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PRESIDENT'S COUNCIL ON SUSTAINABLE DEVELOPMENT

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October 21-22, 1996

The White House Conference Center

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PROCEEDINGS OF THE WORKSHOP

ON

EXTENDED PRODUCT RESPONSIBILITY

October 21-22, 1996
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and
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NOTICE

The presentation of case studies in this document does not reflect endorsement of the featured companies or their policies or products by the President's Council on Sustainable Development (PCSD) or the U.S. Environmental Protection Agency (EPA). The recommendations contained in the Executive Summary reflect the views of the PCSD working group on Extended Product Responsibility based on discussions at the workshop. They do not necessarily represent consensus among every participant at the workshop, members of the New National Opportunities Task Force, or the PCSD.

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Martin A. Spitzer, J.D., Ph.D.
Executive Director
President's Council on Sustainable Development

EXECUTIVE SUMMARY

Impetus for Convening the Workshop

In its report, *Sustainable America*, the President's Council on Sustainable Development (PCSD) endorsed the principle of Extended Product Responsibility (EPR) as a means for industry, government and the environmental community to "identify strategic opportunities for pollution prevention and resource conservation" throughout the life cycle of a product (p. 38). The recommendation was based on two premises: that significant change is required for the United States to become more sustainable in terms of resource conservation; and that change will only be incremental as long as all stages of product-related economic activity are viewed separately.

Under an innovative system of EPR, all participants in the product life cycle—designers, suppliers, manufacturers, distributors, users and/or disposers—share responsibility for the environmental effects of products and waste streams. "The greatest responsibility for EPR rests with those throughout the chain of commerce...that are in the best position to practice resource conservation and pollution prevention at lower cost" (p. 40).

EPR is a principle that can be applied by industry voluntarily or by government as a regulatory requirement. A variety of tools can be used to implement EPR. As the PCSD report stated, "the tools used for a particular product category should be designed to achieve the desired change at the most appropriate links in the [product] chain, and where possible, by voluntary action" (p.42).

Some businesses in the United States are already implementing EPR for a variety of reasons. Some are responding to mandates abroad. Some wish to forestall similar mandates in the United States. Some are striving to meet corporate goals to "green" their products. Some recognize that products can be valuable assets even at the end of their useful life. To showcase some of the many creative and strategic business initiatives already under way in the United States, the PCSD's New National Opportunities Task Force decided to hold a workshop on EPR.

Description of the EPR Workshop

The workshop took place on October 21 and 22, 1996, in Washington, D.C., at the White House Conference Center. It was co-sponsored by the PCSD and EPA. Although originally envisioned as a small event (approximately 40 participants), the workshop generated so much interest that more than 85 people attended, including representatives from numerous businesses, trade associations, environmental groups, states, universities, and the federal government. The major goals of the workshop were to: (1) enhance understanding of the principle of EPR; (2) demonstrate the various models, actors, and industry sectors implementing EPR through presentation of case studies; (3) determine how best to educate the business community, government, environmental organizations, and other nongovernmental organizations about the benefits and challenges of EPR; and (4) encourage greater implementation of EPR.

The workshop program included introductory presentations on the concept of EPR and the drivers and obstacles facing businesses and other organizations interested in EPR. Eleven companies presented case studies on how they are implementing EPR to reduce the life-cycle environmental impacts of their products. Some of the presentations included partners (e.g., suppliers, product users, trade associations) in the product life cycle who are helping to make EPR successful. Industry sectors represented in the case studies included the automobile, forest products, consumer products, building cleaning and maintenance, plastics, telecommunications, office equipment, battery, and carpeting industries. In total, more than 30 companies and industry associations participated in the workshop.

Special sessions addressed specific issues on: (1) models and strategies for EPR; (2) the business case for EPR; (3) barriers to implementation of EPR; (4) outreach strategies for EPR (i.e., how to spread the word on the new EPR paradigm); and, finally, (5) next steps that the PCSD and others should take to promote wider implementation of EPR.

Findings

EPR is actively being implemented in the United States, and is bringing about significant changes in some products and their associated environmental impacts. In many cases, changes are occurring at multiple stages in product life cycles: upstream; during manufacturing; during product use; and at the end

of the product's "useful life." Though EPR is not yet a standard way of doing business in the United States, the participants agreed that the idea must spread to more products and players in this country.

EPR Workshop Case Studies

Company	Project
DuPont Films	PET Regeneration Technology
Ford Motor Co.	Bumper Take-Back and Recycling
Georgia-Pacific Corp	Recycled Urban Wood
Interface Flooring Systems, Inc.	Evergreen Program
S.C. Johnson Wax Co.	America Recycles Aerosols
Nortel	Product Life Cycle Management
Rechargeable Battery Recycling Corp.	Charge Up to Recycle
Rochester Midland Corp.	Office Building Cleaning
Safety-Kleen Corp.	Solvent Take-Back
U.S. CAR	Vehicle Recycling Partnership
Xerox Corp.	Asset Recycle Management

Detailed summaries of case studies can be found in Appendix E of this document.

When government institutions decide that it is necessary to set environmental goals or mandates affecting a particular industry or product, government should, when possible, set performance standards, ensure appropriate public accountability for the performance standards, and leave implementation of the objective to the creative forces of the market system. This essentially takes the "control" out of the phrase "command and control." EPR is a process that can be used to meet such government objectives or address a problem before government becomes involved.

The case studies presented in the workshop prompted discussion of the PCSD definition of EPR, contrasting it with the terminology and approaches taken abroad. Whereas the PCSD definition of "extended *product* responsibility" stresses sharing among many players the responsibility for environmental impacts over a product's entire life cycle, the approach taken abroad—known often as "extended *producer* responsibility"—typically places responsibility solely on producers or manufacturers, and only for the end-of-life disposition of the products.

During the workshop, some participants suggested that the PCSD definition of EPR should be narrower and that not all of the projects presented at the workshop would qualify as EPR under a narrower definition. Others suggested that, in principle, it may be best to keep a broad definition. Nevertheless, there was general agreement among the participants that EPR is about sharing responsibility and reducing environmental impacts in all stages of a product's life cycle, not just reducing and recovering waste. In addition, participants agreed that a "one size fits all" approach to EPR will not work; by necessity, EPR approaches vary by product, market conditions, and the efforts of participants. Ultimately, many participants decided that rather than redebating the definition of EPR, it would be more constructive to

focus on the key features of EPR as it is being practiced domestically and abroad so that others can build upon or adapt these approaches.

Some of the key features of EPR identified at the workshop included:

- **Companies taking on responsibility and addressing the environmental impacts of their products where they have not done so before.** For example, the nickel-cadmium battery industry has launched and is paying for a nationwide program to collect and recycle spent nickel-cadmium batteries. Also, DuPont has partnered with its customers to develop reverse distribution systems to recover postindustrial (and eventually postconsumer) plastic film waste, which it reprocesses into feedstock used to remanufacture new plastic.

- **New ways of thinking about product delivery, such as recasting products as services or functions.** For example, as an alternative to the conventional sale of carpet for commercial use, Interface Flooring Systems sells a long-term carpet maintenance and replacement service. The company uses replaceable carpet tiles designed to prolong the useful life of the flooring and partners with its suppliers to ensure postconsumer reclamation of its products in a closed-loop system.

- **Rearranging institutional relationships throughout the chain of commerce to minimize wastes and the unnecessary consumption of raw materials.** For example, the Vehicle Recycling Partnership (VRP)—a consortium established by Chrysler, Ford, and General Motors—is investing in research to develop the infrastructure and technologies required for recycling and proper disposal of scrap automobiles. Design changes to increase recyclability (e.g., elimination of mercury switches) are being implemented by the three auto companies as a result of the VRP's work.

- **Creating a feed-back loop with customers to drive environmentally sound redesign of products.** For example, Rochester-Midland, a manufacturer of institutional cleaning products, is involving cleaning service providers (e.g., WECO Cleaning Specialists), building owners (e.g., the General Services Administration), and tenants in the design and implementation of mitigation strategies to improve the indoor environment of office buildings. Customer feedback is the foundation for both product reformulation and the development of new customer services such as education and joint problem solving.

- **Closing the product loop and conserving resources by handling waste products as assets.** In many case studies, there was a discernable trend to make waste products an asset. For example, Georgia-Pacific is working with waste managers and processors of waste to collect, sort, and process wood product discards into new products. S.C. Johnson Wax and other aerosol manufacturers, in partnership with suppliers and waste processors, are educating waste management officials and consumers on the benefits of recycling aerosol cans in order to recover the steel.

- **Evaluating and reducing the life-cycle impacts of products.** Both Xerox Corporation and Northern Telecom have "design for the environment" programs, which in combination

with product life extension and product take-back approaches, are reducing some of the life-cycle environmental impacts of their products.

In discussions, participants identified key drivers and barriers to implementation of EPR. Many of the most common ones are listed below:

Common Drivers	Common Barriers
* Increasing customer satisfaction and loyalty	* Lack of understanding of the concept
* Maintaining or improving competitive advantage	* Regulatory obstacles
* Increasing efficiency of resource use	* Insufficient analytical tools
* Saving money and/or increasing profits	* Customer acceptance
* Responding to actual or threatened regulatory requirements in the U.S. or abroad	* Technological barriers
* Advancing a company's own goals for sustainability	* "Free riders" in voluntary systems
	* Underutilized and insufficient infrastructure for handling, reusing, and reprocessing impaired assets (e.g., waste with potential market value)
	* Organizational barriers that create inertia

Participants also generally agreed that there is a clear role for government in helping to overcome some of these obstacles, particularly in spreading the word on EPR, removing regulatory barriers, creating appropriate regulatory signals, and providing encouragement and recognition.

Recommended Next Steps

The energy and enthusiasm of the participants demonstrated a high degree of interest in EPR and a belief in its potential to move the United States toward a more sustainable economy. The workshop participants agreed that we should maintain the positive momentum on EPR that was demonstrated at the workshop. Specific recommendations are:

- ***Step 1: Create and maintain a focal point for promotion of EPR.*** Participants agreed that maintaining EPR's momentum requires a focal point. This focal point could be a Presidentially-appointed multi-stakeholder "product responsibility" panel, as recommended in the *Sustainable America* document. Or, it could be a more informal steering committee of volunteers representing multiple stakeholders. Regardless of the final structure, it should have some stability and an adequate staff and budget to fulfill its mission.

- ***Step 2: Continue PCSD involvement.*** Many participants felt that the PCSD should continue its involvement, regardless of how the focal point is established. White House-level commitment to this issue will help to ensure that it spreads farther and faster to participants and sectors that are not yet engaged in EPR.

- ***Step 3: Promote further evaluation of case studies and demonstration projects.*** There seemed to be agreement that the PCSD's recommendation to develop "models of shared responsibility" was accomplished, in many ways, by showcasing case studies at the workshop. EPR could be promoted further by evaluating the potential for expanding individual cases to entire industries, and/or soliciting additional demonstration project proposals. Demonstration projects could attract the attention of private companies and other parties who are interested in obtaining recognition for adopting environmentally sound practices and for creating partnerships. Such projects create opportunities to "troubleshoot" barriers, including regulatory barriers, and to demonstrate solutions. Some involvement on the part of the PCSD in such a demonstration program would be critical to "draw in" proposals.

- ***Step 4: Maintain a role for government in EPR.*** There was general agreement that government has a role in providing incentives for and removing obstacles to broader implementation of EPR. There are several specific possible roles for government:

  Facilitate, educate, and disseminate. Disseminate information and provide education on EPR; bring parties together to explore opportunities for EPR; provide recognition for companies and others implementing EPR; and collect further examples of EPR. Though not agreed on, several participants pointed to the power of government procurement as one way to highlight products that reflect EPR in action and to overcome barriers to customer acceptance of these products.

  Encourage the use of EPR as an efficient framework to solve environmental problems. When governments legislate, regulate, or agree by consensus to establish or mandate an environmental objective, they should try to: (1) set performance standards whenever possible; and (2) leave implementation to the creative forces of the market system (which could be a voluntary EPR framework).

Overall, the workshop provided valuable insights into current EPR practices and provided a forum for discussing key features of EPR, obstacles to its implementation, and ideas for next steps. The enthusiasm of the participants illustrates that EPR has an important role to play in moving the United States toward sustainability.

WORKSHOP PROCEEDINGS

INTRODUCTION

In its report, *Sustainable America*, the President's Council on Sustainable Development (PCSD) endorsed the principle of Extended Product Responsibility (EPR). The EPR concept envisioned by the PCSD is one in which all participants in the product life cycle share responsibility for the environmental effects of products and waste streams. EPR can be applied by industry voluntarily or by government as a regulatory requirement. Some businesses in the United States are already implementing EPR for a variety of reasons.

To showcase some of the many creative and strategic business initiatives already under way in the United States, the PCSD's New National Opportunities Task Force held a workshop on October 21 and 22, 1996, in Washington, D.C., at the White House Conference Center. It was co-sponsored by the PCSD and EPA. The 85 people that attended the workshop included representatives from businesses, trade associations, environmental groups, universities, and state and federal government.

The major goals of the workshop were as follows:

- Enhance understanding of the principle of EPR.
- Demonstrate the various models, actors, and industry sectors implementing EPR through presentation of case studies.
- Determine how best to educate the business community, government, environmental organizations, and other nongovernmental organizations about the benefits and challenges of EPR.
- Encourage greater implementation of EPR.

The workshop program included introductory presentations on the concept of EPR and the drivers and obstacles facing businesses and other organizations interested in EPR. Eleven companies presented case studies on how they are implementing EPR to reduce the life-cycle environmental impacts of their products. Special sessions addressed specific issues on: (1) models and strategies for EPR; (2) the business

case for EPR; (3) barriers to implementation of EPR; (4) outreach strategies for EPR (i.e., how to spread the word on the new EPR paradigm); and, finally, (5) next steps that the PCSD and others should take to promote wider implementation of EPR.

OPENING REMARKS

Keith Laughlin, Executive Director, The President's Council on Sustainable Development

At the 1992 Rio de Janeiro conference on the environment, began Keith Laughlin, the United States joined countries from across the globe in committing to building a sustainable development strategy. The PCSD is the product of that commitment. President Clinton created the Council in 1993 and charged it with (1) identifying long-term national goals for integrating the economy, equity, and the environment—in essence, creating a vision for sustainability, and (2) providing leadership in achieveing those goals. The Council is a diverse group, with members drawn from the President's cabinet, leaders of national environmental groups, corporations, and labor and civil rights organizations.

In February 1996, the PCSD presented its vision and recommendations in a report to the President entitled *Sustainable America: A New Consensus*. One of the issues the PCSD spoke to directly in the report was the need for EPR: suppliers, manufacturers, users, consumers, and disposers of products together taking responsibility for promoting pollution prevention and resource conservation. The work of the Council did not end with the report, Mr. Laughlin emphasized. After the release of *Sustainable America*, the President asked the Council to identify a series of projects that would start the process of implementing its many recommendations. Among the proposed projects were two workshops, one on eco-industrial parks and one on EPR. This workshop begins the critical process of turning the ideas of the Council into reality.

