard.

However, the notion of "resource recovery" implies that some "resources" are worth recovering in the economic sense, and this in turn implies that there is a market for such recovered "resources". The interrelationships among: (1) waste materials, (2) resource recovery, (3) markets for recovered materials and (4) the value of resource recovery to environmental protection were recognized well over 10 years ago by the congress when it passed the Resource Conservation and Recovery Act of 1976 (RCRA).

RCRA is an environmental law, and most of the responsibilities fall within the purview of the Environmental Protection Agency. But the Congress specifically charged the investigation of these interrelationships to the Secretary of Commerce. Specifically, RCRA directs the Secretary of Commerce, among other things, to:

> Encourage greater commercialization of proven resource recovery technology by developing accurate specifications of, and stimulating market development for, recovered materials; identify geographical location of existing or potential markets for recovered materials (obviously this includes export markets);
>
> Evaluate commercial feasibility of resource recovery facilities and publish results;
>
> Develop data base to assist proper selection of resource recovery systems.

Thus, RCRA provides the Secretary with a fairly broad charter for addressing resource recovery issues. About two years ago, the Secretary reassigned his RCRA duties from the National Bureau of Standards to the International Trade Administration, and in turn, to the basic industries sector, which I direct. In April, 1986, the Under Secretary for International Trade chaired a meeting of interested trade associations to discuss ideas of how the RCRA secretarial duties should be discharged. We have now meshed the excellent and constuctive ideas regarding resource recovery which were advanced at that meeting into the framework of other major departmental goals. Some of these are:

> To increase America's competitiveness in the world economy;
>
> To safeguard the national interest through effective administration of U.S. trade laws;
>
> To stimulate productivity and economic development;
>
> To improve the quality, scope, timeliness, and availability of departmental statistics and analysis;
>
> To manage effectively the nation's oceanic and atmospheric resources; and,
>
> To improve service delivery and internal management.

Then too, we must implement our resource recovery program being mindful of the budget constraints imposed by the Gramm-Rudman-Hollings law. Practically, this means that we must "piggyback" our resource recovery programs onto existing programs. Here are some ways we're doing this:

> As part of the administration's Caribbean Basin Initiative program, we can investigating the feasibility of exporting crumb rubber (made from discarded tires) to the Caribbean basin for possible re-manufacture into rubber goods for either local use or export. The world bank through its Caribbean project development facility has expressed interest in joining the department in such a project. We expect to have a notion of feasibility by late March.

We are investigating how the department's coal export program could be enhanced by promoting U.S. coal ash utilization technology. Some ideas are:

- oo Encouraging the U.S. Army Corps of Engineers, which oversees major construction projects for many "host" countries, to use U.S. coal ash technology, with either ash resulting from combustion of U.S. coal sold to the host country or host country coal ash, in host construction projects. Similar consultations with the American Consulting Engineers Council and the National Construction Association are planned.

- oo Investigating requiring foreign countries that have received advanced credits by the EX-IM bank for purchase of U.S. coal, to incorporate U.S. coal ash technology as an adjunct to their own construction projects, where appropriate.

We are studying the barriers to the recycling of certain nonferrous metals such as lead (from lead-acid batteries), and precious metals (from automobile catalytic converters) within the context of a study of the ferrous scrap industry. We expect to issue this report this spring.

We are planning a follow-up to the Under Secretary's trade association meeting which he chaired last year. At that meeting, several organizations stated their concern regarding regulatory actions which sometimes produced unintended, adverse results not considered or minimized by well-intentioned regulators prior to promulgation. Therefore, in addition to trade associations whose members are interested in resource recovery, we have also identified other agencies and their policymakers for participation. Our objective in hosting such a meeting, tentatively scheduled for late spring, is to avoid a future regulatory gridlock in which well-intended regulations or public policy produce perverse and contrary environmental and economic results, not to argue against protection of the public health and welfare and the environment. We believe the department can usefully act by providing a forum to discuss the avoidance of such a gridlock, especially if the discussion focuses on avoiding environmental contamination by using market forces to drive resource recovery and recycling of hazardous of materials.

Having discussed some of the reasons why the U.S. is committed to resource recovery and our present program, let me turn next to our thoughts of the future. There are two studies I especially call to your attention. The first report is the National Academy of Science (NAS) Management of Hazardous Industrial Wastes, Research and Development Needs. This report was published in 1983 and its general conclusions and recommendations are still valid today. These include:

> No new major and cost-effective technology exists or is likely to be developed that could be a panacea to dispose of all hazardous wastes.
>
> Disregarding cost, there exists some technology or combination of technologies capable of dealing with every hazardous waste so as to eliminate concern for future hazards. Therefore, periodically updated evaluation (including economics, availibility, state of commercial development) of each hazardous waste disposal technology is needed.
>
> The disposal of hazardous industrial wastes should be approached in a hierarchical fashion, first attempting to minimize waste production through process modification and recycling, next seeking to convert the waste to

nonhazardous or less hazardous forms, and finally making use of perpetual storage.

Satisfactory management of hazardous industrial wastes is inhibited by nontechnical as well as technical factors. These include public attitudes and misconceptions and the lack of assurance of long-term reliability and consistency in the management of waste.

Research on the utilization of the treatment and assimilative capacity of all phases of the global environment is justified.

The use of landfills should be minimized, since some landfilled constituents (for example, halogenated solvents) will very likely migrate over long time periods (100 years) into groundwater.

The second report is the Office of Technology Assessment's (OTA) Serious Reduction of Hazardous Waste, released in 1986. With its emphasis on reduction, it complements the conclusions and recommendations of the NAS report, which focuses on waste management. The OTA report opens a public discussion to consider how a nonregulatory program for waste reduction can be an adjunct to existing pollution control regulations. Such a concept might use, in part, the economic and market forces for resource recovery envisioned by the congress in crafting the Secretary's RCRA responsibilities. We intend to strengthen our liaison with OTA in this regard.

Many of the OTA findings and conclusions support the notions of resource recovery as a cost-containment practice, a spur to more efficient technological innovation, and thus, a market boost to U.S. industries' international competitiveness. The OTA report concludes:

By reducing waste generation, industry can use materials more efficiently, achieve more certain protection of health and environment while lowering waste management and regulatory compliance costs, liabilities, and risks.

The attention and resources required by industry for waste management activities (i.e., regulatory compliance) limit the thought, time, and other resources that industry can devote to waste reduction. With federal leadership and assistance, however, the U.S. could move to an economically sensible environmental protection strategy based on both pollution control (waste management) and pollution prevention (waste reduction). Specifically, the U.S. should:

- Develop a federal policy of education and oversight to illustrate publicly that waste reduction is not some unique technology, but an existing body of engineering and management techniques now ready for innovative application.

- Initiate limited federal legislative actions to define waste reduction, collect better information, and encourage waste reduction through programs such as technology transfer of generic waste reduction techniques and concessions for existing pollution control regulatory requirements.

Most if not all of these concepts should be studied by industry because:

The focus is on process improvement (as measured by waste reduction) which should lead to lower disposal costs, making those processes less costly and our industries more competitive.

Waste reduction, particularly in the context of congressionally-mandated goals and requirements, should also help alleviate industries' liability and liability insurance problems.

Waste reduction should be conceived and implemented on a multi-media basis (i.e., encompassing air, water, and solid waste discharges) as the way to minimize risks to public health and the environment while keeping our industries competitive internationally.

The OTA report is an excellent point from which to begin further deliberations regarding how our nation addresses its waste problems, particularly its hazardous waste ones. Further, I believe the relationships between the serious liabilities which attach to resource recovery of hazardous wastes and market forces for the legitimate resource recovery and recycling must be addressed.

I solicit your comments on the department's Resource Recovery Program and your suggestions of how our program can assist industry to become more competitive.

THE ALLIANCE: CAN A MARRIAGE OF PUBLIC AND INDUSTRY PRODUCE A STRONG FAMILY OF RECYCLERS?

William M. Sloan, President
International Materials Reuse Alliance, Inc.

Why has recycling, a fundamental of in the environmental groundswell of the early 70's, hit more snags in practice than almost anything you can name? Why has recycling been more a buzzword than a working concept?

While material reuse should work, it hasn't lived up to its potential. Convinced that the problems were not technical, and that group action made sense, the organizers of the Alliance set about in 1986 to do the following:

- Improve the quality of service from waste exchanges,and develop a solid base of information (including the human element, by helping to make connections between generators and the recycling industry).
- Get plants that turn out low-value byproducts to try recycling (instead of wasting materials by sending them to destructive treatment)
- Involve government at all levels (dropping unnecessary barriers, and adopting positive programs.)
- Give the public a voice in what constitutes effective and responsible recycling.

FREE LUNCH

Every step forward, we have been trained to think, has a price tag. But where material reuse and waste reduction are employed, we're looking at a win-win situation more often that not. People waste materials. "Waste" is not a good word to describe materials of potential value.

There are many alternatives that can protect health and environment from hazardous and toxic byproducts of industry. Treatment facilities of very low risk can be built. We do not have to reduce waste or recycle byproducts in the cause of safety. We should do it in the cause of economy. Reduction and reuse save energy, materials, and money that can be used on other social and environmental problems. Generally speaking, however, we also believe that material reuse and waste reduction do have lower "risk tags".

We have, as a society, viewed environmental protection and improvement as a cost-benefit situation. It would be worthwhile, now, to step back and look at what we have created. We might change our perspectives, for instance, on the type or degree of control that would best achieve our aims. If industry can be convinced, or prodded, to consider recycling and reduction first, we might conceivably get more effect from less control or a different kind of control. But we also must remember that the present regulations resulted largely from abuse in a less regulated situation..

PROMOTERS AND DOERS

The Alliance resembles a trade association in some respects but not in others. It is not, unlike the traditional recycling industry, organized around well-defined classes of secondary materials. The Alliance foresees the exchange of a heterogeneous array of materials that often have the following characteristics: produced in small quantities and irregularly; nonstandard and off-specification; hazardous and regulated; mixed or contaminated with extraneous substances. The eleven classes used in waste exchange catalogs span the groupings used by the Chemical Marketing Reporter, and listings on the exchanges are pretty evenly distributed among them. Both producers and users of "chemical scrap" are varied and changing.

The membership -- prospective membership is more accurate -- and the objectives of the Alliance thus revolve around a market that calls for flexibility, energy, and entrepreneurial ability. (In a sense, the reuse of chemical scrap mirrors the trends in material substitution taking place in manufacturing generally.) The operators in this field have been small and, we believe, generally unrepresented by any association. The Alliance would like to see this group grow. It would also like to establish ties with other secondary materials groups.

In having members from government and public, the Alliance clearly envisions public benefits in by-product reuse; in having members from industry it foresees a vigorous industry offering general economic benefits and profits to smart, alert operators.

OPERATIONS AND MARKETING

With effective marketing backed up by available informational and processing technology, recycling works. In 1985, even after a decade of operations supported only by New York State and four north-central New York counties, the Northeast Industrial Waste Exchange finds an average value of $42,000 per exchange. One bulletin listing in eight is exchanged, and this is expected to escalate as the Exchange uses an infusion of US EPA grant money to publicize and upgrade its on-line computer service. This service, moreover, does more than list mater-

ials. It promotes the human chemistry by putting producers and users in touch with recyclers. The exchange manager, Lewis Culter, is Vice President of the Alliance and chairs the Alliance's Marketing and Technical Matters Committee. He is responsible for developing ties that help to make the private recycling industry effective along with his own exchange.

SAFETY FIRST

The performance and safety function may come first or last to mind, depending on who you are and where you live. Many legitimate, competent operators have been shaded by unfortunate experience. Some "recycling" operations were excuses to collect drums of weird chemicals, and never recycled a drop of anything. National experience, on balance, was like that. The Chief of the US EPA's Office of Solid Waste told the 1983 Waste Exchange Conference that more superfund sites were attributed to "recycling" than anything else. Some states responded with restrictive rules, New Jersey being perhaps the foremost example. Few governments were willing to endorse recycling wholeheartedly, partly because of doubt about effectiveness and partly because too many operations were suspect.

Because of the concern for adequate performance, and the concern on behalf of the public that Waste Exchange information not be misused, the Alliance's Senior Vice President Denise Nagle-Stoll, a private New York consultant, is personally involved in the Performance and Safety Committee. Skip Jacobs, a Director of the Alliance and a Chicago businessman in materials reuse and cleanup, is also involved with this committee.

This task group's concerns go beyond mere compliance with regulations. In fact, for some materials that the US EPA describes as more "commodity-like than waste-like," the hazardous and solid waste regulations may not apply any more than they do to gasoline shipents. Yet safety and care are still basic concerns. Regulations moreover, speak to transgressions and were basically designed around treatment and disposal, not conservation and reuse. The Alliance hopes to promote voluntary business and technical standards that would enhance the effectiveness of regulations and provide reassurance to customer and public alike.

MAKING A FEDERAL CASE OF IT ... ALSO, STATE AND LOCAL

The Government Affairs and Public Policy committee, chaired by Alliance Vice President Mary McDaniel of the Southeast Waste Exchange, likewise hopes to go beyond advising on rules, and to gain acceptance by all levels of government of materials reuse as one of the workable options for managing low-value byproducts.

Government has not put much emphasis on the reuse of in-

dustrial materials. Even those states that lead in development of management programs tend to let materials reuse as a management alternative by overshadowed by in-plant reduction on one hand and development of facilities for treatment and disposal on the other.

INTEREST, SUPPORT, DIALOGUE

Membership and funding are, of course, central to an organization's success. The Alliance has had its share of difficulties in these area, as do most new organizations. Its public organizational meeting in late September 1986, called for participation and commitment from a group of about fifty people. Some of that has happened, some hasn't. There have, however, been continual inquiries to the President's office. Vice President for Membership and Funding is Stephen Mahfood of the Missouri Environmental Improvement and Energy Resources Authority. One of the things that Mr. Mahfood has been wrestling with is an appropriate dues structure for various classes of membership.

For a group dedicated to matching perceptions with environmental, economic, and engineering reality, communication inside and outside the organization is basic. Getting together the names and addresses and preparing the messages is hard work. We expect to create the office of Vice President for Communications.

The Alliance was formed to cover an underrepresented group of waste exchanges and competitive recyclers, to gain recognition of materials reuse possibilities from government and from industrial generators of unused byproducts, and to involve the public. We invite your help in carrying out the work.

For more information, contact William M. Sloan, President of the Alliance, at 60 West Street, Suite 200-A, Annapolis, Maryland 21401 or (301) 974-3432.

PERMITTING A HAZARDOUS WASTE RECYCLING FACILITY

by S. Wayne Rosenbaum, Technical Director, ETICAM
Hans M. Arsovic, President, ETI, Baden-Baden

ETICAM is a recycler of hazardous wastes. The company defines recycling as the conversion of a waste into a product of commerce. The term "hazardous waste" has already been defined by the U.S. E.P.A. as a product no longer suited for its original use or specifically listed as a waste by the U. S. E.P.A., such as the end product of electroplating wastewater treatment facilities. A "hazardous" waste is also defined by the U. S. E.P.A. as a toxic, corrosive, flammable, or reactive material.

ETICAM accepts materials from its clients, which by definition are considered to be hazardous wastes, and converts them into forms that can be sold to refineries or reclamation facilities. Specifically, ETICAM accepts metal-bearing liquids and sludges containing copper, nickel, tin, lead, zinc, and precious metals.

Since these materials have been refined from scrap or waste for hundreds of years in the United States, the question can be legitimately asked: why did ETICAM choose to obtain hazardous waste treatment storage and disposal permits for its facilities. The reason is simply the change in public perception and government regulation regarding hazardous wastes.

That is, communities have become more and more concerned with hazardous wastes and their appropriate handling and disposal. They are no longer willing to take a company's word that what is being removed from a plant is benign or being appropriately recycled. In response to these community concerns, government, specifically the U. S. E.P.A., put into force more stringent regulations for the manifesting, transporting, treatment, and ultimate disposal of any hazardous waste, where hazardous waste is defined as above.

The result of this regulatory change has been that large quantities of metal-bearing wastes have been labelled as hazardous and disposed of in secure landfills instead of being recycled.

Some exemptions to these regulations were made for specific industries and waste streams, however ETICAM found these exemptions vague and limiting. For example, some precious metal-bearing wastes were considered to be exempt if they contained "economically recoverable" amounts of precious metal. However, the definition of economically recoverable was never made by the U. S. E.P.A. or by any state. Exemptions made on the basis of precious metal content were left to individual, case-by-case review. Some wastes were considered to be hazardous solely on the basis of what industry generated them. For example, a sludge generated by an electroplating shop might be considered a hazardous waste, while an identical sludge produced by a wire-drawing facility might not. Existing definitions of end products, as well as their shipping and export status, were also ambiguous and limiting.

ETICAM determined that without licensing its facilities to treat hazardous wastes, the company would continually be subjected to such regulatory uncertainties, making it impossible to develop and implement rational business plans. It was decided that if ETICAM was to be in the recycling business, it would only do so through operation of licensed facilites.

It then became essential to select permittable sites for facilites. Decisions on site selection were based on two major criteria: 1) was the site beneficial to ETICAM and 2) would ETICAM benefit the community in which the site was located.

For corporate benefit, factors in site selection included a market's potential customer base, the availability of raw materials and labor, and ease of shipping — factors traditionally considered by companies when looking to site a plant or operation.

In addition, however, ETICAM had to determine the benefits it could offer communities in which it sought to site its facilities. ETICAM officials had to convince town fathers not only that the facility was safe, but further that the facility was beneficial to the community. Because, after all, no one wants a hazardous waste facility in their backyard.

Today, one of the most critical issues in any community is employment — job retention or attraction. ETICAM's services are so unique and so desperately needed by the metal finishing and electronics industries that the company's presence in a community can clearly be viewed by town fathers as beneficial in retaining such industries or as a way of attracting these industries to its community. ETICAM has used this benefit to help obtain sites in a number of communities in the U. S.

ETICAM first located itself in Warwick, Rhode Island, a traditional industrial city. Here, the critical issue was job retention because most of the industries located in the city were dependent on waste disposal. That is, there were many platers, electrofinishers, and jewelry manufacturers.

In Nevada, the issue was job attraction. The city in which ETICAM is located, Fernley, is a developing community that wished to have an identity separate from that of the large metropolis of Reno, some thirty miles away. In order to avoid becoming a bedroom community to Reno, Fernley had to attract industry and jobs of its own. ETICAM not only provided jobs at its facility, but made Fernley a more attractive community to other companies, such as printed circuit board manufacturers.

Job diversification was the critical issue in Texas and Illinois communities in which ETICAM sought plant sites. The Texas economy has traditionally been dependent on oil and agriculture. ETICAM offered Temple, Texas a way to attract new industries, which would diversify the local economy and make the community more resistant to economic fluctuations.

Granite City, Illinois is a depressed steelbelt town. While ETICAM was viewed by town fathers as a provider of needed services to existing industry, the company's presence in the community was also seen, once again, as a way to attract a more diverse industrial base to the area.

The second issue in achieving a permit is the consideration of technology. Again, as with any other industrial manufacturer, ETICAM must select technology to produce the product at the best price with the best return to its investors. However, as a regulated industry it must meet the needs of federal, state, and local regulators. Frequently, this requires technologies that provide a zero discharge option. That is, that no waste be generated by the ETICAM facility. In some sites this required not only that all the metals be effectively removed and recycled, but additionally, that all the salt be removed from the discharge water. ETICAM had to be flexible in its engineering designs in order to meet such local community needs, while remaining economically competitive.

The greatest issue, however, that ETICAM has faced in permitting its facilities is education. A good idea is only a good idea if everyone believes and accepts it.

Throughout the permitting process, ETICAM needs the involvement and support of federal, state, and city regulators. This can only be achieved through education of regulators; they must understand ETICAM's technology, the services it offers, and most importantly, alternatives to ETICAM. Our experience has been that once regulators recognize that the alternative to ETICAM's recycling facilities are hazardous waste landfills, they begin to support the company's facilities in an overt manner.

Conservation groups are the public's watchdogs over the environment. Groups such as Save The Bay, Sierra Club, Appalachian Club, Ducks Unlimited, and the Audubon Society spend a great deal of time and money observing and critiquing the hazardous waste regulators and managers in this country. Before ETICAM can enlist their support, which is essential in moving forward in the permitting process, they too must understand the company and the alternatives.

While ETICAM has rarely achieved the overt support of these groups, it has continuously received the covert support of these groups, which is essential in gaining community acceptance of a hazardous waste treatment facility.

In addition, ETICAM needs to educate three groups in the communities in which it locates facilities. These are: the citizens at large, municipal services, and the potential industrial customer base. Education of the citizens at large typically takes place through public meetings and tours of the facility, if completed. The citizenry, also needs assurance from officials overseeing municipal services, specifically, fire, medical, and police, that they can respond to any emergency at an ETICAM facility. Thus, it was essential in the permitting process to have the support of these groups. ETICAM spends considerable time working with these local officials, not only in education, but also in modifying Emergency Contingency Plans to meet specific requests of emergency response groups that might be called on if there ever was a problem at a facility. These groups must be comfortable with the established contingency plans.

Finally, ETICAM needs the support of the existing industrial base in communities it chooses to site plants. Potential users of the facility have to be willing to come forward and speak out that they would use a facility if it were licensed. This requires an admission by industrial manufacturers within a community that they, in point of fact, generate hazardous waste. Therefore, as individuals it is difficult to convince them to come forward publicly. It has been possible, however, to obtain endorsements from industrial associations representing individual manufacturers.

The result of appropriate site selection, technological flexibilty and community education has been that ETICAM has been successful in siting its facilities. At our Rhode Island Facility, the permitting and siting process took approximately two-and-a-half years. In Nevada, it took one-and-a-half years to gain the necessary permits. With this additional experience, we expect permits within six to nine months at our Temple and Granite City Facilities.

It should be noted, these permits do not come without cost. Legal and engineering fees have run between $250,000 and $500,000 per permit. Capital equipment costs necessary to meet specific permit requirements have added approximately a half a million to one million dollars per facility. Insurance has increased by approximately $ 100,000 a year and management costs by over $ 50,000 per year. When we average these costs over a ten-year period, they add approximately six cents per gallon to the cost of treating wastes at ETICAM facilities. A small price to pay for the benefits of full licensure and insurance, and community acceptance.

In summary, ETICAM believes that hazardous waste should treated as such, and that while difficult, the existing licensing and siting laws are workable when industry chooses to work with them. However, communities must be willing to work cooperatively with industry throughout the regulatory process.

RECYCLING — THE NEW SOLUTION TO TOXIC WASTE DISPOSAL

BY HANS M. ARSOVIC, PRESIDENT, EMISSIONS TECHNISCHES INSTITUT
AND S. WAYNE ROSENBAUM, TECHNICAL DIRECTOR, ETICAM

Landfills - A Disappearing Option

The plating and surface finishing industries have long had an inexpensive and easy means for disposing of the toxic wastes they generate: landfill disposal. However, with the enactment of the 1984 Ammendments to the Resource Conservation and Recovery Act (RCRA) of 1974, however, congress began limiting the amount and nature of toxic wastes disposed of in landfills. Each year, RCRA calls for increasingly stringent requirements for landfill disposal with the intent of completely phasing out landfills by 1990. Of particular impact on the surface and plating industries, are current and future RCRA bans on landfilling certain materials. These include:

o Wastes listed as hazardous by the state of California, including wastes containing certain metals and free cyanides in excess of 1,000 milligrams per liter. PCB's in excess of to 50 milligrams per liter and acids with a ph rating lower than 2.0 are banned after July 8, 1987.

o Also banned as of July 8, 1987, are liquid, hazardous wastes containing arsenic in excess of 500 milligrams per liter, chromium VI in excess of 500 milligrams per liter, lead in excess of 500 milligrams per liter, mercury in excess of 20 milligrams per liter, nickel in excess of 134 milligrams per liter, selenium in excess of 100 milligrams per liter, and thallium in excess of 130 milligrams per liter.

Other RCRA restrictions making landfill disposal difficult for the electroplating industries include the following:

o After September 1, 1985, generators must certify that the volume and/or quanitity and toxicity of waste has been reduced to the maximum degree economically practical. Thereafter, generators must annually certify their efforts to reduce waste volume and the reduction actually achieved.

o In considering a delisting petition for sludge disposal, EPA must consider all factors, including, but not limited to those for which the waste was initially listed. EPA must also provide public notice and comment before delisting a hazardous waste. All temporary delistings not finalized by February 1986, lapse summarily.

o As of February 1986, no one may export hazardous waste unless notification has been filed with the United States Secretary of State and the receiving country has agreed in writing to accept the waste.

The Eticam Alternative

The intent of RCRA — to discourage land disposal of toxic wastes — has been achieved. There are currently no methods for landfill disposal that meet the requirements outlined above and the general consensus is that the cost and complexity of developing them is too great.

With the future of landfills a short one at best, plating and surface finishing industries must seek out alternative methods of toxic waste disposal. One such method is now being offered by ETICAM, a wastewater treatment and resource recovery firm based in Warwick, Rhode Island.