Kathleen McGinty, Chair of the Council on Environmental Quality

Raising awareness of EPR is one of the challenges we face, said Kathleen McGinty. These days, sustainable development gets the press—the principle of EPR is not as familiar. But knowledge about it and interest in it are growing. Through efforts such as this workshop, EPR will become more widely

recognized. More important, this workshop will take EPR beyond the conceptual phase to something that is workable, even commonplace. Today's workshop includes participants with a range of real-world experience that will be invaluable in determining how to implement EPR.

This workshop is important, Ms. McGinty emphasized, for three reasons:

- **Initiating a dialogue.** This workshop brings together the key EPR stakeholders and launches a critical dialogue about the best way to bring together environmental and economic aspirations.

- **Collaborating on EPR.** Participants at the workshop have an opportunity to demonstrate collaboration instead of confrontation between environmental and economic interests. Waste of any kind is an economic and environmental negative. A collaborative spirit is critical to the ultimate success of EPR.

- **Harnessing our creativity.** This workshop will stress the importance of technology for meeting environmental challenges. Key to the development of new or improved technologies is tapping our reservoir of ingenuity and creativity.

FRAMEWORK FOR DISCUSSION

Extended Product Responsibility: Origins of the Concept and Evolution of the PCSD's Approach to Shared Responsibility

Sergio F. Galeano, Manager of Product Environmental Policy, Georgia-Pacific Corporation

The best way to set a framework for the workshop's discussions, began Sergio F. Galeano, is to review the PCSD's definition of EPR. EPR is a principle that uses the life-cycle approach to identify strategic opportunities for pollution prevention and resource conservation throughout a product system. A key aspect of this approach is that all sectors in a product's life cycle share responsibility in seeking solutions for the environmental problems that arise during the life cycle.

There is an interesting history to the concept of EPR, Mr. Galeano explained. EPR evolved from the concept of extended *producer* responsibility—a term that first appeared in research conducted by the Organization for Economic Cooperation and Development (OECD). Initially, extended *producer* responsibility was implemented as a single-point approach to resolving specific waste problems such as

packaging waste. The single-point approach meant that responsibility was placed on one sector or a link in the packaging chain. Germany's famous packaging law is an example. End-of-life primary packaging under this law became the responsibility of the retailer, while the manufacturer became responsible for end-of-life secondary packaging.

This approach has been shifting recently toward a multiple-point approach in which the responsibility is shared by more product sectors. In the United Kingdom, responsibility under the recent Packaging Act is shared between four sectors: raw materials, converting, packaging, and selling. Out of necessity, the allocation of this shared responsibility varies according to specific circumstances (including the nature of the product system and the location in question). According to Mr. Galeano, the producer need not always be allocated the largest share of responsibility. In fact, under the Packaging Act, the parties—on their own initiative—decided to allocate implementation costs in the following way:

Selling/Retailing	47 percent
Packaging/Filling	36 percent
Converting/Manufacturing	11 percent
Primary (Raw Materials) Manufacturing	6 percent

Sustainable development, continued Mr. Galeano, must be socially acceptable, economically viable, and lead to a sustainable environment. EPR fits in perfectly with this paradigm. The products that we use through our system of commerce connect the ecosystem and the social system—and EPR, as a product-related principle, is a means of ensuring that the connection operates within the principle of sustainability. Product stewardship, consumer information, and policy options are all elements of EPR, which in turn can be an element of eco-efficiency.

Implementing EPR involves drawing from various policy options and tools, both voluntary and mandatory. While voluntary policies are ideal, mandates are often necessary. According to Mr. Galeano, an EPR program has four key features:

- Shared responsibility
- A basis in the product system
- Partnerships

- A variety of policy options

If programs are designed around these features, they will be successful. It comes down to a simple proposition, Mr. Galeano insisted: Take the "control" out of "command and control." Laws and regulations represent the "command" part of this approach to environmental protection, and are properly a function of government. Details of implementation, however—the "control"—could be established more effectively if stakeholders share responsibility and draw from a variety of policy options. This perspective can help the United States move closer to achieving Extended Product Responsibility.

Drivers and Obstacles to Implementation of EPR

Gary Davis, Director of the Center for Clean Products and Clean Technologies, University of Tennessee

EPR, simply put, is a new principle geared for a new generation of environmental protection and pollution prevention, began Gary Davis. Actors along the product chain share responsibility for the life-cycle environmental impacts of the whole product system, including upstream and downstream effects, product use, and disposal. This is the critical factor distinguishing it from other environmental strategies: Whereas past approaches have focused on facilities, EPR focuses on product systems.

The PCSD chose EPR, Mr. Davis continued, as one of its recommended strategies for achieving a "sustainable America" because it meets the themes developed in the PCSD's new consensus. This consensus states that the nation must move from conflict to collaboration and adopt stewardship and individual responsibility. In endorsing EPR, the Council recommended that the United States adopt a voluntary system that ensures responsibility for the environmental effects associated with a product throughout its life cycle. That responsibility is shared by all of those involved in the product at some stage of its life cycle. There are several key features of EPR programs. EPR:

- Extends up and down the product chain. This is its most important feature: EPR is not just about take-back programs.
- Focuses on the product system rather than keying in on a single point in the product chain. As a result, the product designer has a key role in minimizing the environmental impacts of the product system.

- Involves shared and overlapping responsibility among all the actors along the product chain.

Extended *product* responsibility is not the same as extended *producer* responsibility. They tend to be similar, however: European "extended producer responsibility" policies do not place the entire responsibility on producers; rather, the policies embody shared responsibility. The German packaging ordinance, for example, involves shared responsibility between retailers, packaging manufacturers, consumers, and waste managers. One of the goals of EPR is to identify the actors and actions with the greatest ability to reduce the environmental impacts of the product chain and to provide the necessary incentives to encourage them to accept responsibility and take appropriate action.

Fully understanding EPR, continued Mr. Davis, requires clearly establishing its context. EPR is a principle, meaning it represents the highest level of consensus on a topic. A process is a way of implementing a principle. Life-cycle management and industrial ecology are both processes. (Policies are another way to implement a principle.) To initiate a process, relationships and tools are needed. Life-cycle partnerships or arrangements among different stages of the product life cycle and multistakeholder partnerships are examples of relationships. Tools include life-cycle assessments, Design for the Environment, and environmental management systems. Tools are often confused with processes and the goal for using tools.

Any type of EPR program—whether product take-back, materials selection and management, leasing systems, or some other program—offers critical benefits for the individual participating actors, and furthers the drive to establish sustainable development in the United States. Specific benefits include:

- Cost savings, particularly through the process of taking back products, allow manufacturers to recover valuable materials, reuse them, and save money.
- A demonstration of environmental stewardship.
- Product innovation born of end-of-life management of products—companies are looking at designing for recycling and disassembly, which in many cases helps them realize how to assemble products more efficiently.
- Increased consumer satisfaction and loyalty.
- Green marketing.

- Take-back mandates and product restrictions (EPR measures are not always voluntary).
- More efficient environmental protections, since product-based environmental strategies often are a more cost-effective method of complying with environmental regulations and avoiding environmental liabilities than existing facility-based programs.

Despite these benefits, however, obstacles to EPR exist. These include:

- Costs of EPR.
- Lack of information and tools to access overall product system impacts.
- Difficulty in building relationships among actors in different life-cycle stages.
- Rigid product specifications that preclude cleaner designs.
- Product liability concerns associated with extension of responsibility.
- Hazardous waste regulations that require hazardous waste permits for collection and take-back of certain products.
- Antitrust laws that make it difficult for companies to cooperate.
- Facility-based environmental regulations that focus company resources on compliance only.

In the time since the PCSD endorsed EPR, Mr. Davis concluded, increasing attention has been focused on this strategy. Some interesting questions we might consider in this workshop include:

- Which models of EPR work best for priority product systems? How do we decide which models work best? How do we spread the word on which EPR models work?
- How do we develop the relationships among actors in the chain that are crucial to EPR?
- How do we deal with product systems in which voluntary EPR is not occurring because the short-term economics are negative for those stages of the product life cycle that can make the most difference?
- What are the next steps for implementing EPR in the United States?

These are the kinds of questions that further explorations of EPR—and, most important, real-world experience with EPR programs—can help to address. Ultimately, EPR is an opportunity to explore new models of environmental policy that are less costly and more flexible.

PRESENTATION OF CASE STUDIES

Xerox Corporation: Asset Recycle Management

Presenter: Jack Azar

Xerox's goal is "waste-free products manufactured in waste-free factories," said Jack Azar. Achieving this goal will result in environmental benefits, satisfied customers, improved productivity, and increased global competitiveness. Xerox has developed a number of projects under its Environmental Leadership program, including an asset management program for equipment and parts, a toner cartridge program, and a packaging program. Each represents a different way that the EPR concept can be implemented.

The business factors driving Xerox's Environmental Leadership program, which began in 1993, include the solid waste problem and high landfill costs, the need to utilize natural resources, the proposed European take-back regulations, customer requirements, and Xerox's competitive advantage. In the past, a recycling strategy was not part of Xerox's business process—when products were built, they were always new. No process was in place to handle remanufactured products, nor was there any design continuity that anticipated the need to deal with them. Now, the eventual recycling of products is incorporated into the design phase. When equipment comes back, Xerox tries to find a new market for the product or strips it down in a manufacturing facility, then repairs parts and rebuilds the product. If a product cannot be rebuilt, parts are salvaged and materials recycled. When possible, product modules or components are converted into other products. The company's goal is to send nothing to the landfill.

For example, Xerox examined possibilities for recycling its toner cartridges, which can last for 6 months or more. In early versions of cartridges, frames were welded together with no plans for remanufacture or reuse. Then Xerox found a way to make cartridge recycling economically feasible. The company offered customers incentives to return the cartridges and now has up to 60 percent recovery. In fact, the company loses money if the equipment is not returned for remanufacture. Xerox also developed an EPR program for its empty toner bottles, which were formerly thrown away. Xerox reduces the raw material in the bottles and manufactures them with postconsumer polyethylene (PET). Xerox also began reusing the bottles.

Factors enabling EPR within the corporation include senior management support, market research, the elevation of environmental considerations among the corporation's goals, and the establishment of a new business process by working with designers, engineers, and suppliers. Infrastructure development is a particularly important issue. Xerox needs to locate cost-effective regional recyclers and establish an effective return system.

Mr. Azar then responded to a question about whether Xerox's competitors have implemented similar programs. These EPR programs have given Xerox a competitive advantage over foreign manufacturers exporting to the United States, Mr. Azar said, many of which are starting to set up similar systems locally to be competitive.

When asked how Xerox overcame customer resistance to remanufactured products, Mr. Azar stressed that Xerox views consumer education as key. The company communicates the message that its remanufactured products are made with the same workmanship and quality as new products. Customers are more comfortable with recycled products, however, than with rebuilt or remanufactured products.

Georgia-Pacific Corporation: Recycled Urban Wood

Presenter: David Kurtz

Georgia-Pacific manufactures particleboard from multispecies wood recovered from commercial disposal or general urban solid waste, began David Kurtz. The company has agreements with five recycling and processing companies that accept or collect wood at various sites. The wood is cleaned of contaminants and sent to a Georgia-Pacific particleboard manufacturing plant in Martell, California, or to other end users.

The project involves five stakeholder groups: (1) wood waste producers (e.g., operations involved with construction and demolition [C&D] debris, cut-to-size lumber, commercial wood waste from furniture), (2) collection agents, (3) processors of wood waste, which make the waste into a product that can be reused, (4) transportation contractors, shippers, and haulers, and (5) end users (e.g., Georgia-Pacific's Martell plant). The project has a variety of goals, including increasing the availability of the

wood supply for particleboard production, contributing to Georgia-Pacific's goals of product stewardship, and contributing to California's mandated reduction in solid waste (e.g., 50 percent reduction by 2000).

Business factors driving the project include the shortage of fiber for the particleboard plant, rising costs of landfilling, and mandated solid waste reductions. Benefits include an expanded fiber supply in the Northwest. Contamination is one of the most significant barriers to the wood recovery program. Often the collected wood is mixed in with metal, plastic, and paper and must be cleared of these contaminants to be usable. The captured paper, plastic, and nonferrous metals are sent to a landfill. Wood byproducts that cannot be used in particleboard processing are sold for use as animal bedding, playground cover, soil amendment, and lawn or garden mulch.

Mr. Kurtz responded to a question about the economics of processing postconsumer fiber. Virgin fiber used in particleboard is often a byproduct from sawmills and is often less expensive than recovered fiber. As wood becomes more scarce, however, the economics will even out. The wood waste processing, explained Mr. Kurtz, is performed by local contractors for which Georgia-Pacific provides training and testing.

SC Johnson & Son, Inc. (SC Johnson Wax): America Recycles Aerosols

Presenters: Tom Benson (SC Johnson Wax), William Heenan (Steel Recycling Institute), and Edmond Skernolis (WMX Technologies)

SC Johnson Wax, makers of consumer products such as Pledge®, Shout®, and Windex®, has been one of the key players in the aerosol industry's aerosol can recycling program, Tom Benson said. He noted that the company is recognized as a formulator of environmentally responsible aerosol products and that it strives to achieve continuous improvement in products to provide quality performance and value with minimal environmental impacts. Upstream, the company has worked with its suppliers to produce lightweight aerosol cans and to use a minimum of 25 percent recycled steel. Downstream, the company has worked to ensure that the empty aerosol container is responsibly handled in the recycling stream.

There are consumer misconceptions surrounding aerosol containers. For example, aerosol cans were regarded as environmental scapegoats in the late 1980s. Many consumers are not aware that aerosols

have not contained chlorofluorocarbons since 1978. Because of such misconceptions, many municipal recycling programs originally forbade aerosol can recycling. SC Johnson conducted studies on the safety of processing empty aerosol cans and found there was a tremendous opportunity to recycle them—an opportunity to keep some steel out of landfills and involve consumers in an environmental activity. According to Mr. Benson, results bear this out. In 1991, only one community recycled aerosols; now over 3,800 community programs recycle them.

The steel industry has been involved with the aerosol can recycling program just described, pointed out William Heenan. The Steel Recycling Institute realized it needed to educate municipal recycling managers about aerosol can recycling and provide them with the information they needed to educate their constituency. Recyclers had numerous questions about recycling aerosol cans. They wanted to know whether aerosol cans are traditionally empty when thrown away, whether they are flammable, and what risks are involved in recycling them. Research conducted by SC Johnson Wax, the Steel Recycling Institute, the Chemical Specialties Manufacturers Association, and the Factory Mutual Research Corporation found that the risks associated with recycling aerosols are no different than the other risks in a materials recovery facility (MRF). The Steel Recycling Institute also conducted a study to confirm that aerosol cans are empty when handled in the recycling stream.

WMX Technologies, added Edmond Skernolis, has also been involved in aerosol can recycling. WMX was initially concerned about the safety of processing aerosol cans. WMX identified the concerns, worked with the aerosol industry to obtain accurate information about the associated risks, and subsequently learned that aerosol cans could be recycled safely by observing basic good management and engineering practices. The company will now include aerosol cans in its recycling contracts.

Aerosol can recycling was made possible, concluded Mr. Benson, through partnerships, communication, information, and education. The key to the success of the program was leadership and perseverance. This program shows that industry can work in upstream and downstream partnerships to effectively catalyze eco-efficiency at all junctures in the product's life-cycle.

Rochester Midland Corporation: Office Building Cleaning

Presenters: Stephen Ashkin (Rochester Midland Corporation), James Foley (Environmental Protection Agency), Norma Edwards (WECO), and Nelson Palma (General Services Administration)

Rochester Midland supplies cleaning products to the commercial and industrial marketplaces, explained Stephen Ashkin. The company has 5 manufacturing plants, 30 warehouses, and a total of 1,200 employees. When Rochester Midland realized it was not able to compete on price to achieve an advantage in the marketplace, the company recognized a growing need for cleaner, safer products. The company commissioned Arthur Andersen and Company to perform a gap analysis, which found that the greatest opportunities for meeting untapped customer needs were in two areas: safety and environmental impacts. Rochester Midland also realized that making its products safer would increase employee productivity due to reduced absenteeism and increased morale.

Rochester Midland examined both the human health and environmental effects of its products. The company wanted to reduce risk for product users, building occupants, and the general environment. Company officials realized that the availability of safer products would be of little value without training cleaning personnel on how to use the products properly and safely.

Communication is a key aspect of Rochester Midland's approach to promoting cleaner and safer products. The company needed to obtain the commitment of product users and building owners as well as "buy-in" from occupants because programs are ineffective unless those with a stake in the outcome of these programs are involved. Rochester Midland goes beyond educating its commercial clients by educating the public through speeches and articles in the trade press.

For example, consider a pilot project in a building owned by the General Services Administration (GSA), which is home to EPA's Region 2 Headquarters in New York City. Rochester Midland assembled a team of representatives from the various groups involved (e.g., tenants, building owners, cleaning contractors). The team conducted surveys and identified problem areas, then set about training the cleaning staff. Training cleaning personnel can be difficult because of the high level of turnover in the industry.

EPA's perspective as the tenant in the GSA-owned building adds to this example, noted James Foley. EPA participated in the building's design to incorporate environmental principles. EPA

representatives visited INFORM's headquarters in New York, toured the Audubon Society building, and talked to internal Agency experts including members of the Environmental Response Team from EPA's Office of Solid Waste and Emergency Response. GSA provided samples of various building components, many of which EPA asked to substitute with environmentally safer materials. EPA performed indoor air quality monitoring when the building was empty and full, reduced the lighting load, and installed water-saving fixtures and better air conditioning systems. After EPA moved into the building, the Agency found that some people were reacting to indoor pollutants. The problem appeared to be related to cleaning agents that were used to clean the furniture and carpeted surfaces. GSA worked with the cleaning contractor, who suggested contacting Rochester Midland Company, which had a product line with low VOC emissions.

WECO was the cleaning contractor at the building. Norma Edwards of WECO explained that, traditionally, considerable emphasis is placed on protecting the outdoor environment; however, people spend an estimated 90 percent of their time indoors. As a cleaning contractor, WECO is committed to giving quality service. The company's commitment to continuous improvement, customer satisfaction, and pollution prevention led to the search for an alternative cleaning product. When EPA complained about the cleaning products being used in the building, WECO contacted Rochester Midland and several other manufacturers looking for products that would solve the problem. They learned that Rochester Midland could supply an alternative formulation that would potentially solve the problem.

Nelson Palma of GSA pointed out that GSA, as the building owner, wants to interact with its tenants regarding every aspect of their office environment. One reason for this is that GSA must compete with the private sector and take its customer concerns seriously. Investigating options for an alternative cleaning program provided an opportunity to develop partnerships. At the outset, WECO approached GSA to introduce the notion of identifying an alternative program; WECO then brought in Rochester Midland. GSA performed a cost-benefit analysis and determined that switching to the alternative program would be cost effective.

GSA is now involving other tenants (e.g., the Federal Bureau of Investigation, the Internal Revenue Service) and other buildings in the effort to use safer cleaning products. The project could not have succeeded without a strong team approach that included the involvement of suppliers, the contractor,

tenants, and building owners and managers. The project is an example of stewardship, collaboration, and environmental ethics.

The key message of this case study, Mr. Ashkin concluded—and the primary reason that EPA, GSA, and WECO were asked to share the podium with Rochester Midland—is the importance of shared responsibility and the benefits of forming successful partnerships up and down the chain of commerce.

Safety-Kleen Corporation: Solvent Take-Back

Presenter: Bill Constantelos

In describing his company's parts cleaning service and used oil recycling operations, Bill Constantelos emphasized that rather than providing a product, Safety-Kleen provides a service to its customers to help them manage spent solvent and used oil in an environmentally appropriate manner.

In 1968, Safety-Kleen started leasing and servicing parts cleaning equipment and supplying the associated solvent. The company periodically took back the spent solvent for recycling and, in 1970, began supplying recycled solvent back to its customers, thereby "closing the loop." In 1993, Safety-Kleen introduced its "cyclonic green machine," which generates 50 to 80 percent less waste solvent, reducing the amount of clean solvent needed. The cyclonic green machine can precipitate solids and heavy grease, allowing solvent to be used two to three times longer. By 1995, Safety-Kleen's customers had reduced their solvent use by 11 million gallons per year, he said.

The company's solvent recycling program involves more than 300,000 customers in operations such as gas stations and bike shops as well as in the steel industry. Business factors that serve as driving forces behind the program are providing safety, convenience, reliability, and cost effectiveness; Resource Conservation and Recovery Act (RCRA) "cradle to grave" regulations; and the Pollution Prevention Act of 1990. The benefits of the program include improved safety, resource conservation, reduced costs, waste volume reduction, and environmental improvements. Barriers included the lack of a nationwide distribution system in 1970 when the closed-loop recycling system was established, RCRA inflexibility (e.g., paperwork, permitting, and other administrative compliance costs), inconsistencies between the

Pollution Prevention Act and the new Combustion Strategy rule, and the costs and limits of new technology.

Safety-Kleen also collects and recycles more than 170 million gallons of used oil per year. The company estimates that out of 1.4 billion gallons generated each year, 900 million gallons are collected (10 percent of which is rerefined and 90 percent is burned as fuel), and 500 million gallons escape proper handling. Safety-Kleen collects used oils after they are dirty and no longer useful as lubricants, rerefines them at the company's two North American rerefineries, then supplies rerefined oil products to its customers. Project participants in Safety-Kleen's oil recycling program include used oil generators, rerefined oil approvers, and rerefined oil users (e.g., the federal government, blenders, individual consumers).

Project goals, stressed Mr. Constantelos, include economical collection and recycling of used oil and market development. Project drivers included Executive Order 12873 (which addresses federal government purchasing of recycled-content products), the demand for green products and services, and product liability reduction (i.e., ensuring that used oil does not cause environmental damage). The benefits of the project include cost savings for Safety-Kleen; producing a gallon of rerefined lube oil is 40 to 50 percent less expensive than producing a gallon of virgin crude oil. Other benefits include increased customer acceptance of "green" motor oils, reduced environmental impact, conservation of natural resources, and less waste handling.

The barriers to the used oil recycling project included perceived quality issues, acceptance by specification writers, uncontrolled burning, and the fact that used oil regulations do not favor recycling over burning. The project has resulted in improved convenience for users, encouraged conservation and reuse, and satisfaction of consumers' green product demand.

Safety-Kleen's product take-back programs (i.e., solvent and used oil recycling) are, according to Mr. Constantelos, (1) an economical means to recycle, reduce, and reuse, (2) convenient to customers, and (3) profitable to the company.

Mr. Constantelos was asked whether Safety-Kleen's programs are really examples of extended *service* responsibility. Extended service responsibility, according to him, is a form of EPR. Safety-Kleen

provides a service to its customers but also takes back products. He added that the solvent take-back and used oil recycling programs encourage the conservation and reuse of nonrenewable natural resources, provide generators with convenient options to improve the environment by managing wastes appropriately, and meet a growing demand for green products and services.

Rechargeable Battery Recycling Corporation: Charge Up to Recycle

Presenter: Jefferson Bagby

The Rechargeable Battery Recycling Corporation's (RBRC's) "Charge Up to Recycle!" program is designed to make the public aware that used nickel-cadmium (Ni-Cd) batteries should be recycled, began Jefferson Bagby. RBRC funds and facilitates Ni-Cd collection and recycling programs across the United States. More than 200 companies worldwide that manufacture rechargeable products (e.g., cellular phones and laptop computers) for sale in North America fund the program.

Manufacturers pay 5 cents to place an RBRC seal on their batteries. The seal indicates that the batteries can be recycled through the RBRC program. When Ni-Cd batteries no longer work, consumers can bring them to one of numerous retailers who collect the batteries in a cardboard box. When the box is full, the retailer seals the box and sends it via the United Parcel Service (UPS) with a prepaid, preaddressed label to a recycling facility in Ellwood City, Pennsylvania. There, the entire battery is recycled—the cadmium is used to make new batteries, and the other components are recycled into stainless steel.

EPR calls for shared responsibility based on the product system, and it involves partnerships between government, industry, retailers, and consumers. EPR also presents many policy options. The RBRC program is, according to Mr. Bagby, an asset recovery program, not really a take-back initiative.

RCRA cradle-to-grave regulations were the greatest obstacle to recycling Ni-Cd batteries, Mr. Bagby explained, because batteries are considered hazardous waste. The Universal Waste Rule, which had to be adopted by individual states, could have eliminated this barrier. Battery manufacturers lobbied state officials asking them to adopt the rule so that batteries could be collected for recycling, but, this was a large, time-consuming effort. The battery Act that was passed in 1996 implemented the Universal Waste

Rule nationwide for batteries only. As a result, batteries can be dropped off in retail stores, and county recycling programs can include them because they no longer must be handled under hazardous waste regulations.

The RBRC has established an 800 number that soon will appear on batteries and product literature and in television commercials and public service announcements. When consumers call the number (1-800-8-BATTERY), they can obtain the location of the nearest retail store and county dropoff site. By January 1, 1997, 28,000 retail locations were expected to be participating in the battery recycling program.

A question was posed about program financing. Recycling Ni-Cd batteries, conceded Mr. Bagby, is a money-losing proposition. The license fee paid for the RBRC seal funds the UPS shipping and advertising. RBRC intends the 5-cent charge to last through 1997. RBRC estimates that 25 percent of participants are free-riders (i.e., their batteries are collected and recycled but they do not pay the 5-cent charge). When asked about recycling nickel metal hydride batteries, Mr. Bagby stated that the RBRC hopes to collect them in the near future because they can be recovered profitably.

In response to a question about program drivers, Mr. Bagby explained that Minnesota and New Jersey have passed laws requiring collection and recycling of Ni-Cd batteries. Some European countries mandate collection as well and have proposed a ban on Ni-Cd batteries. The industry believes that unless manufacturers voluntarily collect and recycle the batteries, they will be banned or become hard to sell. Another participant asked whether any design changes in appliances have resulted from the program. State laws have enabled Ni-Cd batteries to be more easily removed from products, answered Mr. Bagby. Power tool manufacturers had to redesign their products to use uniform-sized batteries that can be easily removed for recycling.

Interface Flooring Systems, Inc.: Evergreen Program

Presenters: Joan Reynolds and Graham Scott

Interface's Evergreen program, explained Joan Reynolds and Graham Scott, helps to illustrate some of the principles being discussed at this workshop. Interface manufactures carpet tiles used in commercial and institutional buildings. The company offers customers the Evergreen program, which is a bundled service package that includes design, layout, carpet tile installation, ongoing maintenance, and ultimate removal of carpet tiles for recycling. The program has three 7-year lease cycles. In the first cycle, the product design is established with long-term objectives. Designers conduct traffic surveys to help recommend designs and choose materials. After being selected, materials are subjected to wear simulations to determine how much wear and tear the carpet can withstand. Final design and materials selection are based on these surveys and tests. The chosen design allows for periodic replacement of tiles in areas that get heavy use. The second lease cycle involves the renovation of the 20 percent of the carpet that experiences high traffic. In the third cycle, a combination of new and existing carpet is used to rejuvenate the facility.

Carpet recovered from customers under this program is ground into powder and used in molded products or recycled into carpet backings. This is an important advance because raw material suppliers can provide yarn products with partial postindustrial content but rarely with postconsumer content.

The goals of the Evergreen program are to save nonrenewable natural resources by extending product life, to create a closed-loop recycling standard for the industry, and to implement Interface's cradle-to-cradle philosophy. The driving force behind the program is Interface's Chief Executive Officer, Ray Anderson, who believes that industry has the strongest voice in the creation of a sustainable America. The benefits of the program include the environmental advantages of diverting carpet from landfills and producing performance carpet with less nylon face fiber. Another benefit is reducing the need for petroleum-based products. The program's ultimate goal is to recycle old carpet tiles into new ones and eliminate all its waste. A monthly expense can be more practical for some customers than a large periodic capital outlay for flooring. In addition, the source lease ensures constant interaction on a regular basis with customers.

Program barriers include the economic justification of the program in the current market structure (i.e., shifting from short-term disposal to long-term use of products). Consumers need to be educated about environmental responsibility and the liability of product ownership. Over a 21-year period, Interface believes it can realize both the environmental and economic benefits of the Evergreen program. Another barrier is the lack of available technology for breaking down carpet tile components and purifying the fibers for reuse as raw material for making new carpet fiber. The backing system can be reused, but finding a commercially viable way to reuse the nylon fiber in new carpet has yet to be devised. Interface is researching the possibility of reusing the materials in other product areas. The low cost of energy is another hurdle; the Evergreen system will become more attractive if oil prices increase. Finding progressive financial partners also has been difficult (i.e., getting them to embrace the leasing service concept).

Nortel (Northern Telecom): Product Life Cycle Management

Presenter: Virginia Snyder

Nortel is a supplier of digital telecommunications networks, began Virginia Snyder, offering products for designing and building digital networks for education, communication, and the business world. Nortel provides products and services to businesses, universities, and governments, with approximately 40 percent of its markets outside North America. Nortel is a leader in environmental management. The company's philosophy holds that the product life cycle corresponds to the value chain, which measures the value of products and services from product design through product end-of-life. Nortel believes that efficiency improvements can be achieved by extending the producer's responsibility.