The ETICAM approach to hazardous effluent treatment is unique; it's a total recycling process that generates no waste whatsoever. Instead, it produces saleable products that can be sent back into industry.

The waste streams ETICAM processes are those generally produced by the metal finishing and electronics industries: cyanide, acid, alkaline and chelated wastes that contain precious metals (gold, silver, platinum, and palladium) and base metals (copper, nickel, tin, lead, and zinc).

The average metallic concentrations of the feed stock are as follows:

Copper	7,462 ppm
Nickel	2,001
Tin	2,996
Lead	1,753
Zinc	4,922
Cadmium	1,587
Chromium	1,593
Iron	6,854
Silver	13
Gold	3.6
TOTAL	29,184.6 ppm

*Based on all shipments delivered to Warwick between 1/13/87 and 1/27/87.

Since ETICAM attempts to defray part of the recycling cost by selling the metals it reclaims, the plant is designed to work on concentrated wastes.

Further, as an inorganic recycling plant, the facilities have a limit of 500 ppm Volatile Organic Hydrocarbons.

How it Works

In the first stage of processing, the industrial effluents are classified into the aforementioned chemical groups:

1. Acids
2. Cyanides
3. Alkalines
4. Chelates

These wastes are then segregated and stored in one of forty-eight different storage tanks. Cyanide and chelated wastes then go through an organic oxidation step for the destruction of cyanide and organic chelates. At this point, the treated cyanide and chelated wastes are combined with the acid and alkaline wastes to form a metal-rich "soup". The metal types and concentrations of the soup are controlled by mixing and matching the storage tanks from which the soup components are selected.

In the next stage, the various metallic components are extracted from the soup in a form that is suitable for recycling.

Copper, nickel, and zinc are first extracted by means of liquid ion exchange. Each of these metals is extracted separately and converted to sulphate or chloride salts. In this process, metals are selectively extracted down to 100 ppm with solvent losses of less than 50 ppm or 50 to 75 gallons per month. The lost solvent is recovered on activiated carbon beds or absorbed onto sludges which are generated later in this process.

Trivalent, such as aluminum, iron, and chrome metals can then selectively be precipated using phosphoric acid technology. These products can be utilized by the steel industry. However, ETICAM is currently considering newer technologies for the conversion of the chrome to chromic acid and the iron to saleable iron salts.

Next, the tin and lead are co-precipitated and prepared as an oxide powder. (This product is sent to various tin smelters for further refining.)

It is in the precipitation steps that the mixing and matching of the original products in the soup becomes important, for at this stage the system is also capable of precipitating trivalent and divalent metals and forming product groups such as iron, lead, tin and chrome if special care is not taken.

Finally, the precious metals are removed through a chemical reduction process, and the soup scavenged for trace metal ions by an ion-exchange polishing system. The resulting brine solution is then desalinized, generating potable water and saleable salt.

A Cost Comparison- Landfill Disposal Versus ETICAM Recycling

Prospective ETICAM customers have asked how such a sophisticated process can compete economically with traditional land disposal alternatives. The answer is that disposal costs are really a composite of four components. These are:

1. Disposal
2. Transportation
3. Environmental Liability
4. Loss of assets

Less than a decade ago, you could have toxic waste carted off to a sanitary landfill for as little as $5 per ton. Today, with the use of special truckers and faraway licensed landfills, the cost of disposing of toxic wastes in landfills has risen dramatically. Landfill fees of $250.00 per ton for stabilizing and dumping and $100.00 per ton for trucking are now typical.

When a company considers contingent liabilities, management must remember the issue of waste disposal. Federal law now says that when you dump waste anywhere, your liability is perpetual. If any environmental damage, injury or bodily harm is caused by your waste products, regardless of how many years have passed, the generator is responsible.

As previously indicated in this article, landfill disposal also represents a permanent loss of valuable metal assets. Asset recycling, on the other hand, can help defray the cost of this treatment alternative and preserve scarce resources.

The following is a cost comparison of typical costs involved in land disposal versus the ETICAM recycling process:
Assume you need to dispose of 250 gallons of spent nitric acid rack strip containing:

1. 10% free nitric acid
2. 50 grams/liter copper
3. 50 grams/liter nickel
4. 5 ppm/gold

The cost of disposal would be calculated as follows:

ITEM	LAND DISPOSAL	ETICAM RECYCLE
Processing	$ 250.00	$ 300.00[1]
Transportation	100.00	100.00
Environmental Liability	250.00[2]	- 0 -
Recycle Value	- 0 -	100.00
Total Cost	$ 600.00 ($2.40/gal)	$300.00 ($1.20/gal)

Notes:

1. Based on current ETICAM charges for recycling nitric acid waste streams.
2. Assumes that the perpetual liability of generator will cause him to redispose of his waste at least once during the life of the company at a cost no higher than the original disposal cost.

Based on a cost comparison, such as the one provided, it should be clear that ETICAM recycling is price competitive with landfill disposal. More importantly, the hidden cost of landfilling - liability - is completely eliminated.

First U.S. Facility

ETICAM's first U.S. facility recently opened in Warwick, Rhode Island, following the signing of a landmark siting agreement between ETICAM and the city of Warwick.

This agreement respresents significant progress in the treatment of toxic wastes in Rhode Island and throughout the U.S. In Rhode Island, ETICAM's facilities have created a brighter future for the state's leading industry — jewelry manufacturing. This industry has been under heavy fire in recent years by environmentalists, who have maintained that the industry's improper disposal of toxic wastes has contributed to the pollution of the state's water resources. ETICAM's new, centralized treatment facility offers these manufacturers — particularly small and medium-sized manufacturers unable to afford their own treatment equipment — a safe, viable treatment alternative. ETICAM is already being credited by public and private sector officials in the state for helping to retain an important industry in Rhode Island.

The signing of the siting agreement between ETICAM and the city of Warwick also has positive implications for toxic waste treatment in the U.S. The agreement is considered by the U.S. Environmental protection agency to be a model for the siting of hazardous waste facilities in the U.S.

It should also be noted that ETICAM has been recognized by the state of Rhode Island, the city of Warwick, and the U.S. EPA for its efforts in developing an innovative recycling alternative for electroplating wastes.

Expansion Plans

Part of ETICAM marketing and operations strategy is to take into consideration the needs of its customers and the communities in which those customers are located. As a result of this needs assessment, the company made a policy decision that it is better to have a large number of facilities servicing local markets than a few large facilities servicing regional areas.

In keeping with that policy, ETICAM is currently building facilities in Fernley, Nevada; Temple, Texas; and Granite City, Illinois. The company is planning additional facilities for the Arizona and Florida markets.

Based on this aggressive expansion program, ETICAM hopes to be able to provide local, cost-effective waste recycling services to the major plating and surface finishing industries by the time new federal regulations eliminate many of the disposal alternatives now available to these industries.

Summary

As current EPA regualtions are put into force, many of the landfill alternatives now being used will be foreclosed. ETICAM represents a technically viable and cost-effective alternative to landfill disposal. This alternative has also been distinguished by both the U.S. EPA and the communities in which the plants are located as an innovative and socially acceptable alternative to landfill disposal.

WASTE REDUCTION AT DU PONT

H. I. Shade

Every hour of every day, Du Pont's plants are producing 2,000 products in more than 160 locations worldwide -- products that help feed, clothe, shelter, transport, communicate and keep you well. In the course of producing this cornucopia, some hazardous waste is generated.

The handling and disposal of hazardous waste is the number one environmental concern of the American public, which identifies the chemical industry most closely with the problem. In Du Pont, waste reduction is now the focus of a companywide program that is the latest example of the company's long-standing commitment to operate in an environmentally sound manner.

Top management is behind the program and has put in place corporate activities to increase awareness throughout the organization of the potential opportunities and benefits of waste reduction. While this emphasis is dictated in part by changing legal requirements, economics is the prime mover.

We view waste reduction as a business opportunity in two ways. The company can become more cost competitive by utilizing fewer natural resources, and it can develop new marketable technologies to enable other industries and companies to minimize waste.

Du Pont's policy for waste minimization predates the 1984 RCRA Amendments. It was first issued in August 1980 and it states that "It is company policy to minimize the generation of waste to the extent that is technically and economically feasible..." This policy was amended in 1983 to require all plant sites to maintain a written plan outlining the actions to reduce all waste streams.

The individual plant sites are the main players in translating essential policies and needs into direct and constructive actions. To assist the plants with their waste reduction plans and to insure consistency companywide, a corporate program was developed that began with a uniform definition of waste.

"Du Pont tabulated waste" includes all wastes that are dealt with in site waste reduction plans and is a much broader definition than RCRA-defined waste. The Du Pont definition includes solid waste treated or disposed of on- and off-site, waste for fuel, some recycled materials, deepwell injection fluids and wastewater influents. This broad definition provides flexibility for any future regulatory changes and emphasizes that most wastes are to be reduced. Air and water emissions are

already being reduced, and these are tracked with the permit system that regulates such discharges.

Waste data have been entered into a corporate computer data base. This data base will allow several things: first, tracking volumetric reduction of waste for individual waste streams; second, verifying progress towards the corporate goal; third, determining cost savings associated with reducing each waste stream; and lastly facilitating communications among plant sites as to the most successful reduction methods.

These methods have been classified into short and long term efforts. The short term efforts include administrative controls, educational programs, reducing wash water and purging and separating waste streams. Longer term programs are yield improvements, changing the raw materials, improving waste recovery, changing catalysts, developing marketing strategies and new technologies to reduce waste.

At Du Pont both long and short term programs for reducing waste are already being implemented and most recently were the subject of our first companywide Waste Reduction Symposium (Attachment 1). Other elements of the corporate program include "Wasteline," an internal newsletter that provides corporate guidance and specific examples of plant programs, and a video production that features senior management and gives additional case histories.

A corporate waste reduction goal of 5% per year is now being reviewed, and each plant is also setting its own waste reduction goal. For some sites, waste reduction means not just profitability but survival.

Besides money, time and ingenuity, achieving these goals will depend on high operating standards and a sensitivity to waste management on many levels. Already many plants have reported notable achievements.

At a plant in Valencia, Venezuela, a solvent recovery unit has been installed to recycle solvent waste from paint and finishes manufacturing. This and other programs save $200,000 per year and reduce the volume of solvent wastes by 50%.

New membrane technology was installed in the field at the Lonoke, Arkansas site. A pilot plant recovery system recycles 100% of the rinse water from one of four plating units. This conserves plating materials and water treatment chemicals and may eliminate the need for an extensive investment in wastewater treatment upgrade.

A plant in Virginia has developed an innovative method of recovering pump-out solution that was previously disposed of in a landfill. The pump-out solution is now returned to the process with no impact of product quality or disruption of

operations. This recycle step will reduce the cost for waste disposal by $4.5 million.

A belt press filter de-watering device has been installed at the Sabine River Works Plant in Orange, Texas. This has cut the offsite waste disposal by 18 million pounds and landfilled waste by 50%.

At the Cape Fear, North Carolina, plant, a strong effort has been given to taking the "hazardous" out of hazardous wastes by substituting safer, nonflammable cleaning solvents for toxic, halogenated solvents used as degreasers. This change has reduced the number of listed hazardous waste streams from eight to three.

Cobalt, a valuable catalyst, is also now being reclaimed after waste acids from the dimethyl terephthalate process are removed. Another company recovers and reformulates the cobalt and returns it to Cape Fear for reuse in the manufacturing process, enabling the plant to save about $500,000 per year.

These examples are multiplied throughout the company. In the laboratory, in design, in construction and maintenance, in process and operation, in marketing, we are finding more people who see waste reduction not as a problem but as an opportunity.

In stepping up to this challenge, everybody benefits. Companies comply with the law and beyond, reducing production costs and potential future liabilities. This increases short and long-term profits, making waste reduction simply good business.

Society benefits as well. The potential for environmental problems today and tomorrow is reduced. We are able to more effectively use limited natural resources. And finally the greater efficiency of our processes will inevitably lead to lower costs for products and a higher standard of living now and in the future.

THE NORTH CAROLINA POLLUTION PREVENTION PROGRAM
OVERVIEW AND CASE SUMMARIES

Roger N. Schecter, Director

1987 NATIONAL WASTE EXCHANGE CONFERENCE

Conventional pollution control focuses on "end-of-the-pipe" and "out-the-back-door" approaches--creating waste and then trying to figure out what to do with it. These approaches often serve to remove pollution, such as contaminated air or wastewater, from one place, only to deposit the pollution in another form in another place. Regulations for air, water, toxic materials, and hazardous wastes are becoming increasingly complicated. Industries need to critically examine their current treatment and disposal approaches. Once waste is generated, regulatory costs, disposal costs, and liability costs will continue to increase.

A positive alternative is prevention of pollution at its source. Through prevention, waste minimization, and recovery, many firms can find economic benefits and improved environmental management of their wastewater discharges, air emissions, and hazardous waste generation.

In 1983 the General Assembly authorized and funded the North Carolina Pollution Prevention Program. The goal of the non-regulatory program is to work with industries and local governments to help them identify and apply ways to reduce, recycle, and minimize wastes before they become pollutants. The prevention effort addresses water and air quality, toxic materials, and solid and hazardous wastes. Technical assistance, research and education, and matching grants are provided by the program in cooperation with the Hazardous Waste Management Branch, Waste Management Board, and Board of Science and Technology.

The program has compiled more than 1,500 references on waste reduction and minimization. Additional information is available through customized literature searches and access to public and private research organizations. In-house waste reduction reports are published on a variety of industries and waste streams. Non-regulatory, on-site visits for technical assistance are conducted with waste surveys to identify reduction opportunities for water, air, toxics, and hazardous wastes. In addition to funding research projects and workshops for industries, the Pollution Prevention Program offers matching funds to businesses and communities through Challenge Grants for waste reduction and minimization projects.

MARKETING INDUSTRIAL WASTE: A GENERATOR'S PERSPECTIVE

James Nesmith III
Southern Regional Manager, Surplus Products
Union Carbide Corporation

Marketinq industrial waste is a very broad topic to cover in a book, much less in twenty minutes or so. I will concentrate on a relatively small segment of the subject and hope to provide you with some insight and some general guidelines to follow. Much of what I shall discuss could be classed as BGOs, that is Blinding Glimpses of the Obvious.

I will limit my discussion to that which I know well, Union Carbide's residues, by products, spent catalysts, waste oils and solvents. However I am sure the prlnciples apply elsewhere as well.

So that we understand each other I shall have to define some terms. In January, 1985, the EPA redefined "solid waste" to include many materials traditionally recycled and therefore not previously considered wastes. Five general categories of materials were specified; Spent Materials, Sludge, By-Product, Commercial Chemical Product and Scrap Metal were to be regulated if they were listed or characteristic hazardous wastes and their use constituted disposal. For the purposes of my talk I would like to define waste as anything in the way of a byproduct or residue of the production process for which there is no readily apparent use.

Much of what is considered waste under RCRA Union Carbide would not consider waste. The chemical industry, like the petroleum industry, has a history of utilizing by-products and residues as feedstocks for other materials or a fuel. There appears to be more logic to the old definition, but don't make the mistake of trying to interpret RCRA from a logical point of view. For example one of our plants produces hydrocarbon by-product from time to time. It is about 98% pure (slightly better than the commercial specification) and has a motor octane of about 105. We had been selling this material into the gasoline market at a slight premium over unleaded regular gasoline. Under the new definition the material may no longer be a product. Now it may be a D 001 ignitable hazardous waste and we may be precluded from selling it to the gasoline market, since none of our customers or service stations are permitted to store hazardous waste. Moreover, the identical product produced in a petroleum refinery is exempt from regulation. We are attempting to get clarification but the prognosis is not good.

The second term which needs some definition is marketing. I shall use it to mean finding someone who wants/needs that which you wish to get rid of. You don't really sell wastes. You find someone who can use what you have and then make it

attractive for them to use it so they will buy.

Why bother? Why not throw it away? You can't! How about paying someone to dispose of it for you? You can do that but it is getting very costly. Contract disposal costs have increased dramatically in the past few years. It now costs about $.10/lb. to dispose of non-hazardous solid wastes and probably $.30/lb. or more for burnable hazardous wastes. Further increases are expected as the landfill bans begin to take hold. There just isn't enough incinerator capacity to handle all the presently generated hazardous waste; meanwhile, the EPA is moving toward classifying more and more materials as hazardous wastes.

Burning inside your plant may not be acceptable much longer either. Ground burning will be severely curtailed. Unless one can show substantial useful energy recovery off a boiler, it will be considered an incinerator and will have to have a permit.

Recycling/reclamation holds the promise of environmentally sound usage of surplus materials without the high costs associated with contract disposal. In fact, recycling may produce income. Recycling means using a material as a raw material or a fuel, or processing it to make it useful as a raw material or fuel. Reclamation is a subset of recycling whereby an unusable surplus material is transformed into a useful product, for example, solvent reclamation. Generally, recycling is more economical than disposal as some benefit (material or energy) is derived from the process.

The overall marketing process consists of six steps:

1. Evaluating the waste for potential uses.
2. Looking inside your company for users.
3. Looking outside your company for users.
4. Locating potential customers.
5. Evaluating potential customers.
6. Negotiating the recycle agreement.

In the first step one determines if the waste can be used as is to make something else, or if it has a valuable component in it that is worth recovering. For example, if it were a spent catalyst, does it contain a precious metal like platinum or palladium? If not, does the waste have useful fuel value? Should the answer be no to all of these questions you probably have a disposal.

For a waste to be of interest to someone it needs to contain some intrinsically valuable component or components or fuel value. There must be sufficient quantity and the quality, whatever it may be, needs to be reasonably consistent. Most people tend to think that a waste is just garbage. This is especially true of plant workers but is not limited to them. That is not true. To be able to recycle or reclaim waste

economically it must be segregated and kept free of further contamination. Segregation and classification of wastes improve salability and reduce disposal costs. In short, if you treat by-products and residues like garbage ... they will be garbage. Or, as one of my friends from Texas puts it, if you mix chicken salad with chicken ---- all you wind up with is chicken ----.

If chlorinated solvents are mixed with flammable solvent wastes or if waste oil is comingled with water, solvents or other chemical wastes, they are generally no longer recyclable. Therefore you pay.

Where does one look for information on possible end uses and users? There are a number of sources. I will discuss a few that I find useful but there are many more.

1. Chemical Marketing Reporter, Schnell Publishing, New York. They publish a buyers' guide which lists who sells various chemicals-they may be potential customers. They also publish chemical profile sheets on major chemicals which list producers and end uses.

2. Kirk & Othmer, Encyclopedia of Chemical Technology, John Wiley & Sons, New York. Contains very detailed information on how a given chemical is made, its end uses and technology.

3. Stanford Research Institute, Menlo Park, California. They publish a great deal of market research and process technology related material. Two of particular use to me are the Directory of Chemical Producers (companies, plants and products cross referenced) and Chemical Flow Sheets (outline of major derivative chains).

4. Worldwide Petrochemical Directory, Penwell Publishing, Tulsa, OK. Contains a list of companies, plants and key personnel.

5. Thomas Register, Thomas Publishing, New York. Very complete guide to goods and services giving companies and their products.

6. American Metals Market Annual, Fairchlld Publications, New York. Contains an excellent directory of where to buy and where to sell metals and metal wastes.

Trade Associations may be helpful and may publish useful data. There is one for just about every industry segment you can think about. Some that may be of interest are:

1. Synthetic Organic Chemical Manufacturers Association, Washington, D.C.
2. Association of Petroleum Rerefiners, Washington, D.C.
3. National Association of Solvent Recoverers, Washington, D.C.

4. International Precious Metals Institute, Allentown, PA
5. Investment Recovery Association, Cleveland, OH

Look inside your company first. Probably the most valuable recycling is that which you do yourself as the waste replaces material that you would otherwise have to purchase or manufacture. For example, one of our divislons generates a spent electrolyte. Another division recovers a similar material from fibre industry wastes. By bringing the two together it was found that the spent electrolyte could also be used. So one division obtains cheap raw material and the other saves about $80,000 in disposal costs.

Another example involves still bottoms. For one division they are a disposal problem. Another division produces a product which can be based on these bottoms if they are reflned or cleaned up. By finding an outside custom processor who could clean up this waste one division solves its disposal problem and the other obtains raw materials more cheaply than it could manufacture them itself. The overall saving to the corporation is of the order of $1,000,000 per year.

Suppose there is no internal use. Then look outside. Manufacturers of product may be interested in your waste if it can be used as a raw material. End users of a product may be interested in your waste if it can be substituted for something else they must purchase.

Dealing with an outside firm brings some new concerns. Product liability and Superfund clean up responsibility are two major concerns when dealing with wastes. Four potential customer/recyclers must be evaluated before you use them; otherwise you may expose yourself to liability many times greater than the economic benefit you expect to gain. At a minimum we would evaluate:

1. Technical competence
2. Adequacy of the equipment
3. Safety and environmental practices, awareness of regulations and possession of proper permits
4. Financial strength and insurance coverage
5. Opinion of the EPA or state regulatory agency
6. Prior performance

Having approved our customer we are now prepared to make them an offer that they can't refuse. Some examples may help illustrate the process.

One of our plants produces an ethylene dichloride waste stream. Remember the chemical profile? It showed the primary uses of ethylene dichloride to be in the manufacture of vinyl chloride and chlorinated solvents. We had no internal use so we looked outside. We approached several candidates all of whom were Fortune 500 companies and found one who was interested. The rest was simply to negotiate a deal that was attractive to both of us, and the agreement was sealed.

We used to use di methyl acrylamid in the refining of butadiene. We went out of that business and wound up with a lot of contaminated di methyl acrylamid. We looked high and low but were unable to find a use internally or outside as a solvent or heat transfer fluid. In doing some research I found that it was an intermediate in the manufacture of acrylic fibre. After a few phone calls . found an interested fibre manufacturer and we negotiated a sale.

A couple of years ago we had some styrene tar, which contained about 16,000 BTUs/lb but also about 10% sulfur. Good fuel value but not usable with that much sulfur. Started to look into the markets for sulfur. One of them was to make sulfuric acid via burning sulfur. Stauffer Chemical does this and in fact also burns sulfuric acid wastes to make sulfuric acid. We approached them and they were very interested. While they didn't pay us, the result was significantly cheaper than disposal. Having found this out we were able also to send them a large quantity of spent sulfuric acid from another division and save about $50,000 over disposal.

Burning sulfuric acid requires a lot of energy, so when we had an otherwise unsalable heavy hydrocarbon steam we went back to Stauffer aqain. They were interested and the resulting agreement saves us on the order of $500,000 per year versus incineration.

Cement kilns are another consumer of vast amounts of energy. A typical kiln consumes the equivalent of about eight tons of coal per hour. They are good potential recyclers of wastes, containing decent fuel value provided the quality is relatively consistent and the quantity is enough to interest them. Many of them are considering obtaining permits to burn hazardous waste-derived fuels. We have moved metallurgical coke fines, a waste generated in the manufacture of electrodes, to them and also some non hazardous burnable chemicals. We will be looking at them for hazardous wastes in the future. They are not a universal answer, as they have trouble with certain contaminants and aren't interested in low BTU materials.

Wastes can be marketed if you can find something in them which is valuable and someone who wants it. There is no easy way to do this. It takes a lot of effort and some common sense but the end result is almost always worth it. Some of you may wonder why I haven't mentioned brokers. As I see it the process doesn't change; they are simply an extended sales force. Someone must do the leg work, you or your broker. If you choose to use a broker in this fashion I would like to suggest that you protect him. Don't go around him or let his customer bypass him either. If the broker is worth using he is a professional and has valuable marketing knowledge which you must be willing to pay for. Thank you.

MARKETING INDUSTRIAL SOLVENTS
A RECYCLER'S PERSPECTIVE

Kenn A. Wiest, Manager, Marketing and Sales

The recycling industry was probably the beginning of the first waste exchanges. Recyclers were challenged with the opportunity to collect a wide range of organic solvents and find end-use markets for their refined products. This was by no means an easy task. The first challenge was to select those waste streams which could most economically be returned to a product which met near virgin specifications. Secondly, once a product was recovered, it had to be marketed as a refined product in specific end-use markets. Some end-use applications by their very strict specifications were not acceptable, and others because of the perceived differences between virgin and refined products, could not be sold.

The first approach to marketing industrial solvents that have been refined is to work with the industries that generate the waste solvents. We call this a tolling operation. Here we take waste solvents from an individual customer and re-distill his material back to an almost virgin state. This has been a very common practice in the pharmaceutical and chemical industries since World War II. This assures the generator that the solvents he receives back from the recycler are only those products which are common to his process. Obviously, this is critical in a pharmaceutical operation where the returned solvent will be used to produce consumer drugs. Quality control is assured by strict production requirements and laboratory analysis at both the recycler and the end user. Any trace of impurities in the product would be cause for rejection by the drug manufacturer.

The next approach is to profile the types of industries that generate a particular industrial solvent as a waste stream. This is done by using the computer to record the Standard Industrial Classification (SIC) of each generator profiled and the particular solvent waste he generates. After recording many thousands of waste profile sheets, a pattern develops as to the most common solvents used by a particular SIC customer or industry.