Nortel is currently pursuing several different projects under its product life-cycle management (PLCM) program. The goal of the PLCM program is to maximize environmental and economic efficiency. The challenge faced in implementing the program is to reorient the company's business and environmental functions away from being concerned solely with regulatory compliance.

There are four current Nortel initiatives:

- **The materials recycling program.** Nortel recycles 50 million pounds of equipment annually. This includes cables and components from excess or obsolete inventories. Nortel also accepts trade-ins from equipment sites. The equipment recycling program is profitable: 85 to 90 percent of the revenues are returned to businesses or customers. Approximately 90 percent of the equipment processed at the facilities (by weight) is recovered for reuse or recycling. The company's goal for 1998 is to have only 2 percent of its equipment (by weight) directed to landfills.

- **The materials technology program.** Nortel has a pilot project to develop a lead-free technology for its electronic component assembly. Lead from electronics is a growing part of the lead found in landfills. Nortel has successfully manufactured two telephone sets with a lead-free printed wiring board.

- **The product design program.** Nortel is attempting to optimize the efficiency of new product designs by using a modular approach. The company's modular telephone designs allow customers to upgrade their phones by replacing components, avoiding the necessity to buy an entire new unit. In addition to reducing the number of telephones discarded, this system leverages the customer's overall investment.

- **The supply management project.** The company has initiated a pilot project to develop a new chemical supply model to reduce the use and cost of chemicals. Nortel will be purchasing the services of chemical suppliers for a fixed fee rather than purchasing according to the amount of chemicals used. Nortel worked with its supplier to examine chemical processes, storage, and disposal operations. Nortel also developed recommendations for improving efficiencies of chemical use and for delivering only the amount of product needed. The cost savings are shared between Nortel and its supplier.

One of the largest barriers to the PLCM program is changing the way people in the environmental department perceive their role and changing the way other people in the company perceive the environment. When asked how Nortel achieved individual business buy-in to its corporate goal, Ms. Snyder stated that Nortel worked very closely with its four major network businesses to sell them on the idea. Nortel developed its lead-free phone because of the European market and to be prepared for the advent of possible legislation in the future. The result has been an improved bottom line due to the elimination of costs associated with handling lead.

U.S. Council for Automotive Research-Vehicle Recycling Partnership: Vehicle Recycling Partnership
Presenter: Terry Cullum (General Motors)

Ninety-five percent of scrap vehicles in the United States are processed by a successful, market-driven recycling infrastructure, according to Terry Cullum. This infrastructure consists of the consumer, automotive dismantler, automotive shredder, materials reprocessors, and the municipal solid waste landfill. Usually 75 percent of a vehicle by weight is recycled and 25 percent is landfilled, a fraction referred to as automotive shredder residue (ASR). ASR consists of plastics, rubber, fluids, and glass.

One of the Vehicle Recycling Partnership's (VRP's) goals is to reduce the amount of ASR sent to landfills. Chrysler, Ford, and General Motors formed the VRP in 1991. In 1993, the VRP opened the Vehicle Recycling Development Research Center in Highland Park, Michigan. The research center's goals were to improve upon the existing vehicle recycling infrastructure. Its mission is to develop, implement, and communicate research that promotes an integrated approach to the handling of end-of-life vehicles with technical and economic efficiency.

Formal collaborative agreements are in place with the American Plastics Council, Automobile Recyclers Association, Institute of Scrap Recycling Industries, and the Aluminum Association. Other partners include the American Automobile Manufacturers Association, Argonne National Laboratories, and several other research institutes. The VRP collaborators meet twice a year and have developed a 5-year strategic plan.

The VRP has several projects, added Mr. Cullum, including developing design guidelines, which are common-sense things that businesses should do. Each company in the partnership tailored the guidelines and published its own version. The VRP also has a pilot project for pyrolysis, which is the thermal decomposition of organic materials in the absence of oxygen. The VRP knows that pyrolysis works technically but is trying to make it work economically. The VRP also has a mercury switch removal project, as well as a project to develop methods of removing fluids from vehicles.

The benefits of the VRP's projects include creating a sustainable market-driven recycling infrastructure, reducing solid waste, removing contaminants from automotive recycling, and creating jobs.

Obstacles include a recycling infrastructure focused on metals recovery, which makes recovery of nonmetals difficult.

Ford Motor Company: Bumper Take-Back and Recycling

Presenters: Anthony Brooks and Michael Patalan

Anthony Brooks and Michael Patalan introduced Ford Motor Company's bumper take-back and recycling program. Before implementing its program, Ford identified partners and secured cooperation from agents upstream and downstream, including GE Plastics and American Commodities, an automotive plastics recycler. Ford also worked with the engineering community to educate this group about the quality of postconsumer plastic and to assure them that it is not detrimental to product performance.

The driving factors for the program are profitability and leadership in the automobile industry. Ford issued a vehicle recycling directive stating its intention to be a leader in vehicle recycling in terms of design, materials choice, recycling strategies and technologies, and materials management. This directive also calls for internal training in recycling. Ford was the first automotive company to develop postconsumer content guidelines. Ford also has guidelines requiring the use of returnable packaging for its engine manufacturing operations.

Ford uses postconsumer plastic (25 percent minimum) in eight applications, including air conditioning and duct work. This translates into 47 million pounds of postconsumer content used. The company's goal is to manufacture 20 percent of its products with a minimum of 25 percent postconsumer content. Ford has made a commitment to American Commodities to use the plastic that this company is able to recover. According to Mr. Brooks and Mr. Patalan, Ford would redesign products if necessary to incorporate postconsumer plastic.

DuPont Films: PET Regeneration Technology

Presenter: Len Jannaman

DuPont Films makes film for specialty packaging, computer tapes, X-ray film, and labels, as well as film for the printing industry. Mr. Jannaman indicated that these films are difficult to recycle via traditional routes because DuPont's customers use them in many different applications. DuPont Films has developed a new technology called "Petretec" (PET regeneration technology), which allows these types of postconsumer PET film to be recycled back into new film. This technology represents a step forward in PET recycling.

The PET industry is enormous, Mr. Jannaman continued. Some 24 billion pounds of PET were manufactured in 1994. While only about 1 percent of this PET was recycled, PET is one of the most recycled plastics. PET film accounts for 2.2 billion pounds of the total amount of PET manufactured.

For PET film recycling to be successful, DuPont realized it needed to have a new technology and a customer-driven approach. The company has focused on involving its customers in developing a successful recycling program. The customer base of DuPont Films is so varied that the company realized it would need to work with various trade associations. DuPont Films worked with the associations to survey their memberships about the importance to them of recycling, their demand for green products, critical industry issues, and their willingness to work with DuPont to recycle the films. DuPont realized the recycling program would be profitable only if it integrated business and environmental considerations.

DuPont's vision for the plastic films industry is to put the regeneration technology to work and create a competitive advantage for PET film. Benefits of the program include eliminating the landfilling of PET film worldwide, gaining global recognition for meeting consumers' demand for green products, and reducing dependence on oil-derived feedstocks.

A question was asked about the sourcing of DuPont's materials, given the plummeting prices of virgin PET. DuPont is looking at the long term, replied Mr. Jannaman, and the project is still in its start-up phase. DuPont is currently working with used X-ray film as well as film used to make window shades. There had previously been no use for these plastics because they had too many coatings and thus DuPont's customers had to pay to landfill them.

THE NONGOVERNMENTAL ORGANIZATION PERSPECTIVE

Bette Fishbein, Senior Fellow, INFORM

INFORM's mission is to inform the public debate on environmental policy options. As a nonprofit environmental research organization based in New York, Bette Fishbein explained, INFORM has recently been focusing on a case study approach that highlights business innovation in achieving environmental goals. The organization's particular area of interest is the development of public policies that create economic incentives encouraging businesses to innovate. This work brought EPR to the attention of INFORM. Since then, INFORM has been closely following its development.

There are many different ideas about what EPR is and how it should be implemented. In fact, Ms. Fishbein continued, the case studies presented in the morning session are a good illustration of this. She commented that it would be interesting to have a discussion about whether all of these case studies truly represent examples of EPR.

Understanding the international context of EPR can help us all make good decisions about this principle here at home. INFORM has documented the development of EPR not only in Germany and other parts of the European Union but in countries across the globe. An OECD report documenting the implementation of EPR in member countries found that 18 countries had a national EPR policy. That number has probably increased since the issuance of the report. Japan, in particular, has taken an interest in EPR and is providing funding to OECD to support research on EPR.

The programs abroad are generally shared responsibility programs, just like programs in the United States. But programs abroad differ in one important respect: they tend to include cost internalization. OECD's definition of EPR involves shifting responsibility for waste management from the public to the private sector. In this way, businesses internalize the costs of waste management and recycling, incorporating them into product prices. The result of this internalization is that companies, in order to maintain competitive pricing, are making less wasteful products.

This shift in the responsibility for waste and the internalization of waste costs are consistent with the life-cycle approach. Waste is an issue not only because of disposal impacts, but because it represents an

inefficient use of resources, a squandering. The postconsumer stage is the weakest link in the product responsibility chain. It is also the part of the life cycle where industry traditionally had no responsibility. Shifting the responsibility for waste to businesses does more than reduce the amount of trash going to landfills—it moves beyond the consumer to target upstream impacts. EPR programs that follow this model of cost internalization facilitate a wholesale rethinking within these companies concerning the design of their products and the selection of materials.

There is no one-size-fits-all model of EPR abroad. There is, however, much to learn from the different models that are available. Most systems abroad, Ms. Fishbein noted, are designed by industry. Government policy shifted responsibility for waste, and industry designed the programs.

The PCSD report emphasized that change is both necessary and inevitable. Managing this change—in fact, steering it firmly in the direction of sustainability—is the challenge that the United States now faces. Ms. Fishbein insisted that a departure from the status quo is needed. Profitable recycling has existed in the United States for many years; the challenge is to address materials that have not been profitably recycled. One of the benefits of EPR might be that it is actually driving new recycling markets, instead of just responding to current market conditions.

In its report, the PCSD laid out a fairly broad definition of EPR. This definition might be both an opportunity and a danger. If the United States builds on the approaches developed abroad, if taking responsibility for waste is seen as a subset of a life-cycle approach, and if upstream initiatives are included (e.g., if materials are selected based on upstream environmental impacts), then the potential of EPR in this country can be fulfilled. But if the EPR definition is allowed to be so broad that it becomes fuzzy—allowing every environmental initiative by a company to be labeled an EPR program—the initiative will become diluted. Whether EPR improves the situation will be determined by the changes that actually occur. To ensure that we as a nation are satisfied with the ultimate result, Ms. Fishbein emphasized, the definition of EPR needs to be further developed.

To illustrate these points, Ms. Fishbein posed a number of questions for the group to consider:

- If companies use postconsumer materials in their products because they are cheaper, is that EPR?

- Is simply providing information EPR?
- Is there a litmus test for EPR, such as internalizing costs?

To help answer these kinds of questions, individuals and corporations might try thinking about the real significance behind the letters "E," "P," and "R." First, "E" addresses the question of to what point in the life cycle is responsibility extended? "P" speaks to the issue of who is taking responsibility. Finally, "R" addresses the issue of what responsibility is being taken and what specific means (e.g., product take-back or leasing rather than selling) are being employed. These are some of the questions that need to be considered when debating the definition of EPR.

Ms. Fishbein suggested the following additional questions for consideration:

- Is EPR about sharing responsibility or defining the responsibility that is to be shared?
- What needs to be mandated, and what can be voluntary?
- What does voluntary mean?
- How will we deal with the free-rider problem?

In addition, much of the emphasis in discussions concerning EPR is on responsibility sharing. This remains an important part of the EPR principle. It is also important, however, to differentiate between process and results. The point of EPR is to change the current situation—in that light, it is clear that sharing in itself is a process that may or may not result in significant change.

INFORM sees EPR as a tool for creative capitalism, Ms. Fishbein concluded, and as an opportunity to encourage business innovation. We are working to promote initiatives that will result in true innovation and lead the United States to sustainability. Questions like "What is a product's function?" and "Can the product be delivered differently?" can help us begin thinking about production in new ways. No matter how we gauge results in the future, there is one clear sign of progress today. Every company that presented a case study in this workshop is thinking about its product as it becomes waste. This would not have been true a few years ago, and it is a clear indication that we have moved forward. Of course,

thinking about it is not enough. We need to continue to move ahead and take action. To quote Vice President Al Gore's challenge to the PCSD: "look long, be creative, and think long."

BREAKOUT SESSIONS—PART I

For the breakout sessions, the workshop participants separated into five groups to discuss four topics: (1) models and strategies for EPR (two separate discussion groups); (2) the business case for EPR; (3) barriers to implementation of EPR; and (4) outreach strategies for EPR. After the group discussions, participants reconvened to hear summaries of each group's discussions.

Group 1: Models and Strategies for EPR—1st Discussion

Facilitator: Gary Davis

The purpose of this session was to begin to identify the key features and approaches that exemplify the principle of EPR.

Critical to developing effective EPR strategies is the definition of EPR. One participant stated that a definition needs to be broad enough to encompass many activities but still have boundaries. Another participant suggested that a definition could be arrived at by working backwards from an example or case study of EPR or by identifying the progression of steps taken in a case. When considering the appropriate objective of EPR, several participants agreed, the goal should be broader than end-of-life results. It should encompass the entire life cycle. One aspect of EPR's objective should be to provide guidance for companies and policy makers.

There are three key attributes of EPR: extension of responsibility, the product system approach, and sharing of responsibility.

- **Extension of responsibility.** EPR implies shifting responsibility, rearranging institutional relationships, and extending responsibility to where it has not existed before. For example, responsibility should be extended to customers to provide feedback along the product chain.

- **Product system approach.** EPR creates feedback for product designers (e.g., on the use of their products in an entire system). New relationships need to be formed in the product chain. The customer-supplier relationship needs to be redefined, and continuous loops of feedback (i.e., from customers back to manufacturers) should be established, rather than a linear chain from manufacturers to customers.

- **Sharing of responsibility.** If something is everyone's responsibility, it is no one's. A locus of responsibility is needed. "Producer" is not necessarily the right word for this locus. In addition, there are three types of responsibility: physical responsibility to take a product back; economic responsibility to pay for a recycling system; and the responsibility to provide information (as in the case of the aerosol can recycling example).

Several participants mentioned that economic incentives are important. In addition, it was pointed out that several of the case studies illustrated how legislative incentives can be effective as well. The group explored the differences between extended *product* responsibility and extended *producer* responsibility and discussed whether product sustainability and EPR are the same concept. The meaning of "sustainable products" is not entirely clear, participants noted. In any sort of EPR program, a method for measuring success is needed (i.e., to determine what net environmental benefits were achieved).