Once we've identified the most likely industries to purchase a particular industrial solvent, end-use application becomes critical. A manufacturer of highly sophisticated printed circuit boards, although a large user of virgin industrial solvents, will most likely not be a good candidate for the same solvents in a refined product. Here, purity is critical to the final printed circuit board's performance, and the cost advantages of using re-distilled products are offset by the cost associated with the potential failure of expensive circuit boards.

The same solvents that were not acceptable to a printed circuit board manufacturer may very well be acceptable to metal working shops. In the case of using typical degreasing solvents, such as 1,1,1 trichloroethane, perchloroethylene or trichloroethylene, many manufacturers already use refined products. They use degreasing equipment with

stills as an integral part of the process of purifying their own solvents. These accounts become good candidates since they are familiar with the acceptability of refined solvents. Here, purity equal to virgin solvent is not a critical aspect, providing a consistent quality product is produced which will meet the end-use application.

Recycling, reuse and recovery practices are widely accepted options, and make use of materials formerly discarded as wastes. These materials may be reused directly in the process from which they originated or may find use in an entirely different process. For instance, methanol, which is used to clean ultra-clean electronic parts can readily be used for auto windshield fluids. Caustic used to dry a solvent can readily be used to neutralize another chemical or biological reaction. Hydrochloric acid, used to pickle steel, can be used to floculate sediment and remove phosphates in water treatment. Recycling, both on and off site, reduces the volume of hazardous waste to be disposed and also preserves limited natural resources.

Methylene chloride, a common solvent used to make pharmaceutical intermediates, when distilled is an equivalent replacement to virgin product used in paint strippers and in clean up for fiberglass manufacturing equipment. Halogenated solvents, a major EPA concern in landfills due to their persistence and tendency to contaminate groundwater, can be recycled in most cases and returned to the generator or other end users.

Almost all organic solvents can be recycled and returned to an end-use application which preserves valuable natural resources for reuse over and over again. Today, over five billion pounds of solvents are recycled each year. Users not only preserve natural resources but also save money for their companies. As a general guideline, refined industrial solvents sell for 80% of what the virgin product originally sold for. Methylene chloride selling for $0.20/pound, virgin sells for $0.16/pound as a refined product, with no less effectiveness in use.

Sometimes a market does not exist for a particular type of waste solvent. This is where the development laboratory plays a key role in evaluating the product and developing specialty uses for that product or a combination of that product and other products to impart specific desirable characteristics. Several years ago, a major manufacturer of fiberglass parts with facilities located across the United States, had a major fire, killing one of its workers. They came to us looking for a solvent that did not have a flashpoint up to the initial boiling point of the solvent. They had been using acetone with a flashpoint of 0° F. A spark had caused the explosion and fire, which destroyed their facility and killed the worker. Using the development lab, we custom-designed a blended solvent that met all of the cleaning criteria, yet did not exhibit a flashpoint. This was the beginning of a new specialty solvent which has found application in numerous fiberglass plants from boat builders to fiberglass tank manufacturers.

Another innovative approach to selling industrial solvents was born out of a common waste problem. We noted that manufacturers using urethane foams and adhesives consistently shipped drums of solid waste

which was not recoverable. An investigation at the source of the problem turned up the culprit. The users were using methylene chloride to flush their spray gun application equipment after each pour of foam or adhesive. The flushing solvent was collected in drums where the foam or adhesive continued to polymerize into a solid, unrecoverable mass. Working with a manufacturer of urethane foam, we were able to develop a product that enhanced the cleaning ability of methylene chloride but blocked the polymerization of the foam so that the waste solvent remained in a liquid state and was acceptable for solvent recovery. Again, the most creative form of industrial solvent selling, finding a customer need and tailoring a specialty product to address that need.

There are basically three keys in marketing industrial solvents. First, and probably most important, is product quality and consistency. Whether you are marketing a refined industrial solvent or a virgin solvent, the end user must receive a product that performs consistently each time it is used. This is assured by maintaining manufacturing specifications that exceed your selling specifications. Laboratories play a major role in analyzing each product lot to assure quality and compliance with manufacturing specifications.

Second on the list of importance is reliability of supply. Although this is generally not a problem with virgin industrial solvents, many of us can remember the chaos caused in 1974 and 1975 when most organic solvents were put on allocation. Entire manufacturing operations had to shut down or greatly curtail their operations. This had a domino effect, throughout almost the entire manufacturing sector. With refined industrial solvents, this is a never ending problem.

One must keep in mind that the raw materials for a recycling operation are the waste products from industrial customers. There is always an imbalance between raw material feedstock and end user needs. In any given month you might be long on feedstock and short on users or visa versa. Contracting volumes, both incoming and outgoing, plays a major role in keeping a good balance.

Last on the list is price. This is largely dictated by supply and demand. Once again, reflecting back to the shortages of 1974 and 1975, we can remember industrial solvents selling for two or three times their value today. Certainly costs to produce play a factor in pricing. No manufacturer will be viable long-term if he can not sell his products at a reasonable return, which allows for investment and maintainance of his facilities. For the recycler of industrial solvents, the price of their products is dictated by the virgin solvent market, keeping in mind that most refined solvents sell at 80% of virgin product pricing. Profitability is maintained by controlling the raw material cost in direct relationship to the end product price.

The last form of industrial solvent sales from a recycling operation is the development of end use markets for products which are impractical to recover due to physical and chemical properties or economics. The use of waste derived fuels in cement kilns is the fastest growing segment of solvent recycling today. Not only is the amount of coal or oil used in these energy intensive businesses re-

duced, a market is growing for the use of industrial solvents which heretofore had no market end use. Wastes formerly sent to landfills or incinerators can now be recovered for their energy recovery value. As with all industrial solvents, strict compliance with quality control at the end users facility is the key element for success. It is estimated that over eight hundred million pounds now, or will shortly be recycled in this manner.

With the passing of stricter and stricter landfill regulations which will eventually ban all industrial solvents and the new regulations facing small quantity generators, the challenge continues to be finding economical alternatives for reuse of industrial solvents. As a recycler of industrial solvent manufacturer, the challenge is to remain creative with new products and new end use applications for old products, at the same time maintaining quality, consistency of supply and competitive pricing.

BROKERING OF INDUSTRIAL BY-PRODUCTS

David J. Jacobs

I have been asked to discuss what a broker can do for a waste generator and secondly, what are some of the techniques that a broker uses to market a by-product. My 18-year business experience has been involved with the scrap brokerage business. It is only within the past two years that I have gotten involved with the waste exchanges. However, both industries are similar in that they generate a by-product from manufacturing and it is the "How of Brokering By-Products" that I will discuss today.

I would like to begin by explaining what function a broker has in trading metallic and non-metallic wastes. I suspect that most people have a vague idea, but generally tend to lump brokers and scrap dealers together. Our roles are often quite different. Most of you would refer to a scrap dealer as a "junk yard". A dealer operates a wholesale processing plant, buying metal over the scale to process and reship for melting or refining. He usually operates this business in a local area much like the people in your community. The broker, however, is an individual or company whose basic function is a marketer or the marketing mechanism of the ferrous scrap and waste industries. A broker, by nature, functions over a much larger geographic or marketing area. His basic purpose is to develop, analyze and use information about the supply and demand for various kinds of waste streams and scrap. I do not mean that the sole function of the broker is to secure and supply market information to his customers. Rather, it is the use of this information to turn widely scattered and unconnected multitudes of waste and metallic scrap producers and consumers into an orderly market where these materials can be bought and sold in reasonable quantity, sizing and packaging at almost any time.

The broker takes the place of a waste or scrap exchange. The broker through his knowledge and information may help a cement company, refractory company, steel mill, chemical plant or aluminum manufacturer or other industrial concerns, either domestic or foreign, as the case may be, to decide on various matters.

These are matters such as the availability of industrial or dealers sources of metallics or non-metallics; where they may be procurred, in what volumes and how they might be packaged, and whether these sources are local, remote or foreign.

They also help determine the different values or prices assigned to a given item at any time and if the material can move by truck, rail or water. He also advises on the demand of other consumers and the availability of various types and grades of metallics or non-metallics as the case may be. For example, a broker may suggest that a metallic oxide from the lower part of the Mississippi River may deliver more cheaply by barge to a plant in Cincinniti or

Pittsburgh than a like material in that metropolitan area. At another time he may suggest that because of low demand that a higher value substitute product could be used in the customer's process and, therefore, temporarily be a better value. He may also suggest to the producer or consumer that by changing the size, the packaging or by altering the by-product chemically, that this would open new avenues to markets as supply sources.

The broker also supplies much of the financing needed to move materials from producer to consumer. Therefore, the word "broker" in the metallics recycling and by-product industry can be substituted for the term "wholesale merchant".

So now that you have a better feel for some of the multitude of things a broker does for the waste or by- product producer and consumer let me add one other. A broker must stay abreast of local state and federal laws. Everyone in this room touches upon this very subject at least weekly in the operation of our respective businesses. The worldwide environmental movement has severely disrupted the more traditional recycling patterns. A by-product or waste stream that was acceptable in the scrap cycle a few years or months ago can now be hazardous. In 1985 the average monthly exports out of this country of automobile batteries was 6,000 tons. This is 72,000 tons per annum. Through August of 1986, the average dropped slightly to 5,800 tons per month. From September, 1986 to January, 1987, this average plummeted to 2,700 tons per month. Why? Because of our Federal EPA enacting stricter regulations, restricting the export recycler from exporting batteries to a foreign nation without the written permission from the consumers government. This, ladies and gentlemen, is only one in a series of changes in the laws that deterred recycling and enhanced disposal.

Because of the threat that could arise from brokering waste metallics or non-metallics, many decisions are being made to vacate certain markets, and not to recycle but rather landfill waste products that heretofore had some real value as recycled materials, such as batteries, gas tanks, gauges and measuring devices for fear of radio activity; metallic sludges and drosses for fear of chemicals they contain; and appliances for inclusion of PCB's and/or cadmium, auto brake shoes for asbestos, steel drums, waste oil--the list goes on and on.

The reason for these decisions by brokers and processors to change or avoid the function of recycling is the law known as "Superfund". This law enhances three ominous concepts, the first being strict liability, the second joint and several liability and the third, no statute of limitations. I will not tackle superfund today but rather leave this subject to those of you who are more knowledgable than I.

This basically covers what a broker does for a client that produces or consumes metallic or non-metallic waste products.

4. Can we alter the waste stream with an element or elements to change the chemistry or physical properties to enhance its marketability?

5. Could we use this waste stream or by-product with another like stream or products and in that way enhance their value such as $CAO/AL_2O_3/MGO$.

6. Could our industry use this stream in such a way as to eliminate a more expensive product?

7. Last and finally, which companies in this industry are most likely to use this by-product?

Then it is just a matter of selling the ideas and through the process of elimination we arrive at the best possible home for our by-product.

In closing, ladies and gentlemen, I ask for you to consider how best to deal with your waste stream. Can you substitute materials, which is common in manufacturing, and effect a change in your product that will allow someone else to use your by-product as a raw material for manufacturing or would the purchase of additional processing or refining equipment create this change. I urge you to design your product so that it enhances the by-products recycability, which means designing out the threatening or potentially hazardous material from your manufacturing process and designing in a more marketable by-product.

FINANCING OPTIONS FOR SMALL WASTE GENERATORS

Dr. Tom P. Abeles, President
i e associates, inc
3704 11th Ave South
Minneapolis, MN 55407

612 823 3154

BACKGROUND

Waste management is a difficult issue for any size industry. And it is becoming increasingly troublesome as concerns for potential long term repercussions close more conventional options.

Small business has many unique problems. These include, but are not limited to:

1) low volumes, often not amenable to economic on site disposal or treatment,
2) spatial isolation from similar generators, and
3) disposal options which place stress on daily operations and economics.

Additionally, most small businesses do not have the resources to work effectively with regulatory and related governmental agencies, in an ongoing fashion, to create programs specifically dealing with their needs. Reciprocally, public sector agencies either reduce their attention to these generators or attempt to create options, often in an almost paternalistic fashion. Often the small waste generator is forced to operate under general rules developed for the larger entities.

Because of the radical difference in size, the giants and the micros co-exist without having to significantly interact until an accident or time raises the issue to the fore. Yet in this milieu, viable operational solutions do appear. These include:

1) small recycling businesses (collections and reprocessing)
2) more efficient and lower cost processing technology, and
3) Serendipitous alliances.

Yet, this does not necessarily relieve either time or fiscal pressures on the small waste generator.

Because of the difficulties of defining externalities, the hard decisions regarding waste disposal are reduced to economic terms-cost or perceived cost. And, the longer one waits to find viable alternatives, the higher the life cycle

costs become; especially when options become defined by regulatory agencies. This has proven to be the case in conventional sewage and solid waste solutions and will also be true in the non- conventional waste arena.

ORGANIZATION

For an optimum solution, size becomes a critical issue for a number of obvious reasons:

1) significant numbers provide pressure for favorable regulations,
2) organization provides critical intellectual mass in developing the best options, and
3) size can lower the capital costs and make available the best financing

Unfortunately, developing the critical mass takes one commodity which is not replaceable or bankable- **TIME**. Small business may be able to allocate some funds, but few have a surplus of available time in employee hours to devote to the development of solutions not directly related to the main thrust of the business. Thus, small business must optimize the small fiscal resources to conserve the key non-renewable or recyclable commodity-**TIME**.

In essence, not organizing or pooling resources to deal with physical waste management, creates a higher and most costly waste problem down stream. That down stream cost is lost hours in addition to lost funds or a polluted environment. The time is direct expenditure of the company as well as foreshortened lives of employees or ineffective use of employee time to correct a problem which materializes down stream in time as opposed to down the river. This still does not negate the need for adequate, timely and cost effective monies to create optimum solutions.

Proper organizations and use of organizations can maximize the type and availability of funds. Two types of organizations become most effective in this arena. The first is the trade organization which works across spatial bounds within the industry. The second is the organization which deals with local problems and may cross industry lines (Figure 1).

Trade organizations usually are larger and have greater capital resources. While most national organizations have raised funds, the majority of these monies have been used in advocacy activities rather than to provide substantive support for individual companies to develop solutions to waste management problems. Trade organizations need to explore new options for bringing capital to the assistance of member companies. This will be discussed below.

Similarly, local organizations have dealt more with issues, lobbying and similar intellectual and structural activities. Again, like trade associations, there are a number of creative ways that local groups can help solve individual corporate problems of their small business members.

Both of these alternatives can lead to strengthened organizations along with net economic benefits. We will focus primarily on the way these organizations can assist in bringing capital resources to the waste management problem.

FINANCING

For small businesses, capital for conventional operations is usually at a premium. Use of such resources for pollution management reduces availability for the main business. Development of alternative sources requires creativity if one is to go beyond the conventional appeal to government for such options as grants, low interest loans and tax concessions.

While government sources are an option which should be developed, numerous alternatives present themselves. Some are obvious, others will require "imagineering" to bring them into full force.

Trade Organization Financing

Trade organizations are often developed for both the corporations in the industry and individuals employed in the companies. Information, lobbying and promotion are only some of the underlying programs of these groups. Occasionally, there are over rides such as insurance, travel plans and related monetary benefits.

Few trade associations have looked at opportunities for providing capital support to members, though they often have significant financial strength. For example, pension plans and life insurance programs often have a sufficient capital base which can be leveraged or used as collateral.

Too often associations offer individual members such benefits without looking at the long term value to the organization and its corporate base. Careful evaluation and selection of such options can yield greater opportunities than they have in the past when properly selected and managed.

Because most of trade organizations are organized as not-for-profit, they tend to operate with an eleemosynary mind set. Thus, their mode of operation is similar to that of others organized in the same fashion. The management tends to lack an entrepreneurial or creative bent.

For example, it is possible to establish a series of for-

profit and non-profit organizations under one umbrella or holding company. Several foundations have done this while providing capital for profit making financial activities. Trade associations could structure such options for members for their own resources as well as provide the ability to tap into sources of funds.

The timing for such options is particularly opportune with the growing emphasis on "socially responsible" investment. Creation of such vehicles focusing on waste management could attract significant monies from a growing sector of the investment community. The trade organization, properly structured can tap into this resource.

Restructuring or creating a secondary organization can take advantage of other sources of both debt and equity capital. For example, the formation of a cooperative opens access to funds not available to traditional business organizations. Other structures open up opportunities into mutual funds, stock options, limited partnerships and related capitalization techniques.

The key element to note here is that the trade organization with both individual and corporate membership has the advantage of size which can be passed through to the smallest member. This leverages benefits which individuals and small waste generators could not otherwise access at the same level of efficiency and cost.

Local Organization Financing

Local organizations have an opportunity to cut across trade lines. Though, most are usually trade oriented. These could include hospitals concerned with "red bag" waste or electronic board manufacturing firms with plating wastes.

The advantages include working under common restrictions and opportunities as well as proximity for help and joint solutions. Here, cooperatives provide a strong opportunity from both a funding and management perspective. Additionally, local groups have the ability to seek centralized solutions whether service or hardware oriented.

Again, there are numerous ideas that can be tapped from the arena of socially responsible investing. For example, The Social Investment Forum has members with strong local and regional focus who seek to put funds to use to help the area. There are both debt and equity sources which can be tapped and the mechanism exists to even create these resources.

Similarly, there are hosts of funds, loan pools and related investment instruments which can attract both capital strength within the industry as well as local investment pools. These funds would then be tapped in more conventional

terms such as loans, leases, sale/lease backs, loan guarantees and related mechanisms.

The above point out what might be termed, as non-traditional strategies within the waste treatment arena. In reality, these and related options are conventional instruments in other financing and investment areas.

The advantages of such options are:

1) Creation of a larger pool of funds,
2) Provision of more control and flexibility in planning options in response to needs, and
3) Ability to better direct decisions in response to regulatory alternatives.

Conventional Options

Conventional options usually involve individual companies seeking financing on their own. Most owners utilize the above trade groups and local organizations to act as information filters and, perhaps, as lobby groups. This uses only a small fraction of the potential power residing in such organizations.

As individuals and companies, one then finds that traditional financing options reduce to cashflow financing through leases and loans, contract services and/or grants and government subsidies, without the synergism of group opportunities.

It is interesting that these options are often more costly. Examples from the area of community sewage treatment facilities cogently point out that, with respect to government programs, there is no such thing as a "free lunch". This is often due to the fact that government subsidies are often provided by the same agency which administers the regulations.

The irreplaceable element time, in applying for grants and subsidies is the first cost. Secondly, criteria which usually accompany such funds often lead to both higher capital costs and significantly greater life-cycle costs. Finally, many government criteria lead to systems (either mechanical or service) which are inefficient.

Conventional private sector financing too has its costs. This could include higher interest, time in selection of equipment and building a program and total responsibility for success or failure.

Analysis

Individuals and small businesses which have a waste disposal problem often operate in both an information and fiscal

vacuum. Thus, the first instinct is either to fight waste regulations or seek the path of least resistance in comoliance.

In so doing, few look beyond the informational and lobbying power of both local and national organizations. Thus, a major element, the potential financial strength, of these organizations is overlooked. This is true, not only with respect to waste management, but also with respect to other significant financial opportunities.

One of the oldest ootions for control and direction rests with traditional cooperatives for financing and supporting waste management. But, the creativity of financial management which now exists with deregulation and the growing interest in socially responsible investing open opportunities which have not even been discussed by small waste generators.

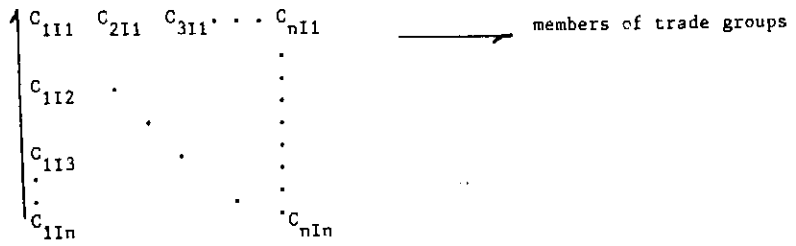
CONCLUSIONS

Organizing of small waste generators on both the local and national level have significant advantages:

1) Traditional opportunities:
   a) informational exchange, and
   b) lobbying and political development.
2) New opportunities in financing:
   a) attraction of selected private funds
   b) development of self funded programs using the strength of the organizations

For small waste generators, not utilizing the potential of organization generated fiscal opportunities can be extremely costly in both time and money. Time is a non renewable resource and, for this fact alone, mandates a new and more creative private sector approach to waste management financing.

members of local organizations
with the same waste problem



C= company e.g. company 1.2.3
I= industry

Thus, the first row represents different companies in the same industry and the first column represents different companies in the same industry.

Figure 1 The Universe of Companies and Industries. Trade groups have industry specific focuses but may have different waste problems. Local groups will have similar problems but cut across industries. Trade groups tend to be stronger financially and thus usually provide better opportunities to assist members. Local groups tend to provide more peer group support.

PROCESS FOR FORMING A SMALL QUANTITY GENERATOR COOPERATIVE

William Stough
Waste Systems Institute

PART I - INTRODUCTION

In 1976, the Resource Conservation and Recovery Act (RCRA) was enacted by Congress. RCRA is the major federal law governing the management of solid and hazardous waste. It establishes the basic regulatory framework for waste generation, treatment, storage, transporting and disposal. Abandoned and inactive waste sites are regulated by the Comprehensive Environmental Response, Compensation and Liability Act (Superfund) and other laws.

Small quantity generators (SQGs) who produce up to 2200 pounds of hazardous waste per month became part of the RCRA regulatory system on November 8, 1984 when the Act was amended by Congress and signed by the President. The SQG provisions specified for the first time that previously unregulated businesses could receive both civil and criminal penalties including jail and, or fines for noncompliance with SQG regulations.

The Environmental Protection Agency estimates the new regulations will affect an additional 175,000 businesses nationwide. Some states have assessed the potential impact on businesses within their jurisdiction. Michigan, for example, estimates the new small quantity generator regulations could mean an additional 18,000 businesses would be brought into their hazardous waste management system.

The impact of the new amendments have left thousands of small and medium-sized businesses struggling to comply with the new SQG regulations at prices they can afford. Surveys have indicated that SQG's primary concern in selecting hazardous waste management options is cost containment although, many firms are worried about liability as well[1]. As SQGs they often have difficulty finding vendors, scheduling shipments and arranging analytical services. SQGs usually end up paying premium prices because of "less-than-truckload" (LTL) shipping rates and stop charges.

In addition, the typical SQG is confused about environmental regulations and services. They normally do not have an environmental specialist on the staff who is

familiar with waste management options and regulatory requirements. Such limitations dictate that existing staff (plant engineers, managers, buyers or executives) assume these responsibilities in addition to their regular duties.

On an individual basis, waste treatment, storage or disposal facilities usually give priority to customers that generate large volumes of waste. If the SQG can obtain service at all, they usually must experience long delays between the time a sample is submitted for approval and a cost estimate is returned and final arrangements are made for treatment or disposal.

One option that has the potential to reduce the problems SQGs are confronted with individually is for like-groups of SQGs to organize into "Generator Cooperatives". A SQG Cooperative allows the administrative pooling of a group of individual members' wastes, the coordination of waste shipments, collective bargaining with waste management vendors for better rates and services its members as a clearing house for information. SQG Cooperatives could allow members to pool their similar waste streams and achieve economies of scale through collective negotiation for a predetermined level of management services. Even though this concept has been promoted for several years[2], the typical SQG and their trade associations lack the time, resources, understanding and background to develop and operate a Cooperative hazardous waste management system.

Waste Systems Institute has received funding from EPA Region V to develop a model processes and procedures that can provide continuous guidance to SQGs and other parties interested in organizing SQG Cooperatives. The model is designed to be generic in the sense that it will provide basic information on a process that could be utilized by any interested group by inserting data specific to their circumstances. The model presented attempts to anticipate the major organizational relationships that could develop between generators, trade associations, government agencies and vendors considering how a Cooperative is initiated and how its management structure is determined. It should be noted that an infinite number of formal and informal arrangements are possible. Even so, we believe the model presented will provide valuable guidance for groups wishing to investigate its benefits.

PART II. FORMATION OF A SQG COOPERATIVE

Who Will Take The Lead? There are many ways a SQG Cooperative may form. It could be from the realization by a single business person that there has to be a more efficient and cost-effective way to manage their hazardous waste, or from a trade association that decided to respond to requests from its members for assistance. In some cases, a hazardous waste management service vendor has initiated informal Cooperatives in the form of scheduling coodinated pick-ups (milk-runs). Whatever the mechanics, a central theme is that type of each initiator has realized that there are potential benefits to be obtained by approaching the management of small quantities of hazardous waste as a group rather than as an individual. An underlying intent of this project and the model guidance is to provide direction to both private and public sector interest on how to stimulate and accelerate the development of SQG Cooperatives. Although Cooperatives may develop on their own over time, it is felt that this type of management system offers great promise and should be promoted, studied and implemented (where practical) on an accelerated basis.