Group 2: Models and Strategies of EPR—2nd Discussion

Facilitator: Bette Fishbein

Because there was so much interest among workshop participants in discussing models and strategies of EPR, Group 2 was convened to discuss precisely the same topic as Group 1.

The group generally agreed that a good EPR policy should accomplish the following:

- Establish appropriate pricing. A good EPR policy should include the proper price and cost signals for products.

- Encourage innovation. EPR can drive the development of both technological and design innovation.

- Emphasize preventing environmental impacts.

- Provide a mechanism for assigning responsibility.

- Provide for information and education, which are essential to EPR (e.g., to educate users and suppliers).

- Address the particular product. The policy should not try to be a "one size fits all" model.

The group raised the following issues and questions:

- The term "waste" has too much baggage. It is better to think of EPR as a way to deal with products.

- Doing the right thing costs more.

- EPR should encompass postindustrial as well as postconsumer wastes.

- At present, only large companies have implemented EPR. How should an EPR policy encourage small companies to participate?

- To be sustainable in the long term, EPR must be market driven. In the short term, however, should EPR be market driven or should EPR policies drive markets?

- Responsibility should be assigned throughout the life cycle of the product and shared by all the players.

- What is the consumer's responsibility in regard to owning products?

- Can public policy be a driver?

- Can EPR harmonize economic, environmental, and social factors?

- EPR can encompass programs that sell products as services. This holistic view will cover the life cycle from material selection and design to recycling or disposal (e.g., the leasing of cleaning services).

- EPR is not just about take-back programs, but such programs often are a part of EPR.

- End-of-life products should be thought of as assets. Companies can develop asset recovery programs.

Group 3: The Business Case for EPR

Facilitator: Rick Bunch

This group sought to articulate the drivers and benefits of EPR, to discuss how to make the case for EPR to a business audience, and to determine where within the corporate hierarchy the EPR message should be targeted.

The group identified the following drivers and benefits for EPR:

Drivers	Benefits
* Bottom line enhancements	* Bottom line enhancements; lower costs
* Building partnerships	* Increased collaboration
* Quality/value	* Innovation
* Resource efficiency	* Decreased resource use
* Risk reduction	* Risk reduction
* Incentives (e.g., recognition)	* Doing the "right thing"
* Brand loyalty	* Marketing advantage
* Customer Demands	* Customer satisfaction
* Preempt legislation/avoid regulation	* Improved relationships with regulators

After developing these categories, the group focused on the following topics in more detail:

- **Brand loyalty and marketing.** Companies' actions are customer driven. That is, the use of recycled content in a product might encourage certain consumers to purchase the product if all else is equal (e.g., price and performance). Price and performance, however, tend to be the most important factors for customers. One strategy might be to decrease the cost of green products or make the cost of a product proportional to the waste generated. It is not clear how substantial the green market niche is in the larger marketplace.

- **Partnerships.** Forming partnerships with regulatory agencies and other entities in the product chain, as well as internal partnerships with other company divisions, is crucial to implementing EPR. Companies are willing to set goals together with the government—but they do not want to be told what to do.

- **Risk reduction.** Demonstrating that a certain product reduces risks can be a powerful tool for convincing a company's senior management to support a new product.

- **Product innovation.** Waste reduction goals can provide a stimulus for innovation. Innovation can also be a way to reduce risk and preempt regulations.

- **Clearly stated goal and objective.** A company's senior management usually will accept a clearly stated objective with a manageable goal.

- **Resource efficiency.** Because companies view waste in terms of lost profits, reducing waste is good for business and the environment.

There are several strategies for promoting the EPR concept within a company. Efforts can be directed to three different levels within companies: (1) senior management (e.g., CEO's who tend to set a company's vision), (2) the marketing and/or production manager, and (3) research and development management. The government should lead by example and should look to pollution prevention programs and voluntary initiatives for ideas about how to implement EPR.

Group 4: Barriers to Implementation of EPR

Facilitator: Catherine Wilt

This group explored the many preceived barriers to businesses embracing the principle of EPR. The group also discussed ways to overcome some of these barriers.

Among the barriers to implementing EPR are the following:

- EPR is too big and might involve "biting off more than we can chew."

- Regulatory barriers—antitrust laws, taxes, policies, hazardous waste regulations.

- Harmonization with international treaties and trade.

- Technological barriers.

- Management—mindset change, costs, difficulty changing product cycles.

- Economic—markets, cost allocation, education.

- Competition, including confidentiality concerns.

- Customer acceptance of a product, product component, or new behavior.

- Infrastructure development (e.g., for products with nationwide distribution).
- Balance of (or lack of) stakeholder involvement. (Note: Only one nongovernmental organization was involved in this discussion group, and no environmental groups were represented in this breakout group.)
- Definition of EPR—producer vs. product, broader than end-of-life product.
- Relationship between International Standards Organization 14000 and EPR.
- Education—both a barrier and solution.
- Research on understanding the true/net environmental benefits of EPR.

There are potential solutions to these barriers. Some solutions include:

- **Regulatory barriers.** A potential solution to antitrust laws could be for the PCSD to develop a demonstration project (similar to the Common Sense Initiative) to create an exemption or waiver that would allow companies within an industry sector to work together to craft approaches for reducing environmental impacts. Choosing a concentrated industry sector for a project might be more effective than a diluted group (e.g., cellular phone companies). The PCSD could also examine elimination of virgin material tax subsidies or establishment of tax incentives for using recycled materials. In addition, the PCSD could analyze how hazardous waste laws affect specific items in the solid waste stream. A major change suggested was shifting EPA's regulatory focus from being prescriptive to being more outcome based.
- **Technological barriers.** The PCSD could (1) support research and development (R&D) projects, including cooperative R&D, incentive grant programs, and improved industrial processes; (2) provide assistance in determining which industries or materials need prioritized support (e.g., R&D, grants); and (3) foster greater communication between stakeholders involved in technological R&D.
- **Education.** A public forum could be developed (via a World Wide Web site or list server) for the general public, government, and industry representatives providing opportunities to state concerns and discuss possible solutions.

Group 5: Outreach Strategies for EPR

Facilitator: Gwyn Rowland

This breakout group discussed the question of how to promote greater familiarity with the principle of EPR and, thereby, help encourage more implementation of EPR.

More fully characterizing EPR will help encourage the development of strategies for expanding this principle in the United States. One participant stated that EPR entails shifting responsibility from the public to private sectors. Another stated that perhaps "partnering" or "collaborating" is more accurate than "shifting." Government, industry, and nongovernmental organizations all need to be involved in defining EPR. A consensus on the definition is necessary before an outreach strategy can be developed. Also, responsibility should not be limited to any one type of player to allow for the most creative and efficient solutions to emerge.

An important question remains, however: Whom should an outreach strategy target? Local government, trade associations, academia, and nonprofit organizations are the most likely targets. One participant suggested approaching local governments with a list of problems or barriers highlighted in the case studies and asking for help in overcoming these difficulties. Another strategy involves developing a needs assessment to identify who will bear the brunt of costs when responsibility is shifted. The focus of the outreach should be prioritized according to the criteria in the PCSD's eco-efficiency report.

Multistakeholder meetings on specific issues should be held. The government should play an integral role in these meetings, not only as a participant but as an instigator, organizer, and catalyst. Also, an incentive should be provided to encourage stakeholders to participate in the meetings. Businesses will need to be convinced that EPR offers a long-term investment opportunity that can improve their international competitiveness. Consumers—product end users—should also be included in these meetings because they play an important role in the success of many EPR programs. To be successful, the meetings must have a primary focus, whether it is to educate attendees about the problem, educate them about case studies and success stories, or initiate a dialogue on the barriers to EPR and the government's role in overcoming them.

The government's outreach messages should be:

- EPR presents a challenge and an opportunity
- Success stories exist
- The government will work collaboratively with all stakeholders

COMMENTS FROM DIANNE DILLON-RIDGELY

Dianne Dillon-Ridgely, Co-Chair of Citizens' Network for Sustainable Development and a member of the PCSD, commended to the attention of the workshop participants eight PCSD task forces working on sustainability issues. Three of these task forces' reports, she said, should be mandatory reading for anyone interested in furthering EPR. The three reports are the eco-efficiency report, the population and consumption report, and the public linkages and education report. The reports' overarching EPR themes include making greater use of market forces, encouraging tax subsidy reform, and making use of nontax market incentives.

BREAKOUT SESSIONS—PART II: NEXT STEPS

Participants again separated into the same five groups to discuss next steps for EPR implementation. Discussions were based on the next steps identified in the PCSD main report and associated documents. After each group convened, meeting participants gathered to hear summaries of each group's discussion.

Group 1

Facilitator: Gary Davis

This group's discussions are based on the three recommendations in the PCSD's February 1996 report to the President, *Sustainable America*. The recommendations include (1) developing EPR models

and demonstration projects, (2) establishing a product responsibility panel, and (3) applying "lessons learned" from the first two recommendations, adopting practices to implement EPR on a regional and national scale, and removing legislative barriers.

Discussions about these recommendations yielded the following ideas:

1. **Models and demonstration projects.** This action should take a bottom-up approach by improving upon existing successful models of EPR. Incentives for businesses to participate in EPR demonstration projects should be the establishment of voluntary, visible programs. Successful models could then be identified from these projects, and case studies describing the projects could be incorporated in outreach materials.

2. **Product responsibility panel.** Multistakeholder panels by product sector should be established; a panel could be developed for each product category described in the Eco-Efficiency Task Force Report. EPA and the U.S. Department of Commerce could take responsibility for setting up a panel. Other resources that could be leveraged include the National Institute for Standards and Technology's Advanced Technology Program and the Manufacturers Extension Partnerships. In addition, the President could establish an Office of Sustainable Development with a budget to develop demonstration projects and provide for education.

3. **Promoting implementation of EPR.** Following the evaluation of the demonstration projects, companies could voluntarily adopt EPR principles. The product responsibility panel could analyze the results of the demonstration projects and then recommend any legislative actions or policy changes that would be needed to facilitate implementation of EPR.

Group 2

Facilitator: Bette Fishbein

Agreement was reached on two points: (1) the PCSD should recommend a multistakeholder panel, and (2) the PCSD should evaluate the case studies using the criteria in the PCSD final report. After analyzing the results of the case studies, the PCSD should identify the actors in the product chain that have the greatest ability to affect the environmental impacts in the product's life cycle (e.g., product designers).

EPA also should conduct an assessment of what EPR is in the United States and how it relates to the PCSD's criteria for EPR. If EPR is defined too broadly, it will not result in measurable progress. The

findings of the assessment should be presented to the EPR panel selected by the PCSD, and EPR demonstration studies should be implemented with interested companies.

Group 3

Facilitator: Rick Bunch

Conducting a public relations campaign would increase the visibility of the EPR concept, raise awareness, and communicate concrete case study examples of EPR. There are many possible ways of marketing EPR by communicating the short-term goals of bottom line enhancement, innovation, and competitive advantage as well as the long-term goal of sustainability. One possibility is holding a national town meeting on the Internet involving numerous stakeholders.

Demonstration projects should compare non-EPR and full-EPR scenarios for specific products or companies. The projects should identify the costs, common barriers, environmental benefits, and steps to implementation of EPR, and bring other kinds of products and sectors into the EPR realm. Companies seeking national exposure would likely be willing to participate in such projects, and competition with other companies would also encourage them to participate. The government can help promote the EPR concept and give companies the tools they need to implement it. While companies move toward EPR, however, the government should allow them to continue with "business as normal."

The PCSD should not select products to focus on in demonstration projects but rather should publish a broad solicitation to companies for EPR demonstration projects the government would be willing to help implement. Projects would be chosen on the basis of their potential for quantifiable progress within a defined period of time. The multistakeholder panel could assist the demonstration projects by analyzing life-cycle costing mechanisms and brainstorming about how to overcome barriers.

Group 4

Facilitator: Catherine Wilt

In this group's discussion, one participant expressed skepticism about whether the PCSD is at the appropriate point to be considering next steps. Another was troubled that the PCSD might be "firing before it aims," saying that a better understanding of the life-cycle approach is needed before attempting to implement EPR.

Concerns were also expressed that the goals and priorities listed by the PCSD do not strongly articulate the life-cycle aspect of EPR and are too focused on waste and end-of-life management. Tools are needed for assessing, measuring, prioritizing, and making decisions about which portion of the production process has the greatest potential for yielding environmental benefits. Rather than a panel deciding which products should be prioritized, willing partners could take the lead in developing demonstration projects that would test barriers to EPR implementation. Incentives for these partners include preempting regulations as well as realizing economic benefits. The panel's first concern should be identifying issues to be tested in demonstration projects, not identifying product categories. In addition, the PCSD needs to establish a framework so that a dialogue between stakeholders can be continued.

Group 5

Facilitator: Gwyn Roland

This group used as its starting point for discussion about the next steps for EPR, the three phases of EPR implementation described in the Eco-Efficiency Task Force Report. Phase 1 entails creating a multistakeholder advisory panel that would prioritize product categories for initial application of EPR policy options. Phase 2 involves undertaking demonstration projects in the product categories. Finally, Phase 3 calls for applying lessons learned from the demonstration projects to develop regional models and national EPR policies. The group discussed how the ideas contained in the first two phases could be further developed:

- **Phase 1.** Because the PCSD is understaffed, EPA or perhaps the Council on Environmental Quality should be responsible for creating the panel; EPA has both the staff

and the expertise to take on this responsibility. A panel under EPA auspices might be detrimental, however, because EPA is typically seen as a regulator. A suggested first step might be determining a budget and timeline for the panel.

- **Phase 2.** Protecting proprietary information during demonstration projects is important. Demonstration projects should focus on alternative technologies that lead to regulatory innovation. Many case studies exist that should be inventoried and studied. Allowing companies participating in demonstration projects to be exempt from legal and regulatory barriers, it was suggested, might help to ensure that regulatory reform receives a full and open debate.

CLOSING PERSPECTIVES

Thomas Lindqvist, International Institute for Industrial Environmental Economics, Lund University, Sweden

Considering the proceedings of this workshop over the past 2 days, Thomas Lindqvist emphasized that the European experience with EPR can help individuals and organizations that are working to bring this principle to the United States. The International Institute for Industrial Environmental Economics first developed the concept of EPR in 1990. At its core, as envisioned by the Institute, EPR is about creative capitalism. Europe is more market oriented regarding environmental policies than many in the audience might think. EPR is needed because companies need assistance in making sound business decisions about how they can reduce the environmental impact of their products. If we could agree on a principle, the principle could help companies enormously. This definition must be specific: if it is imprecise, decisions cannot be made based on it.

Companies want to be rewarded for being responsible, Mr. Lindqvist continued. The reward is greater profits and an improved business image. If the reward is spread too thin, however (i.e., everyone shares responsibility), then the incentive is lost. Competition, ultimately, is needed to achieve results.