The first step in organizing a SQG Cooperative is determining if there are enough small quantity generators with similar wastes (Department of Transportation compatable) or geographic interests. Normally, the easiest method is to work with a business or trade association or even a vendor who is already servicing the area, although it is possible that an individual could establish a network of businesses that generate compatible wastes on their own. Once it is determined that enough interest exists, the next step is to determine who will lead the effort.

Identifying the individual agency or organization to act as the focal point is critical. As will be discussed later, the decision on who the lead agency or individual is will affect how well the effort is publicized, managed and the level of liability incurred. It is possible for any of the available alternatives to be successful in leading an effective SQG Cooperative. However, the decision is important and should be evaluated carefully and a choice made that is best suited for the conditions present.

LEGAL STRUCTURE

An important issue to consider at this point is the legal implications of the business structure the Cooperative's organizer selects. Consultation should be sought regarding structuring the Cooperative in one of either an informal group, a limited or general partnership, or as a corporation (profit or non-profit). In general, a corporate entity will provide the most protection. Although in certain circumstances it may be appropriate to consider the use of a limited or general partnership, a limited partnership typically provides greater protection against liability than a general partnership. A corporate general partner and limited partners "who could be the various participants in the cooperative" may be a useful structure where the manager (e.g., vendor) is the general partner. If such a limited partnership is used, care must be given to follow all limited partnership formalities required under law.

FINANCING

The structure and day-to-day operation of the Cooperative is another important element to be considered early in the initial planning. The most common form of financing is through user fees. This consists of a general membership fee paid annually for program administration and overhead, plus direct costs for actual services rendered to individual members. Other options exist, such as; local, state or federal grants, or possibly; financial institutions such as, the National Cooperative Bank that specializes in making loans to cooperative business ventures.

MARKETING/PROMOTING SQG COOPERATIVES

Marketing the availability and benefits of a SQG Cooperative is essential to a successful effort. It is brought up at this early point to emphasize that education, promotion and solicitation of members is an ongoing process. Marketing and promoting will be the "spark" that ignites any effort to move toward further cooperative development and, therefore, must be considered early and continued throughout. Initially, educational efforts will be necessary to stimulate interest in participation. Announcements in trade association newsletters, local papers and direct mail flyers are

effective ways to contact SQGs. Printed announcements should outline the problem, explain the proposed solution and ask interested parties to contact representatives at listed phone numbers for further information.

The formation of a SQG Cooperative can be promoted by holding joint meetings of interested individuals and/or business and trade groups. Common problems of individual SQG hazardous waste management can be identified and discussed. Advantages of forming a Cooperative can be presented that identify potential cost savings in reduced administrative time spent, increased access to laboratories, treatment, storage and disposal facilities and lower transportation costs due to the collective increase in waste volume available. In addition, a major advantage is the assurance that through the Cooperative, compliance with hazardous waste management laws and regulations are greatly enhanced.

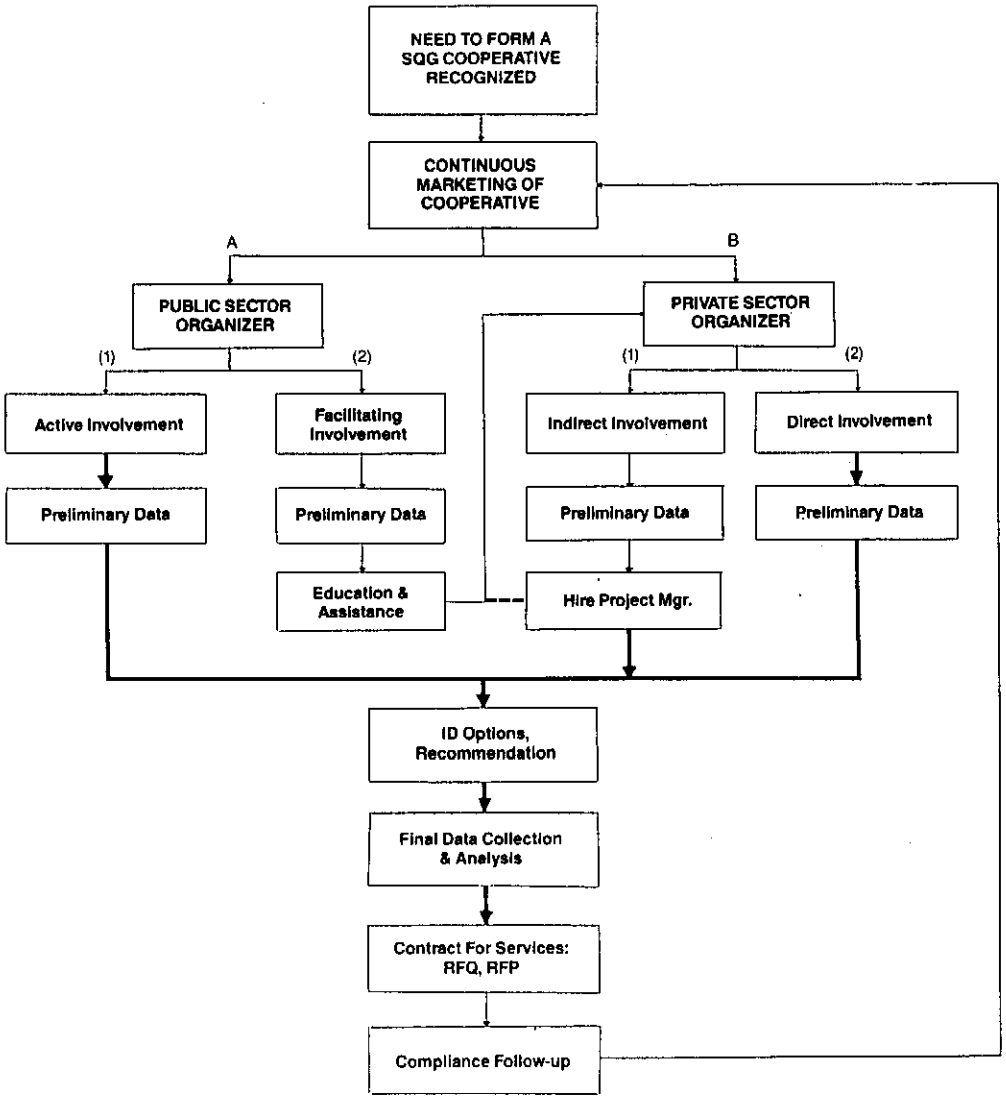
Education, promotion and member solicitation must be a continuous process through all stages of development. It is likely that membership in the Cooperative will fluxuate with old members leaving and new members joining. Additionally, regulations and requirements, as well as service options, will constantly change. An active marketing effort initiated early in the development of the Cooperative and carried on throughout the process will ensure that participants are active, knowledgeable and responsive to changing conditions (see D in flow chart).

PART III, POTENTIAL MANAGEMENT STRUCTURES

As mentioned earlier, the selection of the lead agency, organization, or individual will have major ramifications on how the Cooperative is eventually structured. Again, there are an infinite number of potential management structures possible, so this document will attempt to address those structures that are most likely to develop. These consist of two major alternatives, one is initiated from the public sector and the other from the private sector. Under each of the two major alternatives, there are additional options such as agreements or arrangements between the public and private sectors and a sharing of responsibilities. This section of the paper will identify some of these options and discuss how they might work.

DRAFT

MODEL SMALL QUANTITY GENERATOR COOPERATIVE ORGANIZATIONAL AND MANAGEMENT OPTIONS FLOW CHART



Potential Liability ———

PUBLIC SECTOR ORGANIZER

Public sector organizer (see A on the flow chart) refers to government involvement in the process of initiating a SQG Cooperative and includes boths regulatory and advisory forms. There are existing examples of government involvement that range from a state-wide program such as the one initiated by the Minnesota Waste Management Board[3], to the local program recently initiated by the Washtenaw County Department of Public Works[4]. The Minnesota program exemplifies a comprehensive approach with active involvement in the management of the program. Conversely, the Washtenaw County example is a model created for facilitative involvement in the development of a SQG Cooperative(s). With respect to the liability of a public entity, it should be noticed that sovereign immunity may become a factor in some states.

Active involvement (refer to A(1) on flow chart I). The Minnesota example illustrates how active a government agency can become in initiating a SQG Cooperative. The lead agency in this case is the Minnesota Waste Management Board (MWMB). MWMB has statutory authority to encourage and assist developers in the establishment of a statewide commercial hazardous waste collection and transportation system to serve generators of hazardous waste, especially small quantity generators. Through grant money made available from the State Treasury and a Request For Proposal (RFP) designed and administrated by the MWMB, the agency has initiated and retained ultimate management authority for the creation of a comprehensive state-wide SQG Cooperative.

Requirements placed on respondents to its RFP included the following elements that had to be made available statewide at reasonable cost to generators who wish to use it:

1. A hazardous waste collection service;
2. Assistance to clients about on-site waste management;
3. A shipping coordination service; and
4. A brokerage service to ensure acceptance of wastes at appropriate processing and disposal facilities.

Active involvement by a public sector organization is exemplified by an aggressive role in the initiation, design, promotion, establishment and overall management authority and assumed liability of a SQG Cooperative program (see Appendix A).

Facilitative Involvement (refer to A(2) on flow chart I). In Michigan, Washtenaw County has approached the SQG issue from a slightly different perspective through its Hazardous Substance Panel. As a public sector agency, the WDPW is still the initiator concerned with establishing assistance and services to SQGs. However, it has limited its management involvement to information collection, community outreach/education, technical assistance and enforcement. In essence, taking the program up to the stage where a SQG Cooperative would be ready to form (see Appendix B).

The WDPW would gather information on SQG characteristics in the county through various public sources (i.e., state permitting and manifest data, tax assessor, townships, planning documents, etc.) to determine approximate number and location of establishments, initiate door-to-door surveys of identified establishments and inventory waste streams and determine the level of technical assistance required.

Community out-reach and education programs would be focused on business groups, local governments, community forums, universities and the news media to increase SQG awareness of hazardous waste management regulations and technical assistance programs available. Planning and zoning regulations would be utilized to minimize mismanagement and a Pollution Incident Prevention Plan (PIPP) would be required for new building permits. Finally, Washtenaw County would promote compliance with all applicable laws.

The Washtenaw County's model would set the stage for the development of a SQG Cooperative. Development could then be transferred to the private sector for implementation. Passive involvement by a public sector organization refers to actions that lead toward the initiation of a SQG Cooperative without the public sector initiator assuming an active involvement in its implementation, overall management and liability.

PRIVATE SECTOR MANAGEMENT

Private sector management (see B on flow chart) involves a non-government entity taking the lead in forming and managing a SQG Cooperative. There are many structures possible in the private sector, the final arrangement will depend, in large part, on the human, institutional and

financial resources and incentives available. Under each structure, legal ramifications must be considered and analyzed. Some of the major options include the following:

1. One Trade Association - In this option, a single trade association would take the responsibility for initiating the concept. It would identify members interested in participating, identify the scope of issues needing to be addressed, research potential options and make recommendations for action. The trade association could decide to allow participation by non-member SQG with compatable waste streams.

2. Group of Trade Associations - Joint meetings could be sponsored by several trade associations or business groups to investigate the feasibility of providing Cooperative waste management services to their members under one program. The basic stages of development would be the same as No. 1 above.

3. One Vendor or Group of Vendors - With this option, a vendor or group of vendors could take the initiative in developing a SQG Cooperative. One vendor (i.e., hazardous waste transportation firm) could organize individual SQGs to form a coordinated pick-up for treatment, storage or disposal of compatable wastes. A group of hazardous waste management vendors could combine efforts (i.e., an environmental consultant and a transportation firm or TSDF) to develop and manage a SQG Cooperative.

4. Individual SQG(s) - Individual SQG(s) could initiate the formation of a Cooperative by identifying other businesses that could utilize similar hazardous waste management. Management of the Cooperative might come from the individual responsible for initiating the program or from a group of participating individuals.

Each of the above management options listed also have to identify the level of management they wish to undertake. In this report, two levels are identified; Indirect and Direct Involvement (see B(1) and (2) in flow chart). The two levels roughly correspond to the passive and active involvement in the public sector.

Indirect Management Involvement. This involvement refers to a Cooperative being managed on a day-to-day basis externally. The entity that undertakes the establishment

and development of the SQG Cooperative identifies participating businesses and collects preliminary data on waste types and quantities generated. At this point, the cooperative either makes a recommendation to contract management services at a specified level or contracts with a management firm to recommend the level of management required and then perform it. Indirect involvement minimizes technical and legal responsibilities to the Cooperative by hiring outside vendors.

Direct Involvement. Direct involvement like its active counterpart in the public sector takes responsibility for all functions required to initiate, develop and manage day-to-day activities of the Cooperative internally. Planning, scheduling, billing and compliance follow through could be the direct responsibility of the Cooperative manager. All contracts with outside vendors, including establishing specifications for service and negotiation of prices, would be accomplished internally. Thus, all technical and legal responsibilities would remain in-house.

Other Options. Many combinations of the two options described above are possible. For example, a combination of the internal/external management could evolve establishing a division of management responsibilities such as a situation where the day-to-day management is primarily external to the Cooperative yet billing could still be internal because of existing computerization or accounting systems. Each Cooperative must determine how existing resources could best be utilized.

PART IV - PRELIMINARY DATA COLLECTION

After the Cooperative's lead entity has been identified, interest assessed, availability marketed and level of management commitment agreed to; it is time to start collecting information that will act as a baseline for future decisions. A stage of preliminary data collection is needed. This data will probably be insufficient to enable the Cooperative to sign a contract with a TSDF, yet will be essential to determine the level of service that needs to be offered to participating SQGs.

At this stage, the information sought will be most valuable to the individual SQGs. The first step is to acquaint SQGs with the regulations that mandate their

compliance. The second step is to have each SQG complete a self-assessment of the waste types and quantities they produce. Finally, an estimate must be made of the cost each SQG would have to pay for administration and management of their hazardous wastes under present conditions.

Regulatory awareness, regarding the SQG's requirements must be presented to participating firms in an easy-to-understand format. A half-day presentation aimed at the individual shop managers responsible for waste management should detail why the regulations were developed, what the requirements are and what steps they must take to be in compliance.

Self-assessment of waste generation is also an excellent educational tool. Experience has shown that most SQGs will not be able to undertake a thorough waste audit by themselves. However, this exercise is benificial as it allows the generator to experience the range of waste generating activities that should be considered. A simple chart detailing generic waste generating activities down the side and generic waste streams across the top can be very useful in this self-assessment. It not only increases awareness of the scope of the problem, but it can also generate enough general data to make basic decisions on individual SQG regulatory status and level of service needed by the Cooperative. More detailed and thorough data collection and analysis will be collected at a later stage.

Estimating range of costs can be accomplished with the data collected to provide a baseline for later decisions. First, each member of the Cooperative will want to know what it would cost to manage their wastes in compliance with the law on an individual basis. The self-assessment will allow a benchmark to be established through estimates from outside vendors. Also, eventhough the collected waste types and quantities data from individual Cooperative members is likely to be under-estimated, it should give the Cooperative's lead entity enough information to determine the level of service ultimately required by the Cooperative, and provide a basis for the generator to compare the benefits of a Cooperative.

PART V - LEGAL LIABILITY AND LEVELS OF SERVICE SELECTED

After the Cooperative has collected enough preliminary data to get a "feel" for the level of service required from its members, it must then decide how involved it will become in the day-to-day management of the Cooperative. This is a crucial decision, because in making this decision, the Cooperative commits itself to the level of legal liability associated with the service offered. Generally speaking, the more directly involved the Cooperative is in "arranging for disposal" the more liability it will assume.

As a starting point, it should be emphasized here that under the Resource Conservation and Recovery Act[5] (RCRA), a generator that produces hazardous waste is liable for ever (as long as it remains hazardous) for that waste once it leaves the site of generation. Under the Comprehensive Environmental Response Compensation and Liability Act[6] (Superfund), generators of hazardous substances discovered at a Superfund site are strictly liable for investigative and clean-up costs. Under past Superfund case law; corporate officers, managers and shareholders have been held liable when they were found to be directly involved in the management of hazardous wastes.

Because there are several levels of service that any potential SQG Cooperative could provide its members, the level of liability assumed will be different. It is believed, that a full range of options exist from no additional liability for the Cooperative, to maximum liability for the Cooperative in managing its members' hazardous waste needs (see flow chart for estimate of when liability is assumed). Under both public sector and private sector alternatives, an option exists to either assume full liability (active or direct involvement A(1) + B(2)) or differ liability to the minimum level possible (facilitative and indirect involvement A(2) + B(1)). The following descriptions will try to combine the major levels of service options available for a Cooperative to consider and the potential liability inherent in each options. The descriptions will begin with the lowest level of liability and progress to the highest.

LIABILITY OF POTENTIAL SERVICE OPTIONS

A. Cooperative organizer hires coordinator or vendor(s) to administer full program. Under this option, the

Cooperative's lead individual or organization has activated the process by determining that a Cooperative needs to be organized. Steps may have been taken to assess interest and meetings may have been held to determine if financial incentives and support for a Cooperative is available. At this stage, the organizer(s) turn the entire program over to an individual, a company or a consortium of individuals or companies to develop, organize and arrange for the management of the Cooperative's waste management needs. The Cooperative probably would be shielded from liability because it has hired another entityt to collect and analyze data and arrange for the treatment, storage or disposal of the members' hazardous waste. Individual generators (Coop members) still retain their generator liability. However, the Cooperative as an entity is not directly involved in deciding how or where the waste will be managed and has protected itself from liability as much as possible.

B. Cooperative organizer(s) collect preliminary data, hire a Project Coordinator to select vendors and service members. This option takes the process in "A" one step further. The Cooperative becomes actively involved in not only the initial organizing and interest assessment, but also in preliminary data collection as discussed previously. Such information collection & organization could include training and educational material, self-assessment by members of waste types and volumes and a basic determination of level of service required to operate the Cooperative. Before any decisions are made that could be interpreted as arranging for actual disposal, a Project Coordinator is hired. Again, the Project Coordinator could be an individual, a company or a consortium of either. However, the Coordinator would make all decisions leading to final disposal for members of the Cooperative. It is possible that the Cooperative as an entity could protect itself by not being directly involved in arranging for disposal.

C. Cooperative organizer collects and analyzes data, recommends Cooperative members contract with pre-approved vendor(s) on an individual basis. This option goes slightly beyond preliminary data collection by including an additional step by the Cooperative of assessing and recommending one or more vendors. In this option, the Cooperative would be

determining the level of services its members require and then evaluate one or more vendors that have the ability to provide those services. In some cases, associations have provided their members with a list of transportation, treatment and disposal services that meet predetermined minimum standards. Individual members are then left on their own to decide which vendors to hire. This option, while generally considered to place little or no liability on the organizing entity, is still somewhat a gray area since recommending specific vendors could be interpreted as "arranging for the disposal" of hazardous wastes. This option should be judged against local options (e.g., availability of vendors and level of services offered) to determine specific levels of liability.

D. Cooperative organization administers full program. In this option, the Cooperative assumes full responsibility for operating the program. It provides all services internally through existing or new staff. Decisions are made on marketing, education, training, data collection, level of service requirements and hiring of transportation, treatment and/or disposal services directly. In this case, the Cooperative maintains complete control over all administrative functions including the final decision on service contracts. In this instance, the Cooperative probably has assumed liability since it has taken an active role in the day-to-day management of the waste disposal activities of its members and played the major role in "arranging for hazardous waste disposal".

PART VI - PROJECT COORDINATOR OF COOPERATIVE COLLECTS FINAL DATA AND SELECTS VENDOR(S)

At this stage of the Cooperative's development, it is assumed that several milestones have been passed. First, the Cooperative has been formed, members have been solicited, educational material has been developed and distributed, preliminary data has been collected and a person or company (Project Manager has been assigned the responsibility of managing the day-to-day operation of the Cooperative.

Before the Project Manager can commit the Cooperative to a specific management option, a more thorough analysis of the waste types and quantities from members will be

needed. This differs from the preliminary data collection undertaken earlier in that under most circumstances, this analysis will be done by a professional. It will provide specific information that will allow the Project Manager to obtain the level of service required and will consist of some of the following activities:

A. Professional walk through audits that provide a comprehensive analysis of the entire scope of wastes generated must be performed. The audits should investigate purchasing records of all raw materials that could be hazardous wastes and compare them to the volume of hazardous wastes that are manifested for treatment, storage or dispoal. A walk-through of the operations should identify all activities that generate a hazardous waste including waste handling and storage, and enable the auditor to quantify the amount of wastes generated. If the total amount of the total of waste generated exceeds 100 kg/mo, which would exempt the firm from regulation, the auditor should initiate the application to obtain an EPA identification number, assuming this has not already been done (see Appendix D). If the Cooperative has a large membership (50 or more), random audits could be completed and the results extrapolated for the entire group. If the group is small, the audit could be given to each member.

B. Identify waste minimization opportunities that are available to reduce the volume of hazardous waste generated. Usually the largest gains can be made at very low cost through implementing good housekeeping practices such as using and reusing materials in-house as much as possible, recycling and reclaiming waste when allowed, treating waste to reduce its hazard, or reducing the amount of waste generated. Opportunities to reduce the waste generated or to eliminate the need to "manage" as hazardous include: not mixing nonhazardous wastes with hazardous ones, avoid mixing different types of hazardous wastes together and avoid using more hazardous products than you need substituting with non hazardous products.

C. Audit potential treatment, storage and disposal facilities that could be used by the Cooperative. At a minimum, the following information should be collected and analyzed: type of facility; name, address, phone number, contact person; EPA/State identification or permit number; material accepted;

forms needed; lab testing capabilites and price; operation records, personnel training, contingency plans, insurance coverage and past-permit violations; and past disposal rates. In addition, a walk-through inspection might be undertaken to assess the general facility appearance: controlled access, fencing, housekeeping, detectable odors or visable emissions, placement of safety equipment and fire protection.

Part VII - QUALIFICATIONS AND SELECTION OF VENDORS

At this stage, the Project Coordinator has collected the essential background information to initiate a search for qualified vendors to service the Cooperative. In some cases, a formal Request For Qualifications (RFQ) may be required. It should ask potential respondents to provide detailed answers to basic questions on their background. Once potential vendors have been evaluated, a formal Request For Proposal (RFP) can be sent to approved vendors. Information that should be included on both the RFQ and RFP are outlined below.

REQUEST FOR QUALIFICATIONS

The RFQ process is essential if the Cooperative's managers have had little interaction with the hazardous waste management vendors offering service in the area the Cooperative is operating in. In this case, basic information will help identify potential vendors that have a history of being managed well, have sufficient financial resources to service its customers and have demonstrated an ability to comply with the law. In instances where the Cooperative's manager has a good working knowledge of these issues, this step may not be necessary.

A. History - it should inquire about the history of the firm, how long its been in business, what areas it operates in and background information on the owners and principal managers.

B. Service - what are the range of services. Are they a full service firm; transportation only; provide consulting and laboratory analysis; do they offer recycling, treatment or disposal services?

C. Clients - will they provide a list of past clients, the type of service provided and the dates provided?

D. Insurance Varification/Financial - ask for copies of insurance certificates required by state or federal law and a recent financial statement that can be compared with other published literature (i.e., Dunn & Bradstreet).

E. Compliance - do they have outstanding permit or other violations and if so, whaty was the nature of the violation and actions taken to remedy (verify with local regulatory agency).

REQUEST FOR PROPOSALS outline the areas of service desired and the level of detail each service should be performed (see Appendix A). RFPs are usually sent to vendors that have been prequalified through either a formal RFQ process or working knowledge of the firm's capabilities. Should a formal RFP be required, it should contain enough information to give the person receiving it enough data to provide a reasonable estimate of the price that would be charged. A SQG Cooperative should consider the following elements in preparing a formal RFP:

A. Background - should describe how and why the project came into being, and what is the goal of the RFP (e.g., to obtain proposals and pricing to service the ABC SQG Cooperative).

B. Project Requirements - list all of the elements that the vendor should address in preparing the proposal. In the case of a comprehensive full-service program, the following elements might be considered:

1. Waste identification, process and hazard determinations.

2. Waste stream sampling and analysis.

3. Storage method to be utilized by Coop participants.

4. Pre-transportation preparation of packaging, labeling and Department of Transportation specifications involved.

5. Training of Cooperative members in vendor management procedures and regulatory compliance.

6. Transportation management including method used in scheduling pick-ups and waste destination options.

7. Management of records, bookkeeping and billing.

8. Description of services the vendor would not undertake, if any, and an explanation as to why.

9. Compliance follow-through.

C. Deadline for submission of proposals.

D. Terms of final contract.

PART VIII - COMPLIANCE FOLLOW THROUGH

Ideally, establishing a SQG Cooperative will provide a reduction in cost to individual members because of the economics of scale employed over each member contracting independently. However, it should be noted that since many SQGs have not yet begun actively managing their waste streams, any cost may represent an increase over existing costs. A second benefit could be "headache" reduction to participants as the administration and management can be centralized to provide greater efficiency through standardization. Also, in many cases, the largest benefit to members of the Cooperative might well be the knowledge that with the Cooperative's assistance, they are achieving a high level of formal, documented compliance to applicable laws and regulations and, thereby, minimize future liability.

This is one area where the Cooperative can offer a major incentive for members to participate. Current regulations require the establishment of programs that most SQG find difficult to develop on their own. The Cooperative could help develop additional services to make compliance easier.

A. Assistance in filling out uniform manifests.

B. Prepardness and prevention plans.

C. Contingency plans and emergency procedures.

D. Changes in law and regulations.

E. Waste minimization follow-through.

F. Continued member employee training.

The Cooperative could become a central source of regulatory and technical assistance to its members by providing either internally through its members or externally through its vendors, a basic information that alone SQG might experience difficulty in obtaining at an acceptable prices.

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5. Resource Conservation & Recovery Act, 40 CFR, Parts 124, 260-268, 270, 271 and 280

6. Comprehensive Environmental Response Compensation and Liability Act, of 1980 (42 U.S.C., 9601 et seq)

LIST OF APPENDICES
(not included)

A. Request for Proposal to Develop Hazardous Waste Collection and Transportation Services, Minnesota Waste Management Board

B. Recommendations for Small Quantity Generator Program, Washtenaw County, Michigan, Department of Public Works

C. Instructions for Completing Daily Hazardous Waste Inventory Chart, Waste Systems Institute

D. EPA form 8700-12 Notification of Hazardous Activity

COPING WITH "BEAR" MARKETS: USED OIL COLLECTION AND MARKETING

Janet Graham, Project ROSE Coordinator

Project ROSE stands for "Recycled Oil Saves Energy."* Project ROSE is a State of Alabama energy conservation program that is sponsored through The University of Alabama. Its goal is to help Alabama citizens conserve a valuable natural resource - used oil - while preserving the environment. Our program was organized approximately ten years ago by Dr. Gary C. April at The University of Alabama. It was begun during the oil crisis created by OPEC during a time when energy conservation was highly important. However, the environmental conservation that results from recycling used oil is an equally important aspect of our program. Used oil is a substance that cannot be disposed of in a manner that is aesthetically pleasing or environmentally safe.

Oil only gets dirty . . . it never wears out. It can be cleaned up and reused indefinitely as a re-refined motor oil or can be processed as a used fuel oil and returned to the market as a consumable product.

The following slide presentation will give you an overview of Project ROSE and its two goals: to assist the "Do-it-Yourselfer" (DIY) used oil changer in recycling used oil at Project ROSE Collection Centers around the state and to operate a waste exchange for used oil and coordinate the collection and recycling of used oil throughout the state.

RECYCLING USED OIL

The narrative of "Project ROSE: Keeping Alabama Beautiful Through Used Oil Recycling" follows:

"From the Tennessee Valley to the Gulf of Mexico, Alabama is a beautiful state. Her mountain streams, her rivers and lakes, her bays and bayous, provide a gracious variety of opportunities for outdoor sports, family fun, and peaceful contemplation. Her forests and beaches, meadows and hillsides are filled with wild creatures who coexist with the people of Alabama, people who respect the importance of keeping balance with nature.

"Alabamians have traditionally been self-reliant people who took care of themselves and their land with equal attention. But today, one aspect of that self-reliance is in conflict with keeping Alabama beautiful and clean.

*Project ROSE is a non-profit program funded by the Alabama Department of Economic and Community Affairs. For further information contact Project ROSE, P. O. Box G, Tuscaloosa, Alabama 35487-9644, Telephone (205) 348-4878.

"Whether it is done from a lack of knowledge or the lack of a better alternative, improper disposal of crankcase oil is making areas that once looked like this (beautiful and scenic), look like this (ugly and dirty).

"But there is an alternative to dumping for Alabamians who change their own oil, an alternative that makes sense both environmentally and economically: recycling used oil through Project ROSE.

"Project ROSE is a non-profit program at The University of Alabama that provides a way for do-it-yourselfers to dispose of their used oil safely. Project ROSE is important because that improper disposal of used oil - either through dumping on the ground, pouring into sewers, spreading on roads or livestock, or burning - is contaminating Alabama's water supply and polluting the air. Crankcase oil drainings are the biggest single cause of oil pollution in our streams and rivers. They also account for forty percent of the oil pollution in our harbors and waterways.

"Oil that has been used in an engine is not used up - it's just dirty. Dirty enough, in fact, that the EPA is sufficiently concerned to regulate its disposal. Used oil contains cancer-causing agents and metal contaminants that filter into the water supply when the oil is dumped.

"It doesn't take much oil to cause real problems: just one part of oil per million parts of water can cause a change in the taste and odor of drinking water. Thirty-five parts per million can make a visible oil slick that can damage aquatic life. The one pint of oil can cause an oil slick that covers an acre of land.

"When you consider that six million gallons of used oil are dumped in Alabama each year, you see the size of the problem.

"But this is a problem we can solve. Since used oil is only dirty, if it is properly disposed of it can be re-refined and used as a lubricant or as fuel oil. By recycling your used oil, you not only protect the environment, but you help safeguard the future by conserving a non-renewable resource.

"Forty-two gallons of crude oil must be refined to produce two and a half quarts of lubricating oil, but that same amount of lubricant can be produced by re-refining only one gallon of used oil. If everyone in America recycled used oil, we could save 1.3 million barrels of oil per day, and cut petroleum imports by 25.5 million barrels each year.

"Other countries have successful recycling programs for used oil. For example, West Germany recycles 70 percent of all its used oil. If you're wondering about the quality of recycled oil, you should know that Mercedes-Benz uses re-refined oil in its new cars!

"Through Project ROSE, we can be just as successful at recycling used oil here. Project ROSE is made possible by the cooperation of city governments that provide curbside collection services and individual businesses that allow their tanks to be used as holding drums for individuals' used oil. These city and individual collectors then sell the oil to re-refiners and to re-processors.

"Participation in Project ROSE is easy. In some parts of the state, your used oil will be picked up along with your garbage and held for a collector. In areas without curbside pickup, you can take your oil to a collection center in your area.

"Here's how to prepare your oil for recycling: next time you change your oil, let it drain into a bucket, then pour it into a resealable plastic container, like a gallon milk jug. Just leave it by the curb, or take it to a collection center, depending on the service your area has.

"That's all there is to it.

"When it's time to change your oil again, think of all the things you like about Alabama's outdoors... think about the importance of a clean environment, not just for us now, but for generations to come... and join other concerned Alabamians who are doing their part to keep Alabama beautiful and safe by getting their used oil to a Project ROSE Collection Center."

USED OIL WASTE EXCHANGE AND COORDINATING COLLECTION

The waste exchange that Project ROSE has developed is a directory or listing of used oil collectors, handlers, and recyclers. Waste exchange information is provided to collection centers, collectors, and recyclers through two toll-free in-state telephone numbers. Project ROSE coordinates collection between collection centers and the used oil collectors.

The collection service provided by collectors, transporters, and recyclers in the past has generated some revenue for collection centers because the collector/recycler would pay a minimal fee for used oil pickup, somewhere between 20 and 25¢ per gallon. However, the drop in used oil prices has created recycling impediments. Used oil collectors now are picking up used oil as a service, but not paying for it or are charging a nominal fee of 5¢ - 10¢ per gallon for pickup. This price is determined by the current market value for used oil. It may also be dependent upon the quality of the used oil they are picking up, the volume, and the distance they have to travel.

Used oil is marketed as a re-refined motor oil or as a reprocessed fuel oil. Reprocessed or used fuel oil is generally settled, separated, and sometimes blended by a reprocessor and marketed for burning to the industrial sector - primarily asphalt

plants or cement kilns. Settling can remove the particulates or metals and solids found in used oil. Separation will remove the water from the oil thus enhancing the quality of the oil and increasing the volume of used oil that is available for marketing as a fuel. However, reprocessing can not remove any of the contaminants that are found in used oil. These contaminants are primarily the result of the additive package which is added by the manufacturer to improve the performance of oil as a lubricant. Used oil is also contaminated by engine blow by. Therefore, a reprocessor can improve the quality and quantity of used oil by settling, filtering, and separating the oil from solids and water. But the used oil product they have processed still contains heavy metals and other contaminants that are part of the additive package.

Re-refining involves the clean up of used oil through an acid clay treatment or a distillation process. The re-refining process actually removes the contaminants found in used oil from the additive package, engine blow by, and any lead that result from its use as a lubricant. Re-refining as opposed to reprocessing is a much more expensive process; therefore, the product, re-refined motor oil - costs more than reprocessed fuel oil which sells for around 40 - 45¢ per gallon. Re-refined motor oil sells for around $1.50 per gallon.

In the United States most used oil is reprocessed as a fuel oil simply because very few re-refiners are still in operation. Currently only six companies are re-refining used oil as re-refined motor oil. Therefore, approximately 90 - 95% of all used oil that is recycled as a consumable product is reprocessed as used fuel oil.

The marketing of used fuel oil is totally dependent on the price and availability of crude oil. When the price of crude oil is up, the price of used oil is likewise up. This is because the crude oil volumes are scarce and the price rises. Likewise, when the price of crude oil is low the market is flooded with both virgin and used oil and the price drops dramatically. Supplies are plentiful and cheap.

Used fuel oil generally sells for approximately 12 - 15¢ per gallon below the current market value for virgin oil fuels. The incentive for its use lies in the profit that it can realize because of the 12 - 15¢ per gallon profit margin. During the energy shortage used oil was a highly desirable fuel first because virgin oil supplies were scarce. Second, used oil was quite plentiful. (Remember this market is dependent upon the supply and demand.) During the energy shortage used fuel oil was in great demand because of its abundance and relatively low price, the largest incentive for its use.

Another factor has recently impacted on used fuel oil values. The proposed regulations for used oil in 1985 created

several marketing hinderances for the product. In November 1985 EPA finalized the burning and marketing regulations for used oil. This regulation banned the burning of off-spec used oil by non-industrial boilers or furnaces, i.e., homes, small businesses, etc. EPA also proposed - but has since abandoned - the regulations to list used oil as a hazardous waste and establish management standards for it. EPA was concerned because burning endangers human health due to the release of heavy metals - primarily lead - and other contaminants to the atmosphere. For this reason EPA felt is was in the best interest of the population to restrict the burning of used oil to the industrial sector. Therefore, used oil can be burned only by industrial boilers and furnaces which EPA feels are already permitted and are equipped with bag houses, precipitators, and equipment necessary to trap particulates and lower emissions.

When EPA proposed regulations for used oil they also created specification levels for the product. The three classifications are on-specification (on-spec), off-specification (off-spec), and as a hazardous waste. On-spec can be burned by anyone, even homeowners and small businesses. Once used oil exceeds the minimum specification requirements it becomes an off-spec fuel. Off-spec used oil is based primarily on the heavy metals that are intrinsic to used oil due to the additive package and its use in engines as a coolant. Generally used oil exceeds specification due to the lead content. Currently used oil contains between 200 - 400 parts per million - down from between 700 - 800 parts per million in 1985. The drop in lead in used oil is due to regulations imposed upon virgin fuel processors to phase out the production of leaded gasoline. Used oil may also be classified as a hazardous waste if it exceeds a thousand parts per million total halogens. Halogens found in used oil are the result of being used for metal working purposes or cutting oils or may be the result of contamination with solvents or cleaning agents. This contamination may be intentional or unintentional. The off-specification designation requires that burners notify the agency of their activity. The notification form has been amended by EPA to indicate that the notification is not for a hazardous waste activity but is specifically for the burning of used oil. Used oil contaminated with a hazardous waste requires that a RCRA-permitted facility handle and dispose this used oil properly. The manifesting and notification that accompany hazardous waste activity are required for used oil in this case.

The listing of used oil burning activity with the Agency has created a hesitance by many industries to use the product. The reprocessors and marketors feel this is an unfair penalty upon industries which burn used fuel oil. Marketors already notify the Agency of businesses to whom they market used fuel oil and feel that the dual notification is an added burden to their customers.

In concluding there are several positive notes to make. The number of Project ROSE Collection Centers remains fairly

constant. A recent survey has revealed that attrition is the primary cause for loss of Project ROSE Collection Centers. Other states have lost many collection centers from their programs. Many businesses have stayed within our program due to their civic pride and their interest in preserving the environment.

The success of Project ROSE has interested other states and municipal governments. Project ROSE continues to assist these groups trying to establish similar recycling programs. Such programs would benefit EPA by alleviating the disposal problems for used oil. They might also encourage recycling of other materials. The success of Project ROSE has been recognized by EPA Region IV. We are currently working with Auburn University in a technical assistance/education program designed to inform small quantity generators, collectors, handlers and recyclers of proper analytical and testing procedures for used oil, regulations governing used oil (both state and federal), and services available to help them reclaim/recycle used oil.

What is the prognosis for the used oil market?

The price of used oil will always fluctuate based on the supply and demand of the crude oil market. Even though the current value of used oil is low, it can be expected to rise in the future once the crude oil market stabilizes. Economists are once again predicting an energy crisis or shortage of crude oil based on the dwindling reserves of oil stockpiled in our country and world wide. When the available volume of crude oil drops while the demand remains constant, then prices will rise as dramatically as they have recently fallen. Used oil will then become a commodity highly desired by industry because of its abundance and the relatively lower price for which it can be purchased. The increase in price and demand for used oil will serve as the catalyst to recycle - thus conserving energy while preserving the environment.

In 1986 Project ROSE documented 8.2 million gallons of used oil as being recycled by used oil recyclers. This is an unexpected increase of 1.1 million gallons above the volume documented in 1985. Factors to which this increase can be attributed are (1) that the volume of used oil which can be accumulated by collection centers, collectors, and recyclers is fixed and (2) once maximum storage capacity is reached, the used oil must be recycled even if it is for a nominal profit. Therefore, the used oil glut which was created by the drop in used oil prices and the regulation of used oil have forced collectors to sell their used oil to reprocessors.

The documented recycling figures are an indicator that, although the used oil recycling market is not as profitable as it once was, the recycling network has survived and continues to work effectively to reclaim used oil. By averting the improper disposal of used oil, Project ROSE can help prevent the environmental damage that results from dumping, land spreading, and

pouring into water supplies while protecting human health. The energy that can be saved by its use as a fuel or re-refined motor oil is a mandate for recycling. Programs such as Project ROSE can assist the reclamation of used oil even during a "Bear" market period.

THE REALITIES OF TIN RECLAMATION

Frank Wills, Reclamation Associates

To a major extent, the present market realities of tin and its reclamation have come about because for many years tin was in effect insulated from the normal cycles of the market place. When reality caught up with tin in October 1986, the price was cut in half, and although there has been some price recovery in recent months, the effects of that dramatic event is what we are faced with today.

Although the lower price is a decided plus factor for consumers of tin, it has the opposite effect on its reclamation from low grade scrap and waste materials, and some drastic adjustments have to be made to the present market conditions.

It is normal for prices to cycle over a period of time. Prices for most commercially useful metals have, however, been at the low end of the range for an abnormally long time. A number of factors have contributed to this situation. Among them are the worldwide industrial slowdown, overcapacity and continued high production by some third world countries, size reduction and substitution, improved product utilization, and improvements in process efficiencies. There is very little to indicate for the short term that any change will occur in this situation.

In an effort to modify the sometimes drastic tin price gyrations some type of producer-consumer program has been tried for almost fifety years. Since the mid 1950s an intergovernmental group, the International Tin Council, by means of production and export controlsand the establishment of a buffer stock, has attempted to modify the swings in the tin market. Upper and lower price levels were established and tin was bought for the buffer stock when prices fell below the low level, and sold tin when it exceeded the upper price level. This procedure maintained stability in the market but ran counter to the price decline of all other commodities. The very stability of the price range encouraged continued high production as well as increased trading on the London Metal Exchange, and the use of warrents as collateral for loans.

Tin has also been affected by the industrial slowdown. World production decreased from about 240000 metric tons in 1981 to 190000 metric tons in 1985. Consumption was always lower during that period. U.S. consumption during that time decreased from about 55000 metric tons to 50000 metric tons. About 25% or 13000 metric tons was from reclaimed tin. Prices between 1981 and October 1985 declined from 6.50 $/lb. to 5.56 $/lb.(1)

Due to several factors, governmental funds for continued purchases of tin came to an end in October 1985 and the price collapsed to about one half of previous quotations. Enormous losses were incurred by anyone holding physical inventory as well as positions on the exchange. Estimates of these losses run as high as 1.4 billion dollars. Tin trading has stopped on the London Metal Exchange and has not resumed as of now. An unofficial market has been established for price quotations which currently are in the 3.15 $/lb. range.

How does all this affect reclamation and what if anything can be done about it? Because of its relatively high price, tin can be considered a semi-precious metal, there has always been a strong economic incentive to reclaim tin from scrap, drosses, and other residues.

Tin recovery from tin plate production scrap has been a well established business both in the U.S. and other countries for many years. Even though the number of cans is not growing due to competition from other materials, and the electroplated coatings have become thinner over the years, it is expected that this area of reclamation will maintain itself. Reclamation of tin from tin plate and other tin containing scrap in shredded municipal waste or incinerated waste has so far not proved feasible. The current low price will make this situation even less attractive.

Reclamation of scrap solder and drosses is another major source of tin, although recovery is generally in the form of solder which after adjustment for composition can be reused. Because of the decline of tin used in tin plate production, solder usage has become the largest single tin consumer in the U.S.

The tin which is contained as alloying ingredient in scrap bronze, brass and as solder in radiators and plumbing materials is generally recovered by melting the scrap, refining the melt and adjustment of the chemistry. This then permits another cycle in the usage of the material.Many of this countries brass mills and plumbing material suppliers recycle their own production scrap augmented by outside purchases of clean scrap to meet their metal requirements.

Once the losses resulting from the drop in tin price had been written off, the effect of lower tin prices for companies reprocessing tin containing scrap by melting and partial refining was a positive one. The lower cost resulted in cheaper feed material, lower inventory costs, as well as a decline in the value of tin contained in their waste stream.

The tin contained in fumes, drosses, and slags recovered from the melting of brass and bronze and from the smelting and refining of low grade non-ferrous scrap, presents the most complex conditions of tin reclamation. These materials are generally low in tin content, 15% or less, and contain major amounts of lead, zinc, copper, cadmium, some precious metals, and possibly halides. Some of these materials may now be classified as hazardous wastes. Complex chemical, pyrometallurgical and electrochemical treatment is required to recover tin as metal or solder from these materials.

The effect of lower tin prices on complex materials has been drastic. Since shipping, smelting and refining costs are relatively insensitive to the price of tin, many low grade materials are no longer economic to process for tin recovery. In fact they may now actually become a cost item for merely disposing of them. Additional complications may arise if these materials are exported to either England or Germany, where two of the major reprocessors of complex materials are located, since new export rules for hazardous materials became effective in November 1986.

The economic and regulatory developments over the past year have consequently created additional problems in the reclamation of tin. Producers of low grade or complex materials are the most affected. They will have to review their operations to try to decrease the quantities generated or even possibly change processing schemes to try to eliminate some of these streams. Upgrading to concentrate tin values and the elimination of some of the problem elements will further help to improve this situation.

(1) All data from Bureau Of Mines Minerals Yearbook, Tin. By James F. Carlin, Jr. 1985

MARKETING INDUSTRIAL SOLVENTS
A RECYCLER'S PERSPECTIVE

Kenn A. Wiest, Manager, Marketing and Sales

The recycling industry was probably the beginning of the first waste exchanges. Recyclers were challenged with the opportunity to collect a wide range of organic solvents and find end-use markets for their refined products. This was by no means an easy task. The first challenge was to select those waste streams which could most economically be returned to a product which met near virgin specifications. Secondly, once a product was recovered, it had to be marketed as a refined product in specific end-use markets. Some end-use applications by their very strict specifications were not acceptable, and others because of the perceived differences between virgin and refined products, could not be sold.

The first approach to marketing industrial solvents that have been refined is to work with the industries that generate the waste solvents. We call this a tolling operation. Here we take waste solvents from an individual customer and re-distill his material back to an almost virgin state. This has been a very common practice in the pharmaceutical and chemical industries since World War II. This assures the generator that the solvents he receives back from the recycler are only those products which are common to his process. Obviously, this is critical in a pharmaceutical operation where the returned solvent will be used to produce consumer drugs. Quality control is assured by strict production requirements and laboratory analysis at both the recycler and the end user. Any trace of impurities in the product would be cause for rejection by the drug manufacturer.

The next approach is to profile the types of industries that generate a particular industrial solvent as a waste stream. This is done by using the computer to record the Standard Industrial Classification (SIC) of each generator profiled and the particular solvent waste he generates. After recording many thousands of waste profile sheets, a pattern develops as to the most common solvents used by a particular SIC customer or industry.

Once we've identified the most likely industries to purchase a particular industrial solvent, end-use application becomes critical. A manufacturer of highly sophisticated printed circuit boards, although a large user of virgin industrial solvents, will most likely not be a good candidate for the same solvents in a refined product. Here, purity is critical to the final printed circuit board's performance, and the cost advantages of using re-distilled products are offset by the cost associated with the potential failure of expensive circuit boards.

The same solvents that were not acceptable to a printed circuit board manufacturer may very well be acceptable to metal

working shops. In the case of using typical degreasing solvents, such as 1,1,1 trichloroethane, perchloroethylene or trichloroethylene, many manufacturers already use refined products. They use degreasing equipment with stills as an integral part of the process of purifying their own solvents. These accounts become good candidates since they are familiar with the acceptability of refined solvents. Here, purity equal to virgin solvent is not a critical aspect, providing a consistent quality product is produced which will meet the end-use application.

Recycling, reuse and recovery practices are widely accepted options, and make use of materials formerly discarded as wastes. These materials may be reused directly in the process from which they originated or may find use in an entirely different process. For instance, methanol, which is used to clean ultra-clean electronic parts can readily be used for auto windshield fluids. Caustic used to dry a solvent can readily be used to neturalize another chemical or biological reaction. Hydrochloric acid, used to pickle steel, can be used to floculate sediment and remove phosphates in water treatment. Recycling, both on and off site, reduces the volume of hazardous waste to be disposed and also preserves limited natural resources.

Methylene chloride, a common solvent used to make pharmaceutical intermediates, when distilled is an equivalent replacement to virgin product used in paint strippers and in clean up for fiberglass manufacturing equipment. Halogenated solvents, a major EPA concern in landfills due to their persistence and tendency to contaminate groundwater, can be recycled in most cases and returned to the generator or other end users.

Almost all organic solvents can be recycled and returned to an end-use application which preserves valuable natural resources for reuse over and over again. Today, over five billion pounds of solvents are recycled each year. Users not only preserve natural resources but also save money for their companies. As a general guideline, refined industrial solvents sell for 80% of what the virgin product originally sold for. Methylene chloride selling for $0.20/pound, virgin sells for $0.16/pound as a refined product, with no less effectiveness in use.

Sometimes a market does not exist for a particular type of waste solvent. This is where the development laboratory plays a key role in evaluating the product and developing specialty uses for that product or a combination of that product and other products to impart specific desirable characteristics. Several years ago, a major manufacturer of fiberglass parts with facilities located across the United States, had a major fire, killing one of its workers. They came to us looking for a solvent that did not have a flashpoint up to the initial boiling point of the solvent. They had been using acetone with a flashpoint of 0° F. A spark had caused the explosion and fire, which destroyed their facility and killed the worker. Using the development lab, we custom-designed a blended solvent that met all of the cleaning criteria, yet did not exhibit a flashpoint. This was the begin-

ning of a new specialty solvent which has found application in numerous fiberglass plants from boat builders to fiberglass tank manufacturers.

Another innovative approach to selling industrial solvents was born out of a common waste problem. We noted that manufacturers using urethane foams and adhesives consistently shipped drums of solid waste which was not recoverable. An investigation at the source of the problem turned up the culprit. The users were using methylene chloride to flush their spray gun application equipment after each pour of foam or adhesive. The flushing solvent was collected in drums where the foam or adhesive continued to polymerize into a solid, unrecoverable mass. Working with a manufacturer of urethane foam, we were able to develop a product that enhanced the cleaning ability of methylene chloride but blocked the polymerization of the foam so that the waste solvent remained in a liquid state and was acceptable for solvent recovery. Again, the most creative form of industrial solvent selling, finding a customer need and tailoring a specialty product to address that need.

There are basically three keys in marketing indsutrial solvents. First, and probably most important, is product quality and consistency. Whether you are marketing a refined industrial solvent or a virgin solvent, the end user must receive a product that performs consistently each time it is used. This is assured by maintaining manufacturing specifications that exceed your selling specifications. Laboratories play a major role in analyzing each product lot to assure quality and compliance with manufacturing specifications.

Second on the list of importance is reliability of supply. Although this is generally not a problem with virgin industrial solvents, many of us can remember the chaos caused in 1974 and 1975 when most organic solvents were put on allocation. Entire manufacturing operations had to shut down or greatly curtail their operations. This had a domino effect, throughout almost the entire manufacturing sector. With refined industrial solvents, this is a never ending problem.