EPR programs should target someone in the product system chain in order to get a reaction—and, in most cases, the target should be the producer. The producer is not necessarily the manufacturer. It is the person who will make something happen. Often it may not be appropriate to include all players in the decision because different players have different goals.

As has been mentioned, command-and-control approaches should be modified. EPA should command results, but not control how businesses implement EPR. EPA should provide goals and allow companies to decide how to reach those goals. In fact, voluntary initiatives work in Europe just as well as mandates. Any problems with mandates often can be eliminated by arranging the mandates in the right way (e.g., by keeping legislation simple).

Martin Spitzer, New National Opportunities Task Force Coordinator

Martin Spitzer summarized a number of critical ideas and themes about EPR that were discussed over the course of the workshop. He invited participants to consider carefully the work done at the workshop to determine what had been gained and where we should go next. The key ideas raised at this workshop include:

- EPR in the United States is not a theory—it's a fact. Many companies are implementing EPR for a variety of reasons. Just communicating this information is an important step.
- Even if we do not agree on what EPR is, all of the companies participating in the workshop submitted case studies that were accepted as EPR. Imagine what the case studies could look like if we could agree on a definition.
- The case studies that have been presented at the workshop need to be distilled to illustrate how they exemplify EPR. This distillation would help clarify the EPR definition.
- A connection exists between EPR and regulatory reform. Perhaps EPR can be sold as a means to advance regulatory reform.
- The next steps in our work on EPR should be identified, and responsibility for this work should be established.
- The PCSD could focus on creating a panel to give EPR some momentum. If such a panel were created, it should have a budget and should be responsible for researching and prioritizing information, soliciting and coordinating demonstration projects, and leading regulatory reform.
- An entity is needed to collect and analyze information on demonstration projects.
- Organizations like the National Academy of Sciences, the National Research Council, and the National Academy of Engineering could be involved.

- Some messages have emerged from this workshop about what needs to be done. Terminology, for example, needs to be clarified. The costing of products throughout their life cycle also needs to be examined to ensure that product competitiveness is maintained. A better explanation of the tradeoffs and benefits of EPR is also needed.

Perhaps the best way to conclude this workshop, Mr. Spitzer suggested, is to summarize the PCSD's goals in convening it: namely, to present diverse case studies and focus on available models for implementing EPR (e.g., take-back, leasing, education, training, economic incentives). Workshop participants have presented and discussed a variety of such models and how they relate to the underlying principles of EPR. Key issues discussed include:

- Focusing on products and services.
- Redesigning products.
- Moving beyond waste in our understanding of EPR.
- Recovering and reusing materials.
- Involving people in the full chain of commerce.
- Identifying the key features of EPR.
- Generating ideas for building the business case for EPR.
- Brainstorming about how outreach can help implement EPR.
- Making the PCSD's recommendations real.

Mr. Spitzer then adjourned the meeting, thanking all the participants of the first PCSD workshop on EPR for their attention and dedication to achieving sustainable development in this country.

BIBLIOGRAPHY

Davis, J.B. 1996. *Product Stewardship and the Coming Age of Takeback.* Cutter Information Corp., Arlington, MA. ISBN 1-57484-030-4.

Organization for Economic Cooperation and Development. 1996. *Pollution Prevention and Control: Extended Producer Responsibility in the OECD Area (Phase 1 Report).* Paris. OECD Environment Monograph No. 114, General Distribution No. OCDE/GD(96)48. January.

President's Council on Sustainable Development. 1996. *Sustainable America: A New Consensus.* The White House, Washington, DC.

President's Council on Sustainable Development. 1996. *Eco-Efficiency Task Force Report.* The White House, Washington, DC.

U.S. Environmental Protection Agency. 1997. *Extended Product Responsibility: A New Principle for Product-Oriented Pollution Prevention.* (Prepared by Davis, G.A., Wilt, C.A., Thornburg, R., Droitsch, D., and Dummer, C., of The University of Tennessee's Center for Clean Products and Clean Technologies, in collaboration with Dillon, P.S., of Tufts University's Gordon Center, and Fishbein, B.K., of INFORM, Inc.). Forthcoming (expected in 1997).

APPENDIX A

AGENDA

Workshop on Extended Product Responsibility

jointly sponsored by the
President's Council on Sustainable Development and EPA's Office of Solid Waste

White House Conference Center
Washington, DC
October 21-22, 1996

Agenda

MONDAY, OCTOBER 21, 1996

12:00PM **Registration/Check-in**

1:00PM **Welcome** ..... *Clare Lindsay*
Office of Solid Waste, U.S. Environmental Protection Agency (EPA)

1:05PM **Opening Remarks** ..... *Kathleen McGinty*
Chair, Council on Environmental Quality
Keith Laughlin
Director, President's Council on Sustainable Development (PCSD)

1:15PM **Framework for Discussion**

- Extended Product Responsibility:
  Origins of Concept and Evolution of PCSD's Approach to
  Shared Responsibility ..... *Sergio Galeano*
  Georgia-Pacific Corporation

- Drivers and Obstacles to Implementation of EPR ..... *Gary Davis*
  University of Tennessee

2:00PM **Presentation of Case Studies** (20 minutes each)

- Xerox Corporation
- Georgia-Pacific Corporation
- S.C. Johnson Wax Company

3:00PM **Break** (Refreshments available in the Jackson Room)

MONDAY, OCTOBER 21, 1996 (continued)

3:15PM **Presentation of Case Studies** (continued)

- Rochester Midland Corporation
- Safety-Kleen Corporation
- Rechargeable Battery Recycling Corporation
- Interface Flooring Systems, Inc.
- Nortel

5:00PM **Closing Remarks/Adjourn**

TUESDAY, OCTOBER 22, 1996

8:00AM **Welcome** ..... *Chip Brewer*
S.C. Johnson Wax (PCSD Member)

8:05AM **Presentation of Case Studies** (continued)

- U.S. CAR Vehicle Recycling Partnership
- Ford Motor Company
- DuPont Films

8:55AM **NGO Perspective and Charge to Breakout Groups** ..... *Bette Fishbein*
INFORM, Inc.

9:15AM **Breakout Sessions (75 minutes for discussion; 15 minutes for facilitators to prepare oral reports)**

- Models and Strategies for EPR (Group 1)
- Models and Strategies for EPR (Group 2)
- The Business Case for EPR
- Barriers to Implementation of EPR
- Outreach Strategies for EPR

10:30AM **Break**

10:45AM **All Participants Reconvene in the Truman Room**
Reports of Breakout Groups ..... *Facilitator: Marty Spitzer, PCSD*
(12 minutes to report; 5 minutes for questions and answers)

12:15PM **Lunch** will be served in the Eisenhower Room for those participants who have ordered and paid for this service.

1:15PM **Breakout Sessions Reconvene**
Each breakout group will discuss next steps and how to promote more implementation of EPR.

2:00PM **All Participants Reconvene in the Truman Room**
Report of Breakout Groups ..... *Facilitator: Marty Spitzer*
(5 minutes each)

2:30PM **Closing Perspectives** ..... *PCSD and Others*

3:00PM **Adjourn**

APPENDIX B

FINAL PARTICIPANT LIST

Workshop on Extended Product Responsibility

jointly sponsored by the
President's Council on Sustainable Development and EPA's Office of Solid Waste

White House Conference Center
Washington, DC
October 21-22, 1996

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APPENDIX C

EXTENDED PRODUCT RESPONSIBILITY: ITS ORIGIN AND EVOLUTION INTO THE PCSD'S CONCEPT OF SHARED RESPONSIBILITY

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EXTENDED PRODUCT RESPONSIBILITY.- ITS ORIGIN AND EVOLUTION INTO THE PCSD's CONCEPT OF SHARED RESPONSIBILITY

by

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A PRESENTATION AT THE
WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY

Co-sponsored by the President's Council on Sustainable Development and the U.S. Environmental Protection Agency's Office of Solid Waste

WHITE HOUSE CONFERENCE CENTER
WASHINGTON D.C.
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INTRODUCTION-THE EVOLUTION OF A CONCEPT

The recent report of the PCSD describes "Extended Product Responsibility" as an emerging environmental principle that uses a life cycle approach to identify strategic opportunities for pollution prevention and resource conservation. All sectors in the product system share responsibility in the solution of environmental problems. It developed from an older concept, Extended Producer Responsibility.

Extended Producer Responsibility, EPR, is a term that originated in documentation and research papers of the Organization for Economic Cooperation and Development, OECD, years ago. It was an extension of the polluter-pays principle. In the early 1990s, and principally in Europe, manifestations of Producer Responsibility emerged with the purpose of resolving the pressing municipal waste problem in certain countries like Germany, The Netherlands and the United Kingdom. The notion was that more of the real environmental costs of waste generation and discard should be borne by the producer of the waste upstream in the product cycle.

In many earlier attempts to implement the concept, a "single-point" approach was taken. In this manner, all the legal and economic obligations were placed in one single sector or "link" in the packaging chain. An example of the single point approach was the original German Packaging Decree as issued by then Environment Minister Klaus Topfer in early 1991. The decree placed responsibility for primary packaging in the retailers and for transport packaging in the producers. The "single-point" approach evolved, in some instances, into an approach involving more sectors.

Sharing responsibility among all sectors involved in the chain of commerce became more apparent to many. For example, the European Union directive on packaging and packaging waste of 1994 recognized, in its Introduction, the need for a spirit of shared responsibility. Likewise, in the United Kingdom, the Producer Responsibility Obligations for packaging waste, under the Environment Act of 1995, were finally resolved in July 1996 on the basis of shared responsibility among four different actors in the packaging chain. Different single-point alternatives were rejected.

The Eco-Efficiency Task Force of the President's Council on Sustainable Development recommended to the Council a novel approach of Extended Product Responsibility which features shared responsibility as a central element. Under the PCSD's novel concept, all the business sectors in the product system as well as consumer and governmental agencies will share different obligations in an environment of partnership.

The PCSD's EPR also recognizes the key role of the product system. It is absolutely necessary to consider the product system in the efforts to understand the implications of sustainable development and the achieving of eco-efficiency.

The share or allocation of these responsibilities will always be considered in conjunction with specific circumstances of the particular program such as; the characteristics of the product system, its region or location as well as the point in time at which it is implemented. Experience indicates that the "one-size-fits-all" approach is not necessarily the most conducive to lasting eco-efficiency results. For example, there is the common perception that in a shared responsibility scenario the manufacturer bears the brunt of the burdens. The example of the U.K. Packaging waste regulation, mentioned earlier, dispels this unfounded assumption. On their own volition, in order to attain the mandated goals of the Act, the affected business sectors allocated themselves implementation costs as follows;

Raw Material Manufacturing..... 6 %
Converting..... 11 %
Packing/filling.....36 %
Selling/Retailing.....47 %

The Reasons for a New Paradigm

While different environmental programs have resulted in pollution prevention and resource conservation, their fragmented approach is not conducive to eco-efficiency. There is need for a more comprehensive approach based on shared responsibility and enhanced partnership among all sectors, including government. Such approach would help overcome some of the short comings of the present paradigm.

Current environmental protection regulations separate, statutorily, air, water and land in isolated media. The transfer of pollution from one medium to the other is the typical problem associated with the old paradigm. Mostly all experts in the field recognized now this major drawback.

In terms of eco-efficiency and sustainable development, the old, and still existing, system needs substantial modification because its usefulness is long overdue. The weaknesses of the traditional approach are many but principally,

a) the inability to properly reflect the relationships among media, of the complete impact of a product, along its system life cycle, on air, water and land.

b) the regulatory apparatus operates very much in isolation of economic and product marketing and functionality considerations. Internalization of costs is thus incomplete and less efficient.

c) by emphasizing pollution control, the present command-control approach is confrontational and leading to adversarial relationships, costly litigation and wasteful of the creativity and efficiency of the market forces.

A New Paradigm Would Consider the Product System

Harmonizing economic activities with ecological processes is the approach implicit in the classical definition of sustainable development; "meeting the needs of the present without compromising the ability of future generations to satisfy their needs."

The theoretical model that would resolve the sustainable development equation is far from available. For the present, many policy makers are concentrating their efforts in the product system as the best available vehicle to begin understanding the complexities in reaching eco-efficiency.

Conceptually, the product system is the most basic linkage between the ecological and the social systems. It allows for a more comprehensive analysis and evaluation of the resources and environmental consequences involved in manufacturing of products. The patterns of demand and consumption of the social system are intimately linked to the product system. In turn, both the product and the social systems are linked to the ecological system. The ecological system is the donor and acceptor of the resources and wastes, respectively, of the other two systems. Figure 1 depicts such trilogy of interrelated systems. EPR is based on the product system as the means to extend responsibilities and partnerships beyond the manufacturing phase.

EPR is a product of the Eco-efficiency Task Force of the PCSD. It is logical in my presentation to suggest the relative position of EPR in accomplishing "the production, delivery and use of competitively good and services, coupled with the achievement of environmental and social goals."

My attempt to position EPR in the scheme of things is depicted in Figure 2.

THE PCSD's EXTENDED PRODUCT RESPONSIBILITY.

As part of the deliberations of the President's Council on Sustainable Development, one of the working groups proposed to the PCSD's Eco-efficiency Task Force, Regulatory Policy, a novel approach entitled " Extended Product Responsibility" *(2)*. The Task Force accepted this concept that was later adopted by the Council in its final recommendations to President Clinton.

The Two Major Features of Extended Product Stewardship

The Council recommends Extended Product Responsibility in order "to encourage the practice of shared responsibility for the environmental impact of products among the designers, suppliers, manufacturers, distributors, users and disposers of those products. This new practice would extend the current approach to waste reduction, resource

conservation, and pollution prevention by treating products holistically, from cradle to cradle."

Shared responsibility and partnerships. EPR is a proposed principle of resource conservation and pollution prevention that advocates a life-cycle approach to identifying opportunities to prevent pollution and conserve resources throughout the product life-cycle. Thus, a "chain of shared responsibility" is borne by designers, manufacturers, distributors, users and disposers of products. The greater opportunity for stewardship rests in the links of the chain with the greater ability to influence the life cycle impact of the specific product system and to do so in a manner that is economically feasible and unleash the creativity of business and other sectors..

Extended product responsibility, EPR, would be a new paradigm in which the actors along the product chain accept and share an appropriate degree of responsibility for the life-cycle environmental impacts of the whole product system. Because effective measures to achieve eco-efficiency involve changes in more than one link in the product chain, EPR creates a need and an opportunity for partnerships throughout the product chain.

The new paradigm is also a challenge and an opportunity for government policy makers. Policies and incentives to encourage greater product responsibility will be, in many cases, much different from those in use up to now. The present paradigm addresses pollution control or resource conservation, separately from each individual actor in each stage of the product life cycle. They also tend to be generic, with the thinking that "one size fits all".