One must keep in mind that the raw materials for a recycling operation are the waste products from industrial customers. There is always an imbalance between raw material feedstock and end user needs. In any given month you might be long on feedstock and short on users or visa versa. Contracting volumes, both incoming and outgoing, plays a major role in keeping a good balance.

Last on the list is price. This is largely dictated by supply and demand. Once again, reflecting back to the shortages of 1974 and 1975, we can remember industrial solvents selling for two or three times their value today. Certainly costs to produce play a factor in pricing. No manufacturer will be viable long-term if he can not sell his products at a reasonable return, which allows for investment and maintainance of his facilities.

For the recycler of industrial solvents, the price of their products is dictated by the virgin solvent market, keeping in mind that most refined solvents sell at 80% of virgin product pricing. Profitability is maintained by controlling the raw material cost in direct relationship to the end product price.

The last form of industrial solvent sales from a recycling operation is the development of end use markets for products which are impractical to recover due to physical and chemical properties or economics. The use of waste derived fuels in cement kilns is the fastest growing segment of solvent recycling today. Not only is the amount of coal or oil used in these energy intensive businesses reduced, a market is growing for the use of industrial solvents which heretofore had no market end use. Wastes formerly sent to landfills or incinerators can now be recovered for their energy recovery value. As with all industrial solvents, strict compliance with quality control at the end users facility is the key element for success. It is estimated that over eight hundred million pounds now, or will shortly be recycled in this manner.

With the passing of stricter and stricter landfill regulations which will eventually ban all industrial solvents and the new regulations facing small quantity generators, the challenge continues to be finding economical alternatives for reuse of industrial solvents. As a recycler of industrial solvent manufacturer, the challenge is to remain creative with new products and new end use applications for old products, at the same time maintaining quality, consistency of supply and competitive pricing.

THE ECONOMICS OF LEAD-ACID BATTERY RECYCLING

Kenneth T. Wise and Sarah K. Johnson
Putnam, Hayes & Bartlett, Inc.
Cambridge, Massachusetts

In recent years, the lead industry has been characterized by flat demand and ample supply. As a result, lead prices have declined to levels that in real terms represent historic lows. The lead industry, and in particular, the secondary lead industry, has also experienced a dramatic increase in the stringency of environmental regulations. This combination of low lead prices and increasing environmental costs has lead to major contractions in the secondary lead industry, which in turn has fostered another threatening environmental problem caused by the breakdown of the battery recycling chain.

The primary conclusion of the study is that low lead prices and increasingly stringent environmental standards have brought the battery recycling rate down to 60 percent from well over 80 percent only six years ago. We have collected anecdotal evidence indicating that the reduction in recycling is leading to an increase in the improper disposal of batteries. Although there is no reason to believe that this trend will be reversed solely through market forces, the existence of a functioning recycling chain does offer some hope that potential problems can be averted. This paper reviews the circumstances that have created the current situation and discusses several ways in which either public or private parties can take action to turn around the decline in recycling activity.

LEAD INDUSTRY ECONOMICS

First, we will review very briefly the current economics of the lead industry. Of the major end uses of lead, only storage batteries, representing 70 percent of the lead market in the U.S., continue to experience growth, currently forecast at 1 percent per year. Consumption of leaded gasoline and lead pigments has declined due to environmental regulations and public concern, and is expected to continue to decline through the 1990s. Similarly, total worldwide consumption of lead is expected to continue the flat or downward trend that it has experienced since 1980.

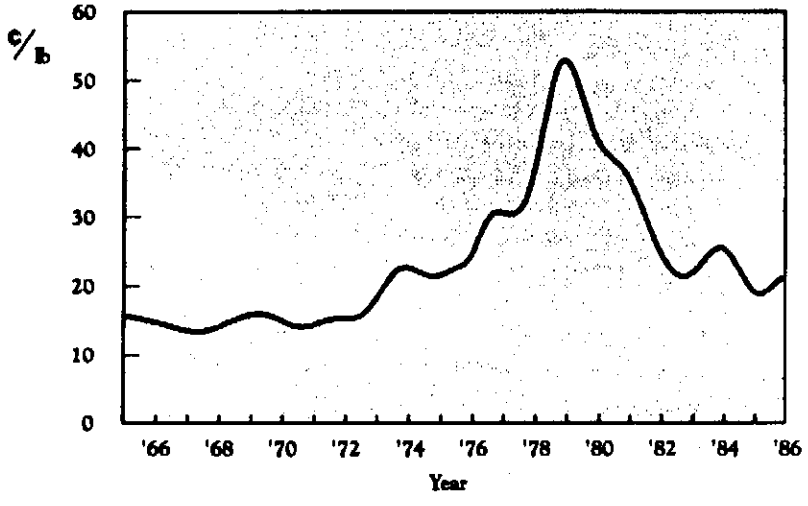
In general, unlike lead demand, the supply potential of the world lead producers has not fallen. One reason for the oversupply of lead in the market is that much of the lead is produced in conjunction with other growing metals markets such as zinc. An increase in zinc production translates into an increase in lead production without a commensurate increase in lead demand. Consequently, the burden of equilibrating lead

supply and demand falls on the marginal producers of pure lead, such as those in Missouri.

These features of lead industry economics have resulted in the lead price profile shown in Figure 1. U.S. lead prices have fallen from over 50 cents per pound in 1979 to 19 cents in 1985, with a slight increase to 21 cents in 1986. In recent months, prices have improved to levels of 26 cents, in large part because of Missouri mine shutdowns. However, given current supply and demand forecasts and the possibility of increased Missouri lead production, there are no fundamental economic reasons for lead prices to increase in the near future.

FIGURE 1

U.S. Producer Lead Prices

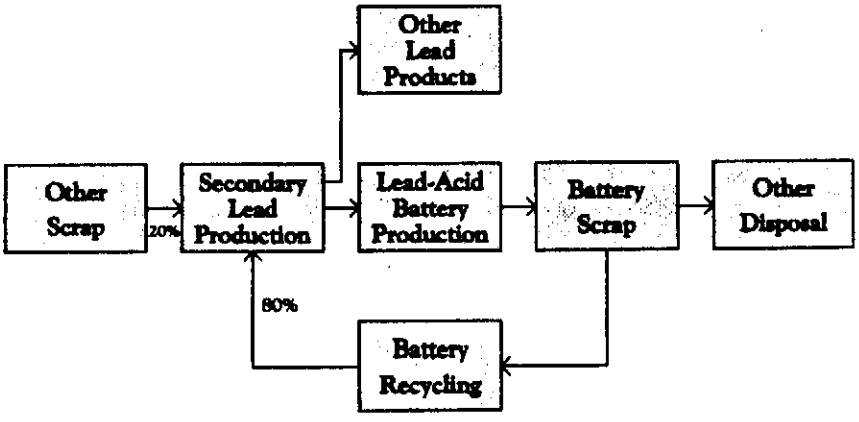


THE SECONDARY LEAD INDUSTRY AND THE BATTERY RECYCLING PROCESS

The major way that lead industry economics affect battery recycling is through secondary lead industry activity. Historically, secondary smelters have produced somewhat more than half of domestically produced lead, but in recent years their share has declined to less than 50 percent. The declining production of secondary lead is closely linked to reduced battery recycling activity. As Figure 2 indicates, 80 percent of the lead recovered by secondary smelters comes from the 60 million automotive batteries replaced and available for recycling annually.

FIGURE 2

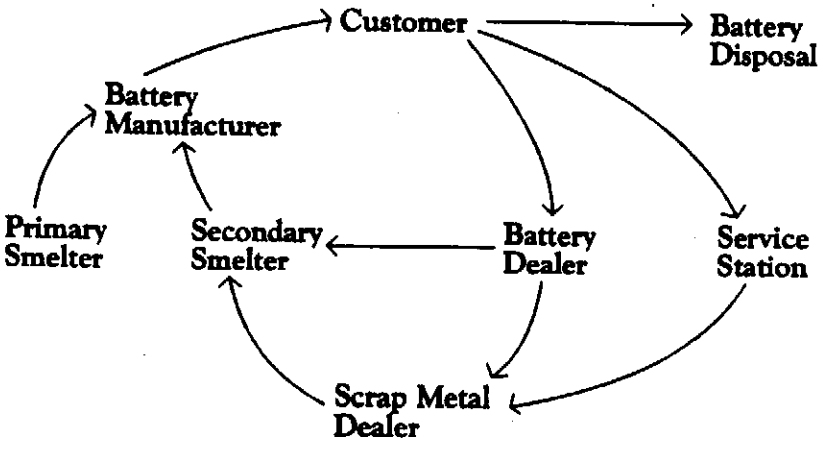
Secondary Lead Production of Batteries



The battery recycling process, shown in Figure 3, has in the past worked with remarkable efficiency. When a battery dies, the consumer typically returns the spent battery to a service station, battery dealer, or mass merchandiser for a discount on the purchase of the replacement battery. The returned battery is then stockpiled until enough batteries are accumulated or until lead prices are sufficiently high to encourage collection by a transporter. In some cases, the transporter may be delivering new batteries and may backhaul spent batteries directly to a smelter for breaking and tolling. In other cases, batteries may go to scrap metal dealers before being returned to battery breakers or smelters for recycling. The time required for batteries to come full cycle is four to five years.

FIGURE 3

Battery Recycling Process



If we look at the costs associated with various points in the cycle, and assume that, typically, breaking and smelting fees are 13 cents per pound and transportation and material transfer costs are an additional 7 cents, the cost to collect, smelt, and deliver secondary lead is typically

about 20 cents per pound (see Table I). Variations around these values probably create a range of 15 to 25 cents per pound, depending upon the efficiency of the smelter and the ease with which the spent battery can be returned to a secondary lead facility. At lead prices around 20 cents per pound, the inability to profitably recycle batteries that are difficult to collect causes recycling activity to diminish.

TABLE I

Typical Recycling Costs

1 ¢/lb.	spent battery
2 ¢/lb.	transportation
2 ¢/lb.	scrap dealer
13 ¢/lb.	battery breaking/smelting
2 ¢/lb.	delivery
20 ¢/lb.	

A survey of secondary lead smelters conducted in March of 1986 supports the fact that the economics of lead recycling have deteriorated. One lead smelter cited an offer of 200 batteries free of charge which it had received from a local major discount store. The smelter turned down the offer because labor costs for loading and transporting would eat up any profit gained from recycling.

IMPACT OF ENVIRONMENTAL REGULATIONS

The economics of the secondary lead industry have been further dampened by stringent and costly environmental regulations enacted since the late 1970s. The major standards that apply to the recycling of spent lead-acid batteries are: recent RCRA regulations for the storage and handling of hazardous waste, OSHA standards for lead in the workplace, ambient air quality standards for lead (part of the Clean Air Act), and water quality standards for smelters and battery manufacturing plants (part of the Clean Water Act). The costs of complying with these environmental standards are typically 6 to 7 cents per pound of lead.

I would like to mention briefly how RCRA regulations, which classify spent lead-acid batteries as hazardous wastes, affect the industry. These regulations impose restrictions on owners of facilities that store spent batteries before reclaiming them. Since some secondary smelters store spent batteries on site, they become land disposal facilities and therefore need a RCRA permit or interim status to operate. To preserve interim status, a secondary smelter that handles spent batteries must: (1) submit a so-called "Part B" application which allows it to store and (2) dispose of the hazardous material, and certify compliance with groundwater monitoring and financial assurance requirements. The costs associated with these requirements are on the order of $100 to $200 thousand per plant, excluding insurance.

For many smelters, along with the cost of complying with the RCRA regulations, a primary issue is the inability to provide financial assurance due to the unavailability of liability insurance. Because most of these smelters can not obtain liability insurance or indicate the financial strength to provide financial assurance, they are in the precarious position of facing the possibility of immediate closure by the EPA.

Current legislation essentially exempts from RCRA operations that generate, transport, or collect spent batteries or persons who store spent batteries but do not reclaim them. These exemptions apply to components of the battery chain such as backhaulers, battery dealers and distributors, service stations, or scrap metal dealers. However, according to our survey, many scrap metal dealers and service stations have ceased to handle spent batteries simply because the economics make them unprofitable. One survey respondent noted that over 50 percent of the scrap dealers in South Texas had posted signs or verbally stated that they were no longer in the business of receiving spent batteries due to low lead prices and fear of government regulations.

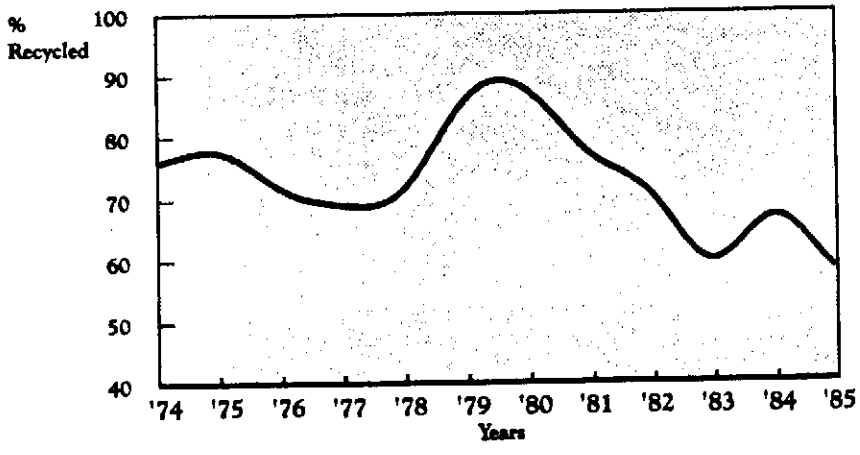
As evidence of the deteriorating economics of secondary lead recycling, more than 550,000 metric tons or over 50 percent of the existing furnace capacity of secondary smelters closed between 1979 and 1985. These closures have led to substantial reductions in the nation's ability to recycle batteries by reducing the density of recycling facilities and increasing the transportation costs of supplying the remaining smelters with the raw material required. Some industry experts estimate that by 1986, independent truckers collecting spent batteries to return to scrap dealers generated 60 to 80 percent less volume than in 1984. As one survey respondent noted, "[A]t current junk pricing, junks cannot be shipped very far and have any value over freight costs."

CALCULATION OF RECYCLING RATES

Does the analytical evidence support the intuitive notion that recycling rates must be declining? Yes! We estimated battery recycling rates as follows: the recycling rate represents the fraction of lead scrap from batteries that is actually recycled to the amount of lead in batteries that is theoretically available for recycling. Figure 4 shows our results. Up until 1980, battery recycling rates averaged about 80 percent, and peaked at 87 percent in 1980. By 1985, however, the recycling rate had dropped below 60 percent. This decline from historical levels represents approximately 150,000 additional metric tons of lead exiting the recycling chain, or 15 million additional batteries not being recycled in 1985 alone!

FIGURE 4

Battery Recycling Rates



IMPACT ON LANDFILLS

It is clear then that the economic incentives that existed up to six years ago for recycling batteries have essentially disappeared. Thus consumers often find it easier to dispose of spent batteries improperly rather than find and maybe pay someone to take them off their hands. The question is, if more and more batteries are exiting the recycling chain, where are they going?

Based on our survey, there is general agreement that batteries are finding their way in increasing numbers to dumpsters and city garbage trucks for hauling to municipal landfills. We have heard reports that some landfills are considering purchasing battery breaking equipment to handle the spent batteries they receive. Other incinerators report increasing problems with heavy metals in scrubber wastewater. Additionally, lead-acid batteries have been causing problems with automobile shredding facilities. Since per-pound payment for the weight of a junked automobile is now often higher than that of the average battery, spent batteries have recently been found inside scrapped vehicles. This can cause unacceptably high lead levels in the residue from the shredding process bound for landfills and can also contaminate crushed auto scrap, causing a potential problem for steelmaking operations.

Because of the limited data currently available, we were unable to find empirical evidence that lead from batteries has in fact already found its way into the soils and groundwater near landfills. However, the scientific view is that the existence of citric or acetic acid from household garbage in landfills provides a potential mechanism by which lead can dissolve and leach into soils. It may therefore be only a matter of time until unrecycled batteries create significant contamination problems.

RECOMMENDATIONS FOR ACTION

To summarize, the current conditions in the lead market provide insufficient financial incentives to increase recycling rates from 60 percent back to historical levels between 80 and 90 percent. If the evidence becomes conclusive that improper disposal of batteries does indeed pose a significant environmental threat, then options to address critical steps in the battery recycling chain should be evaluated. Unlike most hazardous wastes, there exists a recycling chain that in the past has operated with remarkable efficiency in response to market forces. The current market economics and regulatory climate have reduced the efficiency of this recycling mechanism. It may be the case, however, that if the recycling chain were compensated for the environmental benefits provided in addition to the value of the lead recovered, then recycling rates would return to historical levels, and a potential environmental problem could be eliminated.

Such efforts could be made at either the national or the regional level. At the national level, market-based schemes such as deposits on new batteries could provide additional funds for collection. Regulatory reform such as relaxing certain standards affecting recyclers might provide the necessary relief to recyclers and actually bring more benefit than harm to the environment. These efforts could focus on the collection end of the chain to encourage the separation and proper handling of

batteries at the point of disposal. Information programs could also be established to educate consumers about the importance of recycling spent batteries.

Effective programs could also be launched at the regional level. Such programs would focus both on the aggregation of raw materials for recycling and the dissemination of information between the appropriate parties. Regional collection centers could amass enough batteries to make it economical for someone to transport them to a smelter. Perhaps the most effective part for waste exchanges to play is to put landfills affected by improper battery disposal in contact with recyclers, improving the information flow between buyers and sellers of lead scrap. In this way, landfills in essence become part of the recycling chain, providing recyclers with spent batteries at low prices, and reducing the danger of lead contamination at the landfills.

These proposals are only examples of the initiatives that could be taken to turn around the decline in battery recycling activity. Based on our past experience with an extremely efficient battery recycling process, we know that a potential solution exists. With the absence of market forces, the challenge for policymakers, members of the recycling industry, and concerned citizens is to determine how best to intervene.

THE ROLE OF WASTE EXCHANGES IN WASTE MINIMIZATION & RECLAMATION EFFORTS

Walker Banning, Eugene B. Jones, and Roy C. Herndon
Southern Waste Information Exchange

Introduction

The problems associated with the economical and safe management of industrial and commercial wastes have grown increasingly complex during the last few decades. Practical solutions to waste management problems by industry typically require a multi-faceted approach for most waste streams, particularly those containing hazardous wastes. Due to economic considerations and regulatory requirements, many companies that produce hazardous, as well as non-hazardous, wastes are beginning to explore the advantages associated with non-disposal management options such as waste reduction, recycling, and resource recovery. Land disposal has tended to be the most commonly utilized waste management practice; however, as a result of recent legislation and regulations, the liabilities and operating costs associated with land disposal have encouraged industrial waste managers to consider source reduction, on-site recycling, and off-site recycling opportunities as management alternatives to land disposal.

Since the early 1970's, waste exchanges in North America have been assisting waste generators in the identification of off-site recycling opportunities. The United States Environmental Protection Agency (U.S. EPA) has stated that when participation in a waste exchange program affects a generator's efforts to reduce the volume and/or toxicity of hazardous waste, such participation may be used to satisfy the waste minimization certification requirement contained in the 1984 Amendments to the Resource Conservation and Recovery Act (RCRA). Thus, waste exchanges not only can help generators identify recycling and reuse opportunities but they can also assist generators in establishing an environmentally sound and cost-effective waste minimization program that meets legislative and regulatory requirements.

The Role of Waste Exchanges in a Waste Minimization Program

With the passage of the RCRA in 1976, the federal government implemented a regulatory program for hazardous waste. This regulatory program has resulted in a significant increase in the operating costs and liabilities for firms who generate, transport, treat, store, or dispose of hazardous wastes. As a result of the increase in both the costs and liabilities associated with waste management, there is a significant incentive for firms to either eliminate or reduce the volume and/or toxicity of waste generated.

The federal Hazardous and Solid Waste Amendments of 1984 (HSWA), which amended the RCRA, contain many new requirements that affect companies that produce, transport, recycle, and dispose of hazardous waste. The federal government now regulates approximately 150,000 smaller firms that generate between 100 and 1,000 kilograms of hazardous waste in a calendar month. Prior to passage of the HSWA, only firms producing more than 1,000 kg/month were fully regulated. One of the mandates included in the HSWA pertains to waste minimization not only for the generator, but also for those that treat, store or dispose of hazardous wastes.

One of the new requirements for smaller generators involves a certification of waste minimization. This certification requires that generators sign Item 16 on the Uniform Hazardous Waste Manifest which reads: "If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment OR if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method available to me which I can afford."

The HSWA requires waste minimization certification by generators on the Uniform Manifest as well as in their biennial reports and for on-site treatment, storage, and disposal permits. In the biennial report a generator must include the following information: 1) a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated; and 2) a description of the changes in volume and toxicity of waste actually

achieved during the year in comparison to previous years to the extent such information is available for years prior to 1984.

In a letter date January 17, 1986 to the Secretary of the Maryland Hazardous Waste Facilities Siting Board from the Assistant Administrator of the Office of Solid Waste Management and Emergency Response, U.S. EPA, it was stated that: "Waste exchanges provide an excellent mechanism for information transfer and have the ability to realize actual increases in the use of recycling as a waste management alternative." It was further stated that, "The strides taken by waste exchanges in recent years have helped to reduce the threat that these wastes would have otherwise posed to public health and the environment."

In addition to meeting regulatory requirements, active participation in a waste exchange program provides the generator with the opportunity to explore alternative waste management options as well as the opportunity to implement a cost-effective method of waste minimization. Waste exchanges can also influence the use of manufacturing "by-products" as raw materials and/or energy sources. Waste exchanges have proven effective in increasing recycling and resource reuse as a waste management alternative. Waste exchanges can be an important part of a company's overall strategy to manage waste in an environmentally sound and cost-effective manner.

ALABAMA WASTE EXCHANGE

William J. Herz, Director

The Alabama Waste Exchange, located at The University of Alabama in Tuscaloosa, was created late in 1986 to promote economic development by assisting businesses which generate hazardous waste to meet regulatory guidelines, to provide additional income, to conserve natural resources, to conserve energy required to process raw materials, and to reduce the volume of wastes for conventional disposal.

Funding for 1987 is provided by the Alabama Department of Economic & Community Affairs and The University of Alabama. A major objective of the program is to investigate the feasibility of maintaining an on-going, self-sufficient waste exchange activity in the State.

The Alabama Waste Exchange coordinates closely with other waste management programs on the Tuscaloosa campus (Project ROSE [Recycled Oil Saves Energy] and HAMMARR [Hazardous Materials Management and Resource Recovery Program]), and throughout the State, and is helping to build a network of organizations in Alabama interested in recycling and waste reduction programs.

The planning and initial implementation of our program was supported by Ms. Mary McDaniel and the Southeast Waste Exchange. All client listings developed by our program will be listed in the Waste Watcher, and we look forward to working with the entire staff of the Southeast Waste Exchange in the coming months.

The 4th National Waste Exchange Conference provided an excellent opportunity to meet with other exchange managers, waste generators and users, and suppliers to waste minimization field, and we hope to benefit from e broad experience of this group.

ALBERTA WASTE MATERIALS EXCHANGE

Karen D. Beliveau, Manager

The Alberta Waste Materials Exchange (AWME) was established in 1984 as a project of the Alberta Research Council with funding from Alberta Environment. It operates in conjunction with the Canadian Waste Materials Exchange (CWME) as an information clearinghouse designed to put potential users of waste material in contact with waste producers. A company having material that is unusable at their facility but which still has potential value may list the material with the exchange. Information submitted is published in a bi-monthly bulletin without charge and mailed to other industries that may be able to recycle or reuse the available materials.

Listings are divided into three main categories. These are wastes available; wastes wanted; and services available where companies specializing in waste management, reprocessing or transportation of waste materials can describe the services they offer.

Wastes available and wanted are classified into ten categories. These are:

1. organic chemicals and solvents
2. oils, fats and waxes
3. acids
4. alkalis
5. other inorganic chemicals
6. metals and metal containing sludges
7. plastics
8. textiles, leather & rubber
9. wood and paper products
10. miscellaneous materials

Within these categories, each listing is identified by a code number to provide confidentiality for the company involved.

Whenever a participant identifies a material listed in the bulletin that may be of use to him (waste available) or has a material that is being requested for procurement (waste wanted), he completes a form provided in the bulletin and mails it to the exchange. Enquiries are promptly forwarded to the company that placed the listing. The originator of the listing in turn contacts the enquirer directly. The exchange does not become involved in negotiations or the actual transfer of wastes.

Listings are accepted by the exchange on a Listing Form provided in the bulletin. All listings are free of charge and are carried indefinitely or until the listing company requests that the item be removed or indicates that the material is no longer available for exchange.

CANADIAN WASTE MATERIALS EXCHANGE

Bob Laughlin, Ontario Research Foundation

In 1986, the Canadian Waste Materials Exchange completed its ninth year of operation serving industry in Canada. CWME is a "passive" Information Exchange which issues a bulletin listing available and wanted wastes six times per year. About 3,700 companies participate in the CWME programme.

Statistics on the operation in 1986 and cumulatively since its inception in 1978 are given below:

	1986	Cumulative Jan. 1978 to Dec. 1986
Wastes Listed	158	2,543
Enquiries Handled	1,664	18,881
Exchanges Recorded	26	502
Volume of Wastes Exchanged (tonnes/year)	10,000	280,000
Replacement Value of Wastes Exchanged ($/year)	1.4×10^6 Cdn	10.4×10^6 Cdn

Additional funding from Canada's Department of Energy, Mines and Resources, allowed us to develop a special supplement listing 255 wood waste streams. This supplement, along with our regular bulletin, was sent in December to 15,000 companies to try to find potential energy users for these wood wastes.

Provincial Waste Exchanges in Alberta, Manitoba and Ontario continued successful operation in 1986. Two municipal Exchanges in Waterloo and Peel Regional Municipalities also operated in 1986. All of these Waste Exchanges sought local transfers of wastes while working co-operatively with the CWME for those wastes which were not exchanged locally.

The CWME continued to share listings with several Exchanges in the U.S.A., particularly the Northeast, Great Lakes, IMES in Illinois and the Southeast Waste Exchanges.

KEY EVENTS & DEVELOPMENTS FOR THE GREAT LAKES EXCHANGE

Waste Systems Institute
William Stough
470 Market SW, Suite 100A
Grand Rapids, Michigan 49503

The Great Lakes Regional Waste Exchange (GLRWE), initiated by Waste Systems Institute (WSI) in 1983, has expanded its services to over 15 thousand environmental managers. The GLRWE is published as a bi-monthly magazine and generally serves the Great Lakes States as well as adjacent Canadian Provinces. The information in the GLRWE is focused on Waste Exchange listings but also offers information on new legislation, new technology, professional services and important up-coming events.

As a summary of the progress in 1986, the GLRWE received a total of 460 inquiries. Of this total, 298 inquiries were for "waste available" listings and 162 inquiries were for "waste wanted" listings. Under "waste available" listings, the two most significant categories were "Solvents" and "Metal and Metal Sludges;" together they accumulated 41.5% of all inquiries. From the "waste wanted" listings, the most frequent inquiries were for "Plastics & Rubber", "Acids", "Alkalis" and "Solvents", the total of which account for 23.0% of all inquiries.

Activity in 1986 indicates that "Acids", "Solvents" and "Metal and Metal Sludges" were the categories most heavily inquired about, representing 61% of all inquiries. However, an overwhelming number of these inquiries have been from recyclers or brokers. They accounted for approximately two-thirds (2/3) of all "waste available" inquiries. The limited number of inquiries from industry is being evaluated and a marketing strategy is being developed to better accommodate industry.

The GLRWE has set its goal to help guide small to medium-sized industries toward a more cost-effective strategy for proper waste management. In our drive to attain this goal, we are striving to provide highly technical information in an easily-readable and organized format. The long-term strategy is to provide a total waste management package for Environmental Managers. This package includes regulatory information, technological developments, waste exchange and environmental products, plus services.

INDIANA WASTE EXCHANGE

Shelley J. Whitcomb, Editor
Indiana Waste Exchange Listings Catalog

The Indiana Waste Exchange was established in July of 1986 through contract arrangements with the Indiana Department of Environmental Management. It is managed and operated by Environmental Quality Control, Inc. of Indiananpolis, Indiana.

The first issue of the bimonthly listings catalog was published in August, 1986. Since this issue, the Exchange has generated 35 Indiana listings and has reached a circulation of nearly 1500. Originally, all listings were obtained from the Illinois Industrial Material Exchange Service.

The Indiana Waste Exchange is operated as a non-profit service without the support of commercial advertising.

INDUSTRIAL MATERIAL EXCHANGE SERVICE
1986 - 1987 ACTIVITIES

Margo A. Kerka

Many important accomplishments will result from the Industrial Material Exchange Service securing a $750,000 annual budget. Governor James R. Thompson signed the legislation creating a $10 million solid waste management budget, of which IMES was a part, on September 4, 1986.

In process now is a special report to be made to the legislature detailing tax incentives to encourage recycling in Illinois. The concept of a tax credit for companies that use recycled product as feedstock in manufacturing processes will be presented along with other options.

IMES is working with the Research Division of the Illinois Department of Transportation to examine the use of recycled plastics.

IMES is working with the Illinois Department of Correction's Prison Industries Program to find what portion of the six million dollars spent on raw product could be spent on recycled product.

IMES is currently working with paralleling computer data base operations with several other waste exchanges in the United States and Canada.

IMES has begun to specialize in assisting in placing small quantity surplus chemicals.

For the future, IMES hopes to move into an on-site technical assistance program of some type. Details are being developed. And it is felt that much more activity will be done in the area of new market development.

RECENT ACTIVITY OF THE NORTHEAST INDUSTRIAL WASTE EXCHANGE

Lewis M. Cutler, Manager

Substantial progress has been made in expanding the program of the Northeast Industrial Waste Exchange. These areas include grants, state sponsors, and general waste exchange activities.

U.S. EPA REGION III GRANT

The Northeast Industrial Waste Exchange has been awarded, under the RCRA-Section 8001 Program, $103,413 from the Environmental Protection Agency's Region III (Pennsylvania, Maryland, Delaware, Virginia, West Virginia, and the District of Columbia). The purpose of the grant is to improve the Waste Exchange's ability to match waste generators with recyclers who are interested in purchasing industrial by-products.

One way this goal will be accomplished is through the establishment of a computer-assisted Recycling Database. Waste generators, particularly small quantity generators, find it difficult to locate industries that use industrial by-products or surplus materials in their manufacturing processes. The database will provide complete, up-to-date information on recycling industries, allowing waste generators to conduct customized, nested searches of industries that may be interested in their surplus or waste by-products.

The funds from this grant will be directed toward locating recyclers in Region III, however, the Exchange will go outside the region to find companies willing to take industrial by-products generated in EPA Region III. Gathering this information for the data base will be a time-consuming task. The grant will support document searches in libraries, trade organizations, government agencies, and other relevant sources.

The Region III grant also provides funds to support an extensive outreach program to inform both large and small generators of NIWE's services. The campaign will include listings in the Yellow Pages in approximately 75 cities; advertisements in technical magazines, industry newsletters, and Thomas' Regional Directory; a slide presentation; a toll-free telephone number; and a press kit for the media in the region.

U.S. EPA REGION II GRANT

Another 8001 RCRA Secti Grant s about to be awarded to the Exchange. This grant to assist in the upgrading of the Exchange's computer sy- ns and to improve the Waste Exchange's ability to match waste nerators with recyclers who are interested in purchasi industrial waste and by-products

SPONSORS

The New Hampshire Resource Recovery Association and the State of Maryland were added to the growing group of sponsors of the Northeast Industrial Waste Exchange. These sponsors not only provide financial support but also a local coordinator for the Exchange.

CATALOG

The Exchange's catalog has grown substantially in 1986. Circulation went from 8,500 copies to 10,500. Listings increased from 145 in issue 20 to 169 in issue 23 with the length of the catalog increasing from 32 pages to 44 pages.

INQUIRIES

With an increase in the size of the catalog, there as a corresponding increase in inquiries. In 1985, 569 inquiries were made while in 1986 inquiries increased to 678.

RECYCLING BROKERS SURVEY

The Exchange, for the Maryland Hazardous Waste Facilities Siting Board, conducted a survey of all known brokers who deal in industrial wastes, by-products, or off-spec materials. Information obtained included materials wanted, quantities, packaging, and unwanted contaminants.

PEEL WASTE EXCHANGE

L.G. Conrad, P. Eng.
Engineering & Abatement, Waste Management Division

The Industrial Waste Reduction Program was instituted by the Region of Peel in October, 1985, primarily to reduce the amount of solid industrial waste going to our landfill sites. Much of the industrial waste is produced in large continuous quantitites which facilitates an easier segreagation of waste streams than can be achieved with municipal wastes. Although our efforts concentrate on solid wastes, we deal with all types of waste-related requests, including liquid and hazardous wastes.

The Region of Peel supports the Province of Ontario in its regulations aimed at the re-use, recycling, recovery, and reduction of waste materials. In 1985, the Region of Peel Council adopted resolutions to help reduce the dependency on landfill sites and encourage waste reduction as part of a Master Plan update. One goal of the Master Plan is to reduce landfill volumes by 60% no later than 1990.

Peel's computerized data base, the backbone of the Region's waste material exchange program, uses an organizational structure similar to that used by the Canadian Wate Material Exchange Bulletin. Data for internal use includes the company name, waste category, a waste code number, short description of the material, quantity, target company, contact date, and date of completion. when there is a question as to the composition of the waste, the Region sometimes conducts an appropriate anaysis at its own cost.

Southeast Waste Exchange

Mary A. McDaniel, Director

Like many of the dozen waste exchanges now operating in the United States and Canada, the Southeast Waste Exchange (SEWE) is a non-profit information clearinghouse. As such, SEWE provides information, education, and research services to industries that want to develop safe, economical waste management strategies.

The Southeast Waste Exchange experienced a year of large-scale geographic expansion in 1986-87. Formerly known as the Piedmont Waste Exchange, when its services were concentrated in North and South Carolina, SEWE now serves nine states in the Southeast. Thanks to collaboration with other exchanges across the continent, this year SEWE has received inquiries about material and service listings from 48 states, Canada and Puerto Rico.

In addition to expanding its outreach beyond the Carolinas, major SEWE projects for the year have included hosting the 1987 National Waste Exchange Conference, development of a comprehensive marketing plan, and creation of a computer database to sort and store information on material listings and inquiries.

The Exchange continues to work with five other regional waste exchanges to discuss common needs for a computer database and a national bulletin board of shared listings. As the first step in creating a national database, SEWE and several other exchanges have adopted a common listing format.

Workshops conducted by the Exchange during 1986-87 have included Educating Small Quantity Generators on new RCRA Regulations, Handling Waste Oils, Alternatives for Managing Waste Solvents, and Pollution Prevention Pays in the Electroplating/ Metal-Finishing Industries.

Response to the Waste Watcher, SEWE's bimonthly listings catalog, continues to be quite good. Fifty percent of the companies listing materials or services in the catalog received inquiries, with about 25% of the inquiries resulting in successful exchanges. In FY 1985-86 this has meant the rerouting of 2,849,208 gallons of waste and surplus materials from landfills, representing savings of approximately of $1,018,827 in raw material and disposal costs.

In 1985-86 Waste Watcher listings increased by 25% over the previous year, and inquiries about Waste Watcher listings increased by 42%. General information requests increased by 27% during the same period. By July 1, 1986 the Waste Exchange had 1,620 people on its regular mailing list and was distributing 9,000 Waste Watchers each quarter.

SOUTHERN WASTE INFORMATION EXCHANGE

Walker Banning, Eugene B. Jones, and Roy C. Herndon

The Southern Waste Information Exchange (SWIX), founded in 1982, is a non-profit service that provides waste management services to business and industry including the promotion of recycling and the reuse of waste materials.

Since the third National Conference on Waste Exchange, the SWIX has responded to a variety of new opportunities for serving the waste management needs of business and industry. These new opportunities reflect the changing structure of the waste management industry, and new State and Federal regulatory initiatives, and the proliferation of personal computers.

In an attempt to broaden the services that are provided to waste generators and users, the SWIX has expanded its range of activities. For example, the SWIX Catalog is now published on a quarterly basis and is distributed to over 10,000 firms in the United States. The SWIX has expanded its technical staff by hiring Mr. Walker Banning as Manager of the exchange. Mr. Banning was formerly the manager of the Northeast Industrial Waste Exchange located in Syracuse, New York. In addition, the SWIX has implemented additional activities to assist waste generators and users. Conducting workshops, providing training services and consultation in the waste management area are all part of an integrated program to develop a full-service waste management assistance network. At the same time the SWIX participates in waste management information dissemination and source reduction programs to encourage a broader involvement by business and industries in recycling efforts.

Even though the SWIX will continue to add new waste management services to its current acitvities, the primary function of the SWIX will remain the same, that is, to help waste generators and users find new recycling and reuse opportunities for their waste and surplus materials, and to assist recyclers in identifying new sources of waste materials that can be recycled.

WESTERN WASTE EXCHANGE SUMMARY

by Ed Endrews

With new/continued EPA funding, WWX is moving into another year. In addition to catalogs, monthly newsletters will be published and an Industry Assistance program has begun. Also, a Trade Fair for SQG's is being planned for May 19 in Mesa, Arizona. Subscription and advertising pledges will be accepted after July 1987 and the statistics gathered for the first year of operation clearly show there is interest in WWX services. The following statistics are for the 1986 calendar year.

TABLE I

Total number of catalogs	3
Total catalogs mailed	3700
Total listings of materials	84
Total categories of materials listed	11
Total inquiries on materials listed	66
Total service companies listings	19
Total service company listing inquiries	8
Total exchanges of listed materials	7
*Total materials exchanged through WWX	1,232,640 lbs

* Includes an exchange on a cross-listing from the Southern Waste Information Exchange.

TABLE II

Materials Exchanged

Solvents	1%
Metals & Sludges	98.8%
Other	0.2%

INTERNATIONAL MATERIALS REUSE ALLIANCE, INC.

William M. Sloan, President

In 1986 the organizers of the Alliance set about to do the following:

- Improve the quality of service from waste exchanges, and develop a solid base of information (including the human element, by helping to make connections between generators and the recycling industry).

- Get plants that turn out low-value byproducts to try recycling (instead of wasting materials by sending them to destructive treatment).

- Involve government at all levels (dropping unnecessary barriers, and adopting positive programs).

- Give the public a voice in what constitutes effective and responsible recycling.

The Charter and Bylaws provide that the Alliance is organized, and shall be operated to:

- Promote the conservation and reuse of industrial materials.

- Promote safety and responsibility in the conservation and reuse of industrial materials.

- Provide services and products relating to conservation and reuse of industrial materials.

- Operate exclusively for charitable, scientific, and educational purposes as may qualify it for tax exempt status under Section 501(c)(3) of the Internal Revenue Code.

The Alliance is governed by a Board of Directors from among the organizers. The Board will be elected by the membership in 1988. Additions to the Board may be made before then if a proposed motion for expansion is passed. Officers are elected by the Board and serve at the will of the Board, not for fixed terms.

The 1987 Annual Meeting of the International Materials Reuse Alliance, Inc. was held on March 3rd at the 1987 Waste Exchange Conference. A Board meeting followed the annual meeting to consider expanding the Board from seven to eleven members and to establish formally committees on: Marketing and Technical Matters; Government Affairs and Public Policy; Performance and Safety; Education and Communication; and Membership and Funding.

1987 NATIONAL CONFERENCE ON WASTE EXCHANGE AGENDA

March 3, 4, 5, 1987

MILLS HOUSE HOTEL, Charleston, SC

MONDAY, MARCH 2

8:00 - 10:00 p.m.	**Welcome to Charleston Reception -SIGNERS BALLROOM**

TUESDAY, MARCH 3

8:00 - 8:30 a.m.	**Registration/Continental Breakfast - HIBERNIAN HALL**
8:30 - 9:00 a.m.	Welcome and Conference Overview Patricia L. Jerman Southeast Waste Exchange Advisory Board Mary A. McDaniel, Director Southeast Waste Exchange
9:00 - 10:30 a.m.	**SESSION I:** Regulatory Update **Moderator:** Jerry T. Roberts, Chairman of Board Southeast Waste Exchange James H. Scarbrough, EPA Region IV "Federal Legislation Affecting Waste Exchange and Recovery" John Adams Hodge, Attorney at Law "Implementing Recycling Within the Regulations"
10:30 - 10:45 a.m.	**BREAK/EXHIBITS - HIBERNIAN HALL**
10:45 - 12:15 p.m.	**SESSION II:** International Issues **Moderator:** Margo Siekerka, Industrial Material Exchange Service Michael Kelly, U. S. Department of Commerce "Trade Agreements with Other Countries in Industrial Waste" William Sloan, International Materials Reuse Alliance (IMRA) "The Role of IMRA in International Markets"
12:15 - 1:30 p.m.	**LUNCH - SIGNERS BALLROOM** S. Wayne Rosenbaum, Technical Director, ETICAM "Siting a Hazardous Waste Recycling Facility"
1:30 - 3:00 p.m.	**ANNUAL MEETING - HIBERNIAN HALL** International Material Reuse Alliance
7:30 p.m.	**STARLIGHT DINNER CRUISE - MUNICIPAL MARINA** Shuttle bus will leave front of Mills House Hotel from 6:45 - 7:15

WEDNESDAY, MARCH 4

8:00 - 8:30 a.m.	**Registration/Continental Breakfast - HIBERNIAN HALL**
8:30 - 10:00 a.m.	**SESSION III:** Technological Advances in Industrial Recycling I **Moderator:** Bob Laughlin, Canadian Waste Materials Exchange
	Thomas Cody, C F Systems Corporation "Organic Waste Reduction With Critical Fluid Extraction"
	S. Wayne Rosenbaum, ETICAM "Recycling: The New Solution to Metal Waste Disposal"
	Bill Groce, Groce Laboratories "TSD Reclamation Technology"
10:00 - 10:30 a.m.	**BREAK/EXHIBITS**
10:30 - 12:00 noon	**SESSION IV:** Technological Advances in Industrial Recycling II **Moderator:** Bob Laughlin
	Joe Kaminski, Department of Defense "DOD Waste Reduction"
	Harmon I. Shade, DuPont "Waste Reduction at DuPont: Business Opportunities"
	Roger Schecter, North Carolina Pollution Prevention Pays "Waste Reduction Technologies in Small Industries"
12:00 - 1:30 p.m.	**LUNCH/ON YOUR OWN**
1:30 - 3:00 P.M.	**SESSION V:** Innovative Marketing of Industrial By-Products **Moderator:** Lewis Cutler, Northeast Industrial Waste Exchange
	Jim Nesmith, Union Carbide "Marketing Industrial Waste: A Generator's Perspective"
	Ken Wiest, McKesson Envirosystems Company "Marketing Industrial Solvents"
	David Jacobs, Jacobs Trading Company "Marketing: A Dealer's Perspective"
3:00 - 5:00 p.m.	**Update on Waste Exchange Activities: Waste Exchange Managers** **Introduction of Exhibitors and Short Presentations** **Participants Forum: Short Presentation of Your Choice**
7:30 p.m.	**STARLIGHT DINNER CRUISE - MUNICIPAL MARINA** Shuttle bus will leave front of Mills House Hotel from 6:45 - 7:15

THURSDAY, MARCH 5

8:00 - 8:30 a.m.	**CONTINENTAL BREAKFAST**
8:30 - 10:00 a.m.	**SESSION VI:** Developing Marketing Opportunities for Small Quantity Generators **Moderator:** Bill Stough, Great Lakes Waste Exchange Raemelee E. Garrison, Tri-Way Management Systems, Inc. "Managing and Collecting Small Quantity Waste Systems" Bill Stough, Great Lakes Exchange "Model Process for Forming a Small Quantity Generator Cooperative'
10:00 - 10:15 a.m.	**BREAK/EXHIBITS**
10:15 - 11:45 a.m.	**SESSION VII:** Coping with "Bear" Markets **Moderator:** Walker Banning, Southern Waste Information Exchange Janet Graham, Project ROSE "Used Oil Collection and Marketing" Frank Wills, Reclamation Associates "The Realities of Tin Reclamation" Sarah K. Johnson, Putnam, Hayes & Bartlett, Inc. "The Impact of Lead Industry Economics on Battery Recycling"
11:45 - 12:15 p.m.	**CLOSING REMARKS**

NATIONAL WASTE EXCHANGE CONFERENCE SPEAKERS

Tom Cody: Amherst College. Tom Cody has served as Vice President of C.F. Systems Corporation since 1980. C.F. Systems, a subsidiary of Arthur D. Little Company, manufactures equipment to extract and separate organic chemicals from hazardous waste. Prior to joining C.F. Systems, Mr. Cody worked in various roles with the Cabot Corporation and the Norton Company.

Janet H. Graham: Mississippi State University (B.S. Science Education), University of Mississippi (M.Ed. Educational Media). Janet Graham is coordinator of Project ROSE (Recycled Oil Saves Energy) for the State of Alabama. Through her work with Auburn University, Ms. Graham provides industry with regulatory information and technical assistance related to used and waste oil. Ms. Graham is also assisting with Alabama waste exchange efforts as a committee member of HAMMARR (Hazardous Materials Management and Resource Recovery).

William H. Groce III: Newberry College (B.S. Chemistry). William Groce is President of Groce Laboratories in Greer, S.C. He has worked as a research chemist for Celanese Plastics Company, the U.S. Food and Drug Administration and Allied Chemical. Mr. Groce has been responsible for development of several new processes including: safe destruction of cyanides by acid treatment, reclamation of mercury from batteries, destruction of aerosol containers under controlled conditions, and In Situ treatment of barium-contaminated soil. Mr. Groce was recognized as Small Businessman of the Year by the Greer Chamber of Commerce and is listed in Who's Who's in the South and Southeast.

John Adams Hodge: Duke University (B.A. Geology), University of South Carolina (M.S. Marine Science/Geology and J.D. Law). John Hodge works as an attorney and consultant in environmental law. He was formerly employed as a consultant to S.C. DHEC and as geotechnical and legal consultant to the Research Planning Institute of Columbia, S.C. Mr. Hodge is a member of the Society of Economic Paleontologists and Mineralogists, the American Association of Petroleum Geologists, and the Natural Resources Committee of the South Carolina Bar. He also serves as Chairman of the Hazardous Waste Committee of the S.C. Sierra Club.

David Jacobs: University of Cincinnati (B.S. Business Administration). David Jacobs owns and operates several businesses in Pittsburgh, PA. These include Pittsburgh Mineral Trading, which is concerned with the transfer of minerals such as magnesia and alumina to the metals industry, and Jacobs Trading which is involved with the trading of metallic scrap and wastes. Mr. Jacobs is also the managing partner of Wastetech, Inc, which operates a pilot plant for agglomerating electric furnace dust and other mill wastes on site.

Sarah K. Johnson: Harvard University (A.B. Engineering and Applied Science), Stanford University (M.S. Engineering/Economic Systems). Sarah Johnson is an associate at Putnam, Hayes & Bartlett, Inc. She has provided decision analysis and strategic planning support to a number of clients in the private and public sectors, including the U.S. Environmental Protection Agency, the Electric Power Research Institute, the Strategic Decisions Group, and the International Institute for Applied Systems in Vienna, Austria.

Joe Kaminski: Georgia Technological Institute (B.S. Civil Engineering), National University (M.B.A.). Joe Kaminski is a Registered Professional Engineer in California who has sixteen years of sanitary/environmental experience with the National Facilities Engineering Command. For the last three years Mr. Kaminski has served as the Deputy Assistant Secretary of Defense for Environment in Washington, D.C.

Daniel B. Marks: William Jewell College (B.A. Physics). Daniel Marks is President of Progressive Recovery, Inc. He served as Vice President of Progressive Energy Systems, Inc. from 1980 to 1983. Mr. Marks is a member of the American Society of Mechanical Engineers.

James Nesmith III: Cornell University (B.M.E.), New York University (M.B.A.). James Nesmith is Southern Regional Manager for the Surplus Products Investment Recovery Department of Union Carbide. Mr. Nesmith is a member of the International Precious Metals Institute and serves as Vice Chairman of the Materials & By Products Committee of the Investment Recovery Administration.

James H. Scarbrough: Mississippi State University (B.S. Civil Engineering, M.S. Sanitary Engineering). James Scarbrough is manager of the Resource Conservation and Recovery Act Program for EPA Region IV. A Registered Professional Engineer in Mississippi, Mr. Scarbrough first came to the Environmental Protection Agency in 1972 as a Staff Sanitary Engineer in the Water Program. Before becoming Branch Chief, Mr. Scarbrough worked as the Project Manager for the Tennessee Section of the Water Division for a year and a half. Mr. Scarbrough is a member of the American Public Works Association.

Roger N. Schecter: University of North Carolina (M.S. Ecology M.A. Planning and Public Administration). Roger Schecter has been the Director of the Pollution Protection Program since 1983, where he was responsible for development of the nation's first multi-media waste reduction program. Mr. Schecter is a charter member of the American Institute for Certified Planners and has served as Chapter President for N.C. He was senior planner for the nation's Areawide Water Quality Study and currently serves as Chairman of the National Roundtable of State Waste Reduction Programs and as a member of the Editorial Advisory Board for Waste Minimization and Recycling Report.

Harmon Shade: Syracuse University (B.S.), Southern Illinois University (M.S. Science). Harmon Shade is the Environmental and Health Manager of the Cooper River Plant of the E.I. du Pont de Nemours Co., Inc. Mr. Shade is the newly elected Commissioner for the Mt. Pleasant Water and Sewer Commission, Chairman of the Trident Council of Government's Citizen's Advisory Group, and is active in the S.C. Water Pollution Control Association and the S.C. Technical Committee of the State Chamber of Commerce.