The policies for the new paradigm would generally emphasize partnerships among governments, producers, distributors, and consumers. They will replace in a large scale, the present adversarial process of end-of-the pipe, command-and-control regulations with one that would leave to government the process of creating the needed mandates and to the affected sectors, the nuances of their implementation and achievement. It would lead to more cost effective solutions for pollution prevention, fostering economic growth with environmental quality.

A menu of policy options. One other feature of EPR is the concept of a menu of policy options that will facilitate the selection of the appropriate ones according to the point in time and the regional or local conditions. There is not one sole policy that is equally and effectively applicable to all places, under all conditions and for too long. As proposed, EPR includes a menu of different policy options, from voluntary to mandatory and with isolated or shared responsibility. When most effectively implemented, EPR should encourage each link in the product chain to assume the appropriate degree of responsibility for increasing the eco-efficiency of a product system. Even when mandatory steps are taken by government institutions, EPR is an effective approach to implement such mandates. The example given above in the U.K.'s packaging act, demonstrates the wisdom in leaving to the affected sectors themselves the assignment of individual sector responsibilities.

TOOLS FOR THE PRACTICE OF EPR

EPR can use a variety of tools, ranging from voluntary to mandatory and involving either one or many links in the product chain. By themselves they do not constitute EPR but can help in implementing the concept. Examples of policy options that incorporate Extended Product Responsibility in various ways and with varying degrees of shared responsibility include (listed roughly from voluntary to mandatory):

Corporate or Industry-Wide Product Stewardship Programs- Voluntary measures that generally deal with both the upstream and downstream environmental and safety aspects of product manufacture and use. Examples are the chemical industry's Responsible Care initiative and different product stewardship programs in many corporations; P&G, S. C. Johnson, G-P, etc.).These measures encourage pollution prevention and source reduction.

Voluntary Take-Back or Buy-Back Systems: The producer voluntarily takes back or buys back products or waste materials for recycling or proper management. This measure should mitigate downstream environmental impacts from product use and to recover valuable materials and fosters design of eco-efficient products. An example is the collection and recycling of aluminum beverage cans by aluminum producers.

Leasing systems: Voluntary systems in which the ownership of durable materials and products is never transferred down the product chain. Instead, the function of the materials or products is leased to the user. Leasing theoretically encourages the manufacturer to close material flow loops and to extend product life thus reducing consumption. Extension of product life can reduce significantly, resource and energy use and life-cycle pollution.

Partnering Agreements: These are mostly Pollution Prevention measures agreed to among stakeholders in the product chain. An example is the Environmental Defense Fund/McDonalds packaging agreement.

Voluntary Product Environmental Information Approaches: Voluntary approaches in which producers provide information, and training, on the significant environmental attributes of products so that purchasers can reflect environmental preference in their purchase decisions and subsequent product uses and disposal. Voluntary environmental labeling programs, such as the European Union eco-label, which gives a seal of approval based upon pre-set criteria, have been the most widely implemented form of this informational approach. Their effectiveness is still subject of evaluation.

Education, Information or Training: Purchasers and users can be given information to facilitate informed eco-efficient decisions. Information is available through labeling, targeted product literature and certification programs. These options need to ensure a

continuous flow of information from designers to manufacturers, to users and back to the designers.

Government Subsidies and Tax Credits: Direct subsidies or tax credits can encourage production and use of cleaner products. The federal government provides direct subsidies to firms for the development and demonstration of such products. Some states, such as California, provides tax credits for the purchase of energy efficient products. Such programs are not revenue neutral, in that they spend unrecoverable taxpayer money. A national priority is usually the justification for a subsidy or tax credit, and they apply to selected links in the chain of responsibility.

Government Procurement of Environmentally Preferable Products and Materials: The difficulties in accurately determining overall environmental preferability are many. EPA and the GSA are currently collaborating on guidelines for federal purchases in order to implement a presidential Executive Order *(3)*.

Mandatory Disclosure of Environmental Information: Requirements that producers or distributors provide information about the environmental attributes of a product. One example includes labeling electric appliances for energy efficiency. It has been successful in encouraging manufacturers to increase energy efficiency of large appliances. The Dutch government has recently begun a program of mandatory life-cycle environmental information labeling that complements a voluntary seal-of-approval environmental program.

Mandatory Labeling of Product Contents: Labeling that provides the user with information about the product contents. It can take two forms: (1) simply a listing of products ingredients or (2) statements concerning the environmental or health impacts of those ingredients. An example of the second type is the labeling required by the conflicting California Proposition 65 for products that contain carcinogens or reproductive toxicants.

Deposit-Refund System: Mandatory systems in which the purchaser pays a fee or charge at the time of purchase. It is redeemable upon return of the product. It encourages the return of the product (or its packaging) at the end of its useful life. Beverage containers are an example of the application of this option. Such systems are general revenue neutral, in that deposit and refunds balance each other out so there is no net gain or loss for the public treasury.

Taxes to Fund Waste Management Systems: They shift the economic responsibility for waste management to the producer or the user of the product that generates the waste. Examples include taxes on new automobile tires or batteries used to set up recycling and disposal systems, or variable pricing for municipal trash collection. Another example is the charging for disposal based on volume of trash rather than a flat fee. These instruments are typically revenue neutral.

Materials or Product Taxes: Mandatory taxes on polluting materials or products to discourage their use, with the revenue not necessarily ear-marked. Examples include virgin material taxes, gasoline taxes or carbon taxes. These are typically revenue-generating taxes for the public treasury and the most potentially troublesome to trade.

Mandatory Return Requirements for Consumers: This option requires consumers to return products at the end of their useful life, without a deposit-refund system as incentive.

Mandatory Take-Back Requirements: Producers or distributors can be required to accept products or packaging back from consumers at the end of their useful life, in order to meet mandated recycling targets.

Materials Regulations/Prohibitions: It consists of regulations on material use, such as the ban of toxic chemicals or restrictions on use of certain materials in packaging, etc.

THE BLURRED AREA BETWEEN EPR AND PRODUCT STEWARDSHIP

Later today in the Workshop, you will be introduced to a variety of excellent projects selected as representative of the EPR concept. You will recognize in them many features of product stewardship. It is natural this to be case. Figure 3 depicts my understanding of the components of Product Stewardship as a distinct corporate activity. In other words, PS is a process carried on by individual companies, alone or with some level of partnership, but not with the requirement of shared responsibility among other sectors in the chain of commerce. Product Stewardship uses the analytical tools of life cycle analysis coupled with risk assessment. Effective product stewardship extends, upstream and downstream, from the manufacturing site and the operations involved in product manufacturing.

It is understandable thus, that in the earliest stages in the development of EPR some confusion may exist in the demarcation of its limits. A helpful suggestion of mine, is to look, as a "mantra", for the sharing of responsibility among sectors. If only one sector is responsible (or subsidizes) the whole process, regardless the number of sectors, then it is more like product stewardship than EPR. In the discussions of today and tomorrow, we will have the opportunity to explore and learn more about other differentiation of the PCSD's EPR principle with other concepts and programs.

CONCLUSIONS

Industry is vitally interested in helping shape the new paradigm for eco-efficiency and sustainable development policies. The durability of the product system concept is one of the major reasons for such interest. Once a new paradigm is established, its presence and

practice will last for decades thus it is important to make it as good as possible from the beginning.

EPR is a proposal worthy of experimentation because it is based on the product system, on partnership, and on the sharing of responsibilities for decision and action. We will examine different projects which, whatever their motivation, are being carried on a private basis. The implied possibility of separating "command" from 'control", taking the control out of command, could be appealing to most of industry for it recognizes, a) the leading role of government in creating adequate mandates, "command", and b) the private sector's using the creative and expert forces of the market system to implement, "control", and achieve the mandates.

I trust this Workshop, with the tremendous "brain power" available, will shed light on the features of importance that will make the EPR concept grow beyond the cases presented today and become an important part of a new paradigm. Thank you.

LITERATURE CITED

1. Keoleian, G.A., et al.,"*Life Cycle Design Guidance Manual*". National Pollution Prevention Center, EPA/600/R-92/226. (1993).

2. Galeano, S.F., Davis, G. and Brewer, F.H. "*Extended Product Responsibility*". Proposal to the PCSD's Eco-efficiency Task Force. (1995).