William M. Sloan: Georgia Institute of Technology (B.S., Civil Engineering; M.S. Science). William Sloan, President of the Industrial Material Reuse Alliance, is the Executive Director of Maryland Hazardous Waste Facilities Siting Board. The Board has made vigorous investigations of alternatives to treatment and disposal facilities, and this has led to Mr. Sloan's involvement in waste reduction and materials reuse. Mr. Sloan is also Editor of SOLUTIONS, newsletter of the Consortium of State Hazardous Waste Siting Authorities, Inc., and Corporate Secretary of that group.

William A. Stough: William James College (B.S. Urban and Environmental Affairs). William Stough is the Technical Projects Manager of Waste Systems Institute of Michigan, Inc. In this capacity, Mr. Stough designed and implemented the Great Lakes Regional Waste Exchange, a regular feature in the bimonthly technical magazine Great Lakes Exchange. He has served as State Coordinator of the Michigan Used Oil Recycling Project and as a founding Board member of the Michigan Recycling Coalition. Mr. Stough was recently elected President of the Board of Directors for the Michigan Association of Environmental Professionals.

Kenn A. Wiest: University of Wisconsin - Stevens Point (Liberal Arts). Kenn Wiest is Vice President of Marketing and Sales for McKesson Envirosystems. In this position, Mr. Wiest acts as a liaison between McKesson Chemical and McKesson Envirosystems in all areas involving waste transactions. He is also responsible for developing a long range strategy for waste derived fuels with potential users.

Frank Wills: New York University (B.S. Chemical Engineering), Stevens Institute of Technology (M.S. Chemical Engineering). Frank Wills is Vice President of Reclamation Associates in New York City, and a former Vice President of AMAX. Mr. Will's articles have appeared in Chemical Society Journal and The Encyclopedia of Electrochemistry.

NATIONAL CONFERENCE ON WASTE EXCHANGE

Charleston, SC

March 3, 4, 5, 1987

EXHIBITORS

Troy Bridges
Fluid Maintenance
2170 Washington Road
Spartanburg, SC 29302
803/585-8920

Lynn Brown
Geraghty & Miller, Inc.
1410 Whiskey Road
Aiken, SC 29801
803/649-3981

Herb Cobb
Finish Engineering Company
400 Westbrook Drive
Raleigh, NC 27609
919/455-4478

Thomas Cody
CF Systems Corporation
25 Acorn Park
Cambridge, MN 02140
617/492-1631

Gerald Dunaway
Southern Recovery
1658 Katy Lane
Ft Mill, SC 29715
803/548-5740

John V. Elliott
USG Industries
2010 Charlotte Drive
Charlotte, NC 28203
704/333-3950

Rich A. Ellman
Equipment Associates, Inc.
920 Blairhill Road, Suite 104
Charlotte, NC 28210
704/522-0170

Bob Hollins
Baumgardner Oil Company
1514 Black Gap Road
Fayetteville, PA 17222
717/352-7078

John Huebner
Groce Laboratories
P. O. Box 816
Greer, SC 29652
803/877-1048

John Shaw
Department of Defense
926 Taylor Station Road
Blacklick, OH 43004
614/238-3830

Tina M. Tomaszewski
Tennessee Valley Authority
315 CEB-NFDC
Muscle Shoals, AL 35660
205/386-2772

NATIONAL CONFERENCE ON WASTE EXCHANGE

Charleston, SC

March 3, 4, 5, 1987

PARTICIPANTS

Mr. John Alberts Sonoco Products Company	RR # 3, Box 609 A Union, SC 29379 803/427-5677
Ms. Charlene Alston Southeast Waste Exchange	Urban Institute - UNCC Charlotte, NC 28223 704/547-2307
Mr. Jim Anderson Anderson Associates	P. O. Box 288 Topsfield, MA 01983-0388 617/887-2365
Mr. Edward A. Andrews Arizona State University	Center for Environmental St. Tempe, AZ 85287 602/965-1858
Mr. Randall F. Andrews I A C	Rt. 2, Box 521-C Red Springs, NC 28377 919/843-2121
Mr. James S. Balcerek Solid Tek Systems, Inc.	P. O. Box 888 Morrow, GA 30260-0888 404/361-6181
Mr. Walker Banning Southern Waste Information Ex.	P. O. Box 6487 Tallahassee, FL 32313 904/644-5516
Mr. W. R. Beck Jacksonville Electric Company	233 West Duval Street Jacksonville, FL 32202 704/633-4779
Mr. Charles J. Beebe DRMS	74 N. Washington St., FedCtr Battle Creek MI 49017-3092 616/961-7305
Mr. Jeffrey M. Berman Park Trading Company	P. O. Box 9521 Providence, RI 02940 401/467-3100
Mr. Mike Betts Safety-Kleen Corporation	777 Big Timber Road Elgin, IL 60120 312/697-8460

Mr. John Bittle, Jr. Cumberland County Solid Wst. Mgt.	698 Ann Street Fayetteville, NC 28310 919/483-4897
Mr. Leo Bonaventure Jim Walter Papers	5406 West 1st. Street Jacksonville, FL 32205 904/783-1551
Mr. Troy Bridges Fluid Maintenance	2170 Washington Road Spartanburg, SC 29302 803/585-8920
Mr. Coy Bridges Fluid Maintenance	2170 Washington Road Spartanburg, SC 29302 803/585-8920
Ms. Virginia Brien Editorial Services	1952 Kilborne Drive Charlotte, NC 28205 704/535-9096
Mr. John Brien Editorial Services	1952 Kilborne Drive Charlotte, NC 28205 704/535-9096
Ms. Sharon Brogdon Defense Reutilization & Mktg.	P. O. Box 5715 N. Charleston, SC 29206-0715 803/743-5176
Mr. Clyde S. Brooks Recycle Metals	41 Baldwin Lane Glastonbury, CT 06033 203/633-7406
Ms. Lorraine M. Brooks SC DHEC	605 North Main St. Greenville, SC 29601 803/242-9850
Ms. Lynn Brown Geraghty & Miller, Inc.	1410 Whiskey Road Aiken, SC 29801 803/649-3981
Mr. Daniel Buckhiester Bryson Industrial Services	411 Burton Road Lexington, SC 29072 803/359-7027
Mr. James M. Burckhalter SC DHEC	117 Marion Street, NE Aiken, SC 29801 803/648-9561
Mr. Doug Carothers AllWorth, Inc.	500 Medco Road Birmingham, AL 35217 205/841-1707
Mr. Thornell Cheeks EPA Region IV	345 Courtland Avenue, NE Atlanta, GA 30365 404/347-3016
Mr. Bill Child Illinois EPA	2200 Churchill Road Springfield, IL 62706 217/782-6762

Mr. Chay S. Ching BASF Fibers	Drawer 3025 Anderson, SC 29621 803/261-0464
Mr. Herb Cobb Finish Engineering Company	400 Westbrook Drive Raleigh, NC 27609 919/455-4478
Mr. Thomas Cody, Jr. CF Systems Corporation	25 Acorn Park Cambridge, MN 02140 617/492-1631
Mr. Larry Conrad Peel Waste Exchange	10 Peel Center Drive Brampton, Ontario, CN L6T 4B9 416/791-9400
Mr. John W. Cooper Cryovac/W. R. Grace & Company	P. O. Box 338 Simpsonville, SC 29681 803/963-4111
Mr. J. B. Cox U. S. Dept. of Commerce	Main Commerce Bldg., Room 4045 Washington, DC 20230 202/377-2565
Dr. H. W. Cox, Jr. ETS, Inc.	1819 Albert Jacksonville, FL 32202 904/355-2157
Mr. Lewis M. Cutler Northeast Industrial Exchange	90 Presidential Pl. Ste. 122 Syracuse, NY 13202 315/422-6572
Mr. Randall D. Dahle 3-M Company	3-M Center, 1925 Case Ave. St. Paul, MN 55144-1000 612/733-3965
Dr. Louis Daignault UNCC	Dept. of Chemistry Charlotte, NC 28223 704/547-2307
Mr. Robert Dailey Western Carolina University	Industrial Education & Tech. Cullowhee, NC 28723 704/227-7368
Mr. Jeffrey Dauphin Waste Systems Institute	470 Market, SW, Ste. 100A Grand Rapids, MI 49503 616/451-8992
Mr. James Ed Davis Arkansas Energy Office	One State Capitol Mall Little Rock, AR 72204 501/371-1370
Mr. David G. Dempsey Enwright Associates, Inc.	P. O. Box 5287 Greenville, SC 29606 803/232-8140
Mr. Mike Dickens American Crane	P. O. Box 9012 Wilmington, NC 28403 919/395-8535

Mr. William E. DuPre SC DHEC	P-129 One Park Avenue Greenwood, SC 29646 803/223-0333
Ms. Pat Dugger Lexington/Fayette Urban Co. Govt.	200 East Main Street Lexington, KY 40507 606/258-3783
Mr. Keith Dumas Shephard Trucking Co.	4361 Headquarters Road Charleston, SC 29405 803/554-1382
Mr. Gerald Dunaway Southern Recovery	1658 Katy Lane Ft. Mill, SC 29715 803/548-5740
Mr. Harry Durham Highlands Recycling Corporation	5100 Westheimer/Suite 400 Houston, TX 77056 713/840-7124
Mr. Douglas K. Eberhart Mobay Corporation	P. O. Box 10288 Charleston, SC 29411 803/553-8600
Mr. Harry O. Eiler Precision Energy Systems, Inc.	1-25 Morse Schaumburg, IL 60193 312/980-6979
Mr. John V. Elliott USG Industries	2010 Charlotte Drive Charlotte, NC 28203 704/333-3950
Mr. Rich A. Ellman Equipment Associates, Inc.	920 Blairhill Rd., Ste. 104 Charlotte, NC 28210 704/522-0170
Mr. Robert L. Fairey SC DHEC	2600 Bull Street Columbia, SC 29201 803/734-5200
Mr. Gene Farrell Shuman Plastics	35 Neoga Street DePew, NY 14043 716/685-2121
Mr. Adam Feldman CP Chemicals	1 Parker Plaza Fort Lee, NJ 07024 201/944-6020
Mr. Lamar Garrard Alternate Energy Resources, Inc.	2730 Walden Drive Augusta, GA 30904 404/738-1571
Ms. Raemelee E. Garrison Tri-Way Management Systems, Inc.	36345 Van Born Road Romulus, MI 48174 313/595-0430
Mr. Lawrence Gemmell Gemchem Company	140 Kleine Lane Lititz, PA 17543 717/627-0248

Mr. Fred A. Gershman E. I. DuPont de Nemours & Co.	FPD Dept. Barley Mill Plaza Wilmington, DE 19898 302/992-2851
Mr. Roman Gerus Chemical Waste Management, Inc.	3003 Butterfield Road Oak Brook, IL 60521 312/218-1623
Mr. D. H. Gill Celanese	P. O. Box 32414 Charlotte, NC 28232 704/554-2159
Mr. Steve Graefe NH Resource Recovery Association	P. O. Box 721 Concord, NH 03301 603/224-6996
Ms. Janet H. Graham Project ROSE	Box G Tuscaloosa, AL 35487-9644 205/348-4878
Ms. Patricia P. Gray Defense Reutilization & Mktg.	P. O. Box 5715 N. Charleston, SC 29206-0715 803/743-5176
Mr. French C. Gray, III Consolidated Fibres, Inc.	1875 Century Blvd., Ste. 230 Atlanta, GA 30345 404/329-0030
Mr. William H. Groce Groce Laboratories, Inc.	P. O. Box 816 Greer, SC 29652 803/877-1048
Ms. Nancy Grundahl (3HW34) EPA Region III	841 Chestnut Bldg. Philadelphia, PA 19107 215/597-7188
Mr. Greg Harder Resource Recovery & Planning	Fulton Bldg. 7th Floor/P. O. Box 2063 Harrisburg, PA 17120 717/787-6239
Mr. Mike Hargett Applied Laboratory, Inc.	P. O. Box 399 Creedmore, NC 27522 919/846-7544
Ms. Linda Hargrave Envirite	600 West Germantown Pike Plymouth Meeting, PA 19462 215/828-8655
Mr. Ted Harris Energy Resources Foundation	2600 Devine Street, Ste. 200 Columbia, SC 29205 803/256-7298
Mr. Walt Harvey Sonoco Products Company	RR # 3, Box 609 A Union, SC 29379 803/427-5677
Mr. Mark A. Harvley SC DHEC	220 McGee Road Anderson, SC 29621 803/225-3731

Mr. Steve Hensley COMMANDER: Charleston Naval Yard	Naval Base, Bldg. 12 - Code 460 Charleston, SC 29418 803/743-6116
Mr. William J. Herz Alabama Waste Exchange	P. O. Drawer G. Tuscaloosa, AL 35487 205/348-5889
Mr. George R. Hodge Reeves Brothers, Inc.	P. O. Box 1531 Spartanburg, SC 29304 803/576-9210
Mr. John Adams Hodge Attorney at Law	P. O. Box 5066 Columbia, SC 29250 803/779-3363
Mr. Mike Hodgson MKC Enterprises	5856 New Peachtree Road Doraville, GA 30340 404/457-1341
Ms. Sharon Hodgson MKC Enterprises	5856 New Peachtree Road Doraville, GA 30340 404/457-1341
Mr. Bob Hollins Baumgardner Oil Company	1514 Black Gap Road Fayetteville, PA 17222 717/352-7078
Mr. M. P. Huckabee SC Dept of Public Transportation	1424 Shop Road Columbia, SC 29201 803/737-1555
Mr. John J. Huebner Groce Laboratories, Inc.	P. O. Box 816 Greer, SC 29652 803/877-1048
Mr. James Hyland Dana Corporation	8000 Yankee Road Ottawa Lake, MI 49267 313/856-5111
Ms. Mary R. Ironnecklace DRMR-M	2163 Airways Blvd. Memphis, TN 38114-5297 901/775-4973
Mr. David Jacobs Jacobs Trading Company	106 Bertley Ridge Drive Coraopolis, PA 15108 412/262-3543
Mr. Skip Jacobs S & J Recycling	244 Briar Lane Highland Park, IL 60035 312/831-5455
Mr. Norm J. Jardine Equipment Associates, Inc.	920 Blairhill Rd., Ste. 104 Charlotte, NC 28210 704/522-0170
Ms. Trish Jerman EBASCO/Envirosphere Company	1409 Fairview Drive Columbia, SC 29205 803/254-3288

Ms. Sarah Johnson Putnam, Hayes & Bartlett, Inc.	124 Mt. Auburn Street Cambridge, MD 02138 617/492-6900
Mr. Gene Jones Southern Waste Exchange	P. O. Box 6487 Tallahassee, FL 32313 904/644-5516
Mr. Joe Kaminsky OASO Offc. of Secy. of Defense	OASO (M1-L Pentagon) Washington, DC 20301 202/695-7820
Mr. John G. Keck Carolina Steel & Wire Corp.	I-20 & SC #6 P. O. Box 829 Lexington, SC 29072 803/359-5501
Mr. W. James Kelley SC DHEC	3204 Industry Blvd. Florence, SC 29501 803/662-3522
Mr. Michael T. Kelley U. S. Dept. of Commerce	Main Commerce Bldg. Rm 4045 Washington, DC 20230 202/377-2565
Mr. Jack Kendall SC DHEC	2600 Bull Street Columbia, SC 29201 803/734-5200
Mr. George A. Kennedy TVA	T204 NFDC Muscle Shoals, AL 35660 205/386-2374
Mr. Bernard A. Kerns Westinghouse Electric Corporation	1557 Westinghouse Bldg, 6 Pittsburgh, PA 15222 412/642-3864
Mr. David King Virginia Chemicals	801 Water Street Portsmouth, V. 23704 804/393-3228
Mr. Charles Edward Kiser Duke Power Co/Mill Power Supply	P. O. Box 32307 Charlotte, NC 28232 704/373-7023
Ms. Elizabeth L. Kruger Fossil Prod. Div. Duke Power Co.	P. O. Box 33189 Charlotte, NC 28242 704/373-5337
Mr. Art Kuljian Argonne National Laboratory	9700 South Cass Avenue Argonne, IL 60439 312/972-3233
Mr. Tapio Kuusinen EPA REGULATORY REFORM Staff	PM 223, 401 M Street, SW Washington, DC 20460 202/382-2689
Mr. Brian F. LaFontaine LeHan Sales Company	P. O. Box 266 Scottsville, VA 24590 804/286-2344

Mr. Robert Laughlin Canadian Waste Exchange	Sheridan Park Research Comm. Mississauga, Ontario, CN L5K 9Z9 416/822-4111
Mr. Burt Lea Specialized Marine, Inc.	P. O. Box 813 Wrightsville Beach, NC 28480 919/256-5780
Mr. Earl F. Leach S. E. Chemical & Solvent Co.	Rt. 1, Box 434-A Lyman, SC 29365 800/922-0461
Mr. Robert G. Lee TVA/National Fertilizer Dev.	333 CEB Muscle Shoals, AL 35602 205/355-3548
Mr. Mitchell Leu Special Resource Management	P. O. Box 4168 Butte, MT 59702 406/494-2500
Mr. Chris Locke SC-DHEC	2600 Bull Street Columbia, SC 29601 803/242-9850
Mr. Stephen Mahfood EIERA	P. O. Box 744 Jefferson City, MO 65101 314/751-4919
Ms. Mary E. Malotke Tencon Associates	140 Wooster Pk. Milford, OH 45150 513/248-0012
Mr. Gary Mann Hevmet Recovery Ltd.	P. O. Box 278 Port Colborne, Ontario CN L3K 5W1 416/834-0034
Mr. Daniel B. Marks Progressive Recovery, Inc.	1020 North Main Columbia, IL 62236 618/281-7196
Ms. Maxie L. May Southeast Waste Exchange	Urban Institute - UNCC Charlotte, NC 28223 704/547-2307
Mr. J. S. McCormack Environmental Testing, Inc.	1700 University Comm. Pl. Charlotte, NC 28213 704/597-8454
Ms. Mary A. McDaniel Southeast Waste Exchange	Urban Institute - UNCC Charlotte, NC 28223 704/547-2307
Mr. Edwin B. McDowell SC DHEC	P. O. Box 156 State Park, SC 29147 803/737-7015
Mr. Ron McHugh EPA Regulatory Reform Staff	PM 223, 401 M. Street, SW Washington, DC 20460 202/382-2689

Mr. Clyde E. McNeely Chilton Plating Co., Inc.	420 East Main Street Chilton, WI 53014 414/849-9355
Mr. Vic Miles Duracell USA	P. O. Box 500 Lancaster, SC 29720 803/285-8401
Mr. William Paul Moore Waste Management, Inc.	3003 Butterfield Road Oak Brook, IL 60521 312/572-8823
Mr. Vann Moore SC DHEC	100 Air Park Road Charleston Heights, SC 29418 803/554-5533
Mr. Jim Nesmith Union Carbide	P. O. Box 8361 S. Charleston, WV 25303 304/747-3523
Mr. Max E. Norman Kansas City Chamber of Commerce	920 Main Street, Ste 600 Kansas City, MO 64105 816/221-2424
Mr. David W. Opitz Aqua-Tech, Inc.	140 South Park Street Port Washington, WI 53074 414/284-5746
Mr. Jim Ostrowski Safety-Kleen Corporation	777 BiG Timber Road Elgin, IL 60120 312/697-8460
Mr. Charles A. Owen Groce Laboratories, Inc.	P. O. Box 816 Greer, SC 29652 803/877-1048
Mr. Jim Parrish Defense Reutilization & Marketing	Federal Center Battle Creek, MI 49017 616/961-5908
Mr. Ted Pawlaczyk Vermont Republic Industries	3 Mennah Drive St. Albans, VT 05478 802/524-6055
Ms. Donna Peterson MnTap	W 140 Boynton Health Service Minneapolis, MN 55455 612/625-9677
Mr. David Pippin Chem-Way Corporation	P. O. Box 668129 Charlotte, NC 28266 704/377-5512
Mr. James N. Quinn Chemicals for Research & Industry	2928 Poplar Street Oakland, CA 94608 415/893-8257
Ms. Karen Rhodes Northeast Waste Exchange	90 Presidential Plaza/# 122 Syracuse, NY 13202 315/422-6572

Ms. Suzanne Rhodes Governor's Office, Project Admin.	1205 Pendlenton Street Columbia, SC 29201 803/734-0445
Mr. Jerry T. Roberts Carolina Utility Custo :rs Assn.	Ste. 295, Carolina Place Raleigh, NC 27608 919/782-7843
Mr. John Rocchi Retec Resources Recovery	P. O. Box 1477 Bratford Ontario, CN N3T 5I6 519/756-9770
Mr. Wayne Rosenbaum ETICAM, Inc.	P. O. Box 6787 Warwick, RI 02887 401/738-3261
Mr. David Rozelle DEQ	811 SW Sixth St., 8th Floor Portland, OR 97204 503/229-5672
Mr. Bernie Rumbold Retec Resources Recovery	P. O. Box 1477 Bratford, Ontario, CN N3T 5I6 519/756-9770
Mr. James H. Scarbrough EPA Region IV (RCRA Program)	345 Courtland Street, NE Atlanta, GA 30308 404/347-3016
Mr. Roger D. Schecter PPP, NC Dept. of Natural Resource	P. O. Box 27687 Raleigh, NC 27611 919/733-2015
Mr. Harmon I Shade DuPont	P. O. Box 10228 Charleston, SC 29411 803/797-9073
Mr. John Shaw DRMR-Columbus	926 Taylor Station Rd. Blacklick, OH 43004 614/238-3830
Comm. Dennis Shaw Coast Guard Support Center	Elizabeth City, NC 27909 919/335-6587
Ms. Margo Siekerka Industrial Material Exchange	2200 Churchill Road Springfield, IL 62706 217/782-6762
Mr. William Sloan Haz. Wst. Fac. Siting Board	60 West Street, Ste. 200 Annapolis, MD 21301 301/269-3343
Mr. Allen R. Smith Marine Corps Air Station	Cherry Point Cherry Point, NC 28533 919/466-3631
Mr. Tom Smith SunOhio	1700 Gateway Blvd. Canton, OH 44707 216/452-0837

Ms. Hilary Sommer Duke Power Company	Box 33189, Nuclear Prod. Charlotte, NC 28242 704/373-2374
Ms. Penny Spell Dynamac Corporation	363 CSG/DEEV Shaw Air Force Base, SC 29152-5000 803/668-5201
Mr. Joel Steigman PA Enviromental Resources	1 Ararat Blvd. Harrisburg, PA 17110 717/657-4588
Mr. Jim Stewart Chem-King, Inc.	RR # 3 Barrie, Ontario, CN L4M 4S5 705/737-1221
Mr. William A. Stough Great Lakes Regional Waste Ex.	470 Market, SW, Ste. 100-A Grand Rapids, MI 49503 616/451-8992
Mr. Richard L. Strickland TVA	Biomass Branch, 728 CEB Muscle Shoals, AL 35660 205/386-2542
Ms. Tina M. Tomaszewski TVA	315 CEB-NFDC Muscle Shoals, AL 35660 205/386-2772
Mr. Frank J. Trembacki DaTrex Enterprises, Inc.	2 North Gilbert Clarendon Hills, IL 60514 312/789-8616
Mr. Dave G. Trembacki DaTrex Enterprises, Inc.	2 North Gilbert Clarendon Hills, IL 60514 312/789-8616
Ms. Linda Varangu Peel Reg. Waste Exchange	10 Peel Center Drive Brampton, Ontario, CN L6T 4B9 416/791-9400
Mr. Michael C. Vilione Aqua-Tech, Inc.	140 South Park Street Port Washington, WI 53074 414/284-5746
Mr. Guy Watson State of New Jersey	401 East State St., CN028 Trenton, NJ 08625 609/292-0331
Mr. Henry Weber ETICAM	P. O. Box 6787 Warwick, RI 02887 401/738-3261
Mr. Tom Welch EIERA	P. O. Box 744 Jefferson City, MO 65102 314/751-4919
Ms. Elizbeth E. Westfall Kimberly-Clark Corporation	Beech Island Mill Beach Island, SC 29841 803/827-1100

Mr. James C. Wheat DRMO-Charleston	P. O. Box 5715 N. Charleston, SC 29206-0715 803/743-5319
Mr. Kenn Wiest McKesson Envirosystems, Inc.	127 West Berry Street Ft. Wayne, IN 46802 219/424-1940
Mr. Terry Wilkins American Tank Transport, Inc.	6317 Macaw Court Elkridge, MD 21227 800/828-8642
Mr. Frank Wills Reclamation Associates	609 West 114 Street New York, NY 10025 212/666-4699
Mr. Doug Wilson Heritage Environmental Services	4132 Pompano Street Charlotte, NC 28216 704/392-6276
Mr. Mark S. Wise Chemetals, Inc.	7310 Ritchie Hwy. Glen Burnie, MD 21061 301/760-1900
Mr. Tom D. Yates TN Dept of Health & Env.	Customs House, 4th Floor Nashville, TN 37130 615/741-3424