3. Executive Order 12873, October 20, 1993.

FIGURES

Figure 1- Model to Explain Sustainable Development

Figure 2- The Position of EPR in the Sustainable Development Framework

Figure 3- Product Stewardship

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Figure 1

MODEL TO EXPLAIN THE ROLE OF THE PRODUCT SYSTEM IN SUSTAINABILITY

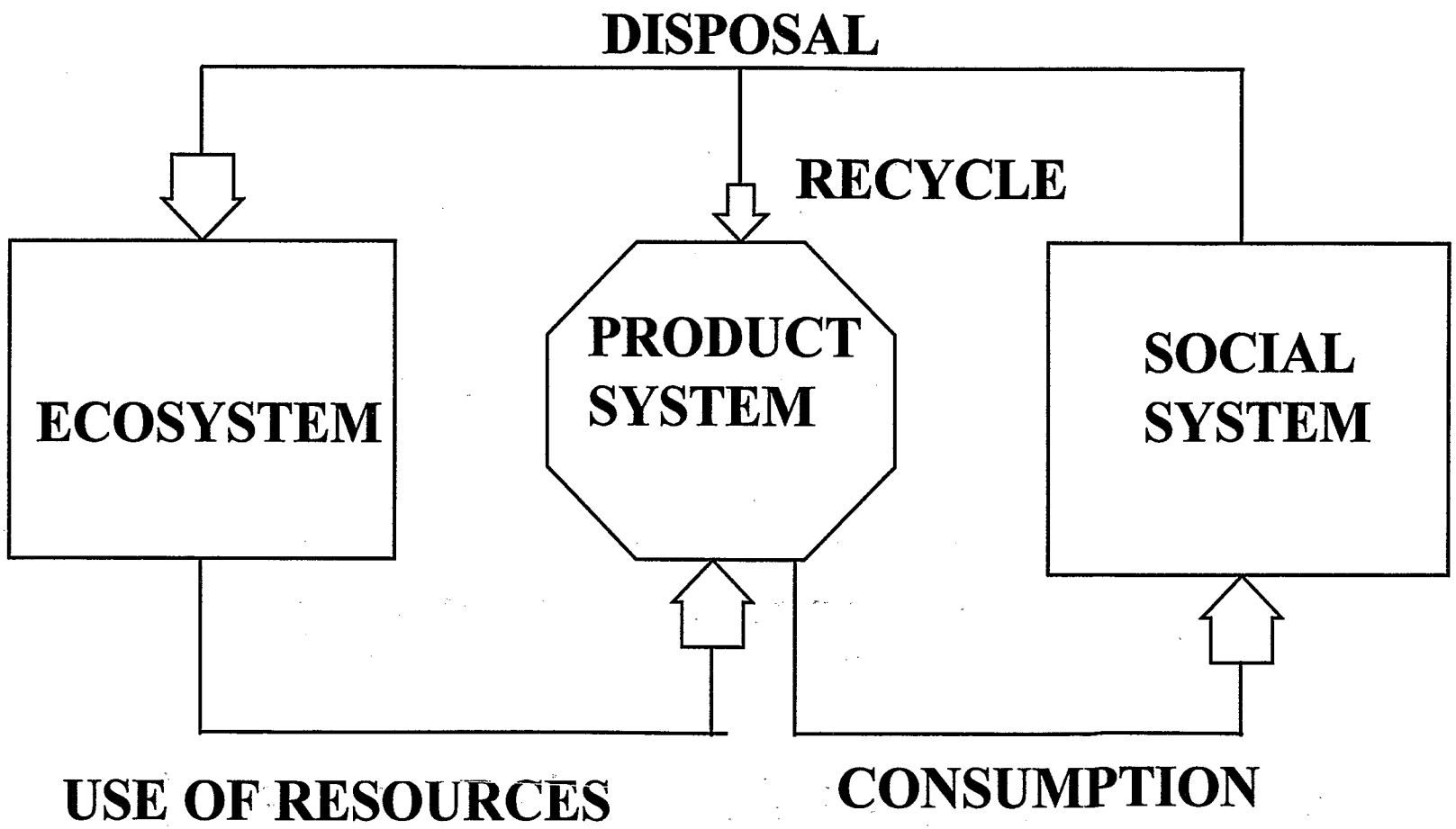


Figure 2

ROLE OF EPR IN THE NEW PARADIGM

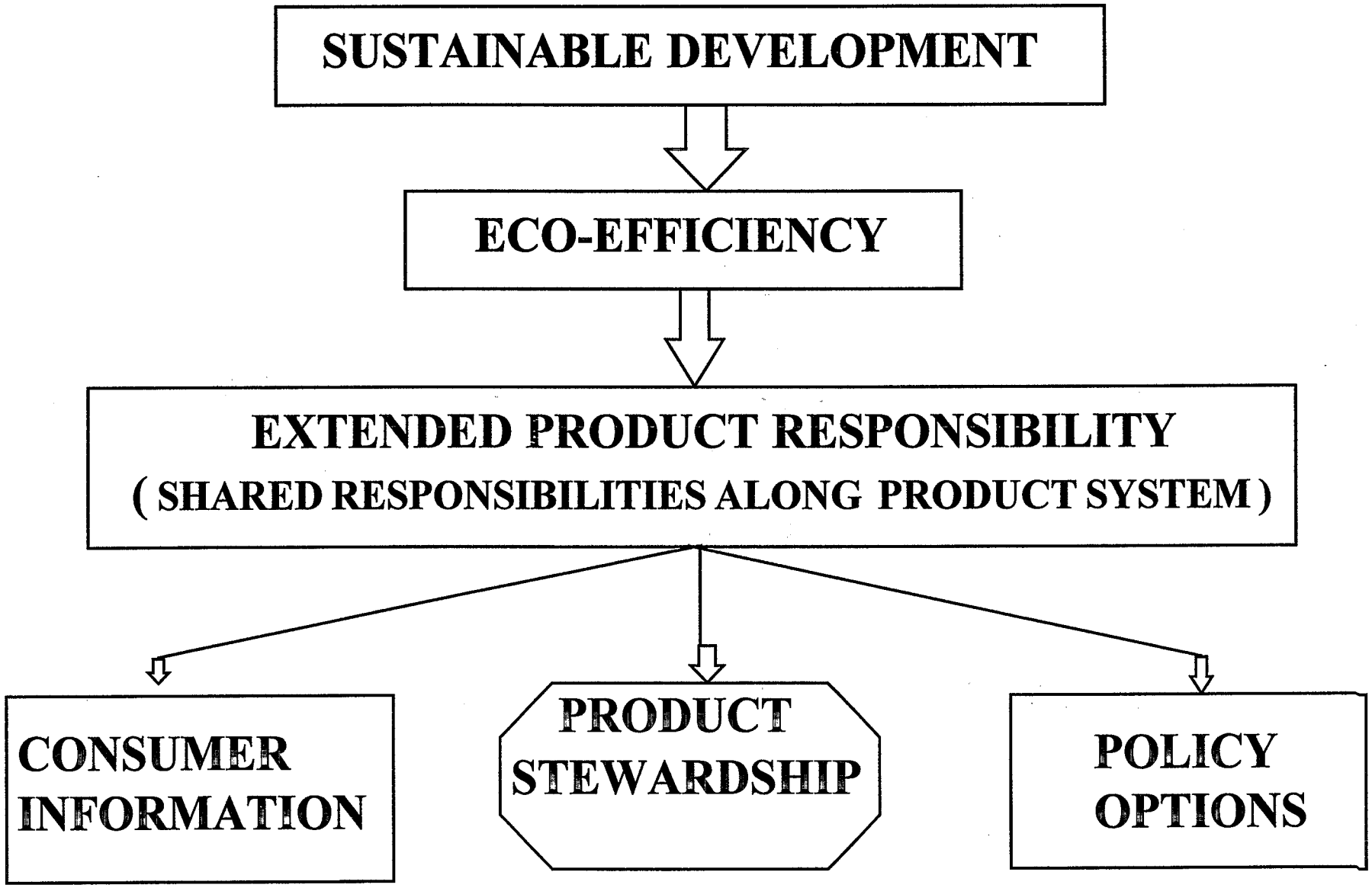
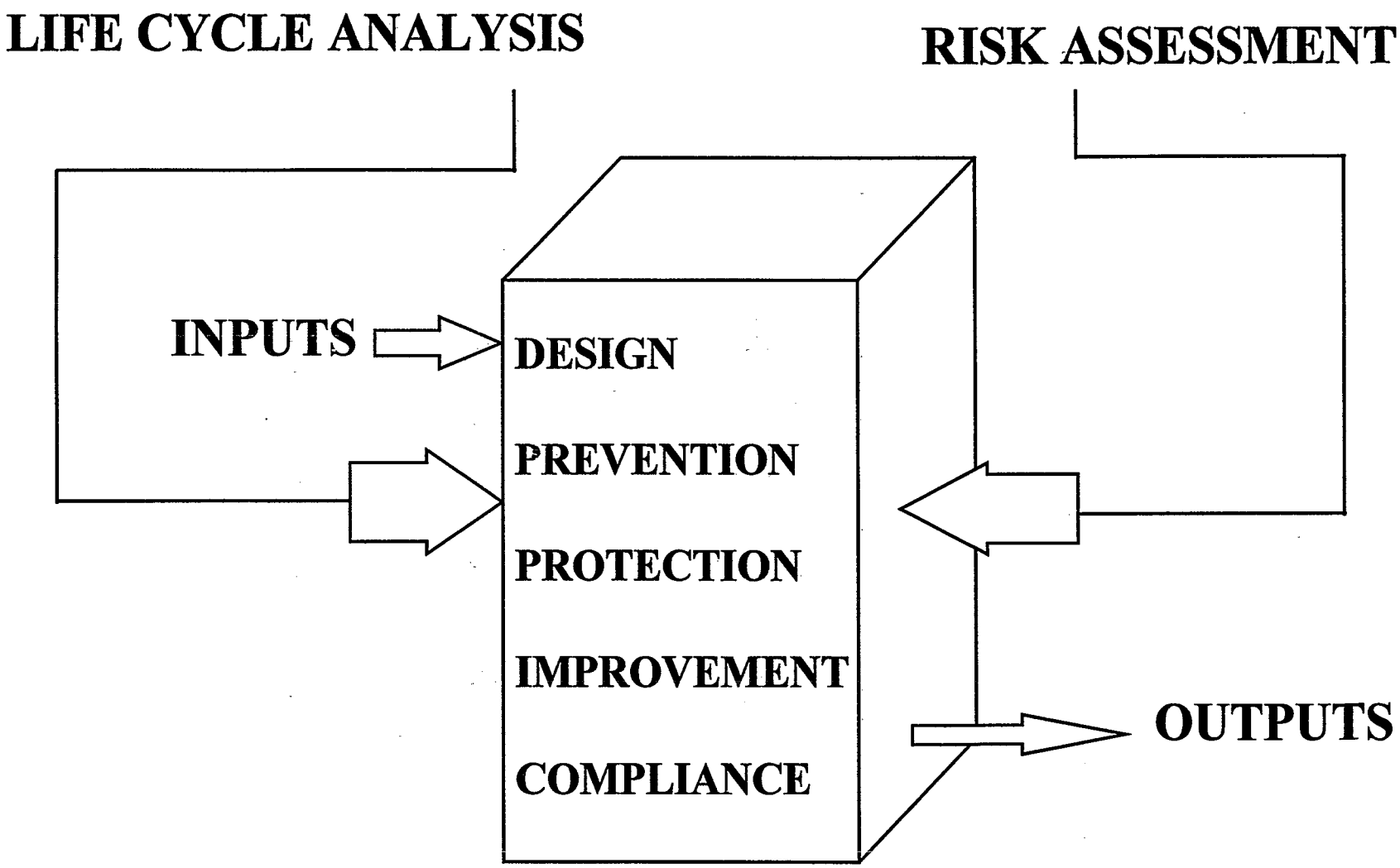


Figure 3

PRODUCT STEWARDSHIP AND ITS TOOLS



APPENDIX D

DRIVERS AND OBSTACLES TO IMPLEMENTATION OF EPR
(Overheads Used for Workshop Presentation)

Gary Davis, Director
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EXTENDED PRODUCT RESPONSIBILITY

A NEW PRINCIPLE FOR PRODUCT-ORIENTED POLLUTION PREVENTION

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CENTER FOR CLEAN PRODUCTS AND CLEAN TECHNOLOGIES

MISSION

The mission of the Center is to develop, evaluate, and promote cleaner products and cleaner technologies that minimize pollution at the source and contribute to long-term sustainable development.

EXTENDED PRODUCT RESPONSIBILITY (EPR)

DEFINITION

Extended Product Responsibility is the principle that actors along the product chain (manufacturers, suppliers, users, and disposers) share responsibility for the life-cycle environmental impacts of the whole product system, including upstream impacts associated with raw material extraction and use, effects from production and distribution, and the downstream effects associated with product use and disposal.

EPR AND SUSTAINABLE DEVELOPMENT

PCSD: "A NEW CONSENSUS"

THE UNITED STATES MUST CHANGE BY MOVING FROM CONFLICT TO COLLABORATION AND ADOPTING STEWARDSHIP AND INDIVIDUAL RESPONSIBILITY.

EPR AND SUSTAINABLE DEVELOPMENT

PCSD: "A NEW CONSENSUS"

GOAL 5: STEWARDSHIP
CREATE A WIDELY HELD ETHIC OF STEWARDSHIP THAT STRONGLY ENCOURAGES INDIVIDUALS , INSTITUTIONS, AND CORPORATIONS TO TAKE FULL RESPONSIBILITY FOR THE ECONOMIC, ENVIRONMENTAL, AND SOCIAL CONSEQUENCES OF THEIR ACTIONS.

EPR AND SUSTAINABLE DEVELOPMENT

PCSD: "A NEW CONSENSUS"

ADOPT A VOLUNTARY SYSTEM THAT ENSURES RESPONSIBILITY FOR THE ENVIRONMENTAL EFFECTS THROUGHOUT A PRODUCT'S LIFE CYCLE BY ALL THOSE INVOLVED IN THE LIFE CYCLE.

KEY FEATURES OF EPR

- EXTENDS UP AND/OR DOWN THE PRODUCT CHAIN
- FOCUSSES ON THE PRODUCT SYSTEM, NOT JUST THE FACILITY
- SHARED AND OVERLAPPING RESPONSIBILITIES AMONG ACTORS ALONG THE PRODUCT CHAIN

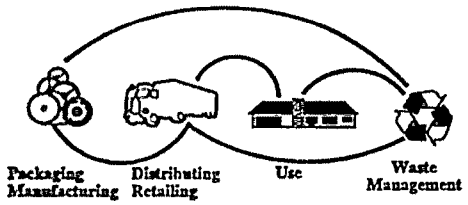
EXTENDED PRODUCT RESPONSIBILITY vs. EXTENDED PRODUCER RESPONSIBILITY

EUROPEAN EPR POLICIES

European EPR policies, although referred to as Extended Producer Responsibility, are actually shared responsibility and do not put the onus entirely on producers.

EXTENDED PRODUCT RESPONSIBILITY vs. EXTENDED PRODUCER RESPONSIBILITY

Shared ResponsibilityFor German Packaging Take-Back System



FRAMEWORK OF EPR

- PRINCIPLE -- EPR
  - PROCESS -- LIFE-CYCLE MANAGEMENT, INDUSTRIAL ECOLOGY
    - RELATIONSHIPS -- LIFE-CYCLE PARTNERSHIPS, MULTI-STAKEHOLDER LIFE-CYCLE PARTNERSHIPS
    - TOOLS -- LIFE-CYCLE ASSESSMENT, DESIGN-FOR-THE-ENVIRONMENT, ENVIRONMENTAL MANAGEMENT SYSTEMS
  - POLICIES

MODELS OF EPR

- PRODUCT TAKE BACK FOR WASTE MANAGEMENT
- PARTNERSHIPS FOR WASTE MANAGEMENT
- MATERIALS SELECTION (UPSTREAM)
- MATERIALS MANAGEMENT (DOWNSTREAM)
- EXTENDED ENVIRONMENTAL MANAGEMENT PROGRAMS
- LEASING SYSTEMS
- DELIVERING SERVICE AND FUNCTION INSTEAD OF PRODUCTS
- DESIGN-FOR-THE-ENVIRONMENT PROGRAMS
- ENVIRONMENTAL PURCHASING

BENEFITS OF AND DRIVERS FOR ADOPTION OF EPR

- COST SAVINGS
- DEMONSTRATION OF ENVIRONMENTAL STEWARDSHIP
- PRODUCT INNOVATION
- INCREASED CUSTOMER SATISFACTION AND LOYALTY
- GREEN MARKETING
- TAKE-BACK MANDATES AND PRODUCT RESTRICTIONS IN THE U.S. AND ABROAD
- EXISTING FACILITY-BASED ENVIRONMENTAL REGULATIONS
- ENVIRONMENTAL LIABILITIES

OBSTACLES TO EPR

- COSTS
- LACK OF INFORMATION AND TOOLS
- DIFFICULTY IN BUILDING RELATIONSHIPS
- RIGID PRODUCT SPECIFICATIONS
- PRODUCT LIABILITY CONCERNS
- HAZARDOUS WASTE REGULATIONS
- ANTI-TRUST LAWS
- FACILITY-BASED ENVIRONMENTAL REGULATIONS

CONCLUSIONS

KEY QUESTIONS

- WHICH MODELS OF EPR WORK BEST FOR PRIORITY PRODUCT SYSTEMS IN THE U.S.?
- HOW DO WE DECIDE HOW WELL A MODEL OF EPR WORKS?

CONCLUSIONS

KEY QUESTIONS

- HOW DO WE GET THE WORD OUT ABOUT EPR MODELS THAT CAN CLEARLY BENEFIT THE ENVIRONMENT AND THE BOTTOM LINE?

CONCLUSIONS

KEY QUESTIONS

- HOW DO WE FACILITATE THE TYPES OF RELATIONSHIPS AMONG ACTORS IN THE PRODUCT CHAIN THAT IMPLEMENT EPR?

CONCLUSIONS

KEY QUESTIONS

- HOW DO WE DEAL WITH THE NEED FOR EPR WHERE IT WOULD HELP SOLVE CRITICAL ENVIRONMENTAL PROBLEMS BUT THE SHORT-TERM ECONOMICS ARE NEGATIVE FOR SOME STAGES OF THE PRODUCT LIFE CYCLE?

CONCLUSIONS

KEY QUESTIONS

- WHAT ARE THE NEXT STEPS IN IMPLEMENTING EPR IN THE UNITED STATES?

APPENDIX E

CASE STUDIES

Workshop on Extended Product Responsibility

jointly sponsored by the
President's Council on Sustainable Development and
EPA's Office of Solid Waste

Case Studies

White House Conference Center
Washington, DC
October 21-22, 1996

EPA

NOTICE

Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the President's Council on Sustainable Development (PCSD) or the U.S. Environmental Protection Agency (EPA). The information presented in the case studies represents the views of the organizations or companies that have prepared the individual case studies. Statements made in the case study presentations do not represent analyses or policy positions of the PCSD or EPA.

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Xerox Corporation

Presented by:
Jack Azar, Xerox Corporation

Asset Recycle Management
Xerox Corporation

Project Description

Asset management is the process of managing products and inventory to minimize their environmental impacts at all stages of the product life cycle, particularly end-of-life. It entails reusing an asset either by remanufacturing to its original state, converting to a different state, or dismantling to retrieve the original components. Implemented in 1991, Asset Recycle Management (ARM) is the critical corporate-wide program at Xerox that manages the ever-increasing range of products returned to the company for reprocessing. Xerox has created a recycling and remanufacturing infrastructure that extends product life, meets the same high-quality standards as new-build products, and will help Xerox meet its goal of providing "waste-free" products.

The goal of the Asset Recycle Management program is to achieve zero percent material disposition to landfill by designing waste-free products with minimal impact on the environment. To achieve this goal the following strategies have been implemented:

- Asset management has become a new product design criterion to ensure recycling and remanufacture are included at the first stage of product development. Design-for-environment (DFE), a management tool focused on resource conservation and pollution prevention at the beginning of product concepts, has resulted in initiatives that include:
    - Limiting production materials to recyclable and recycled thermoplastics and metals;
    - Embossing plastic parts with recycling symbols;
    - Marking engineering drawings with remanufacturing codes to expedite processing; and
    - Adopting snap-together designs to facilitate assembly and disassembly processes.
- Key asset management procedures have been incorporated into the company's current product delivery process (PDP). Xerox has adopted a "focus-factory" concept that integrates new-build and remanufacturing lines to facilitate consistent use of existing manufacturing tools, processes, and product quality controls. The percentage of remanufactured machines has more than doubled in the last five years.
- Cartridge recycling processes have been created whereby customers return spent copy and print cartridges and, most recently, toner containers. The worldwide cartridge return rate for 1995 was approximately 60%, preventing 1100 tons of materials for going to landfill.

The Recycling Process

Field returns that meet equipment remanufacture criteria follow well-established disassembly and reassembly processes. Data recording and damage checks are followed by the removal of external covers, subassemblies, and parts. These pieces are sorted according to their remanufacture codes, cleaned, and repaired to new part standards. Repaired parts and subassemblies are then returned to manufacturing for reassembly in second generation equipment. Parts' assemblies that fall out of the above operation are scrapped to recover the metal and plastic content. Customer-initiated toner and print cartridge returns go through similar processes. Figure 1 illustrates.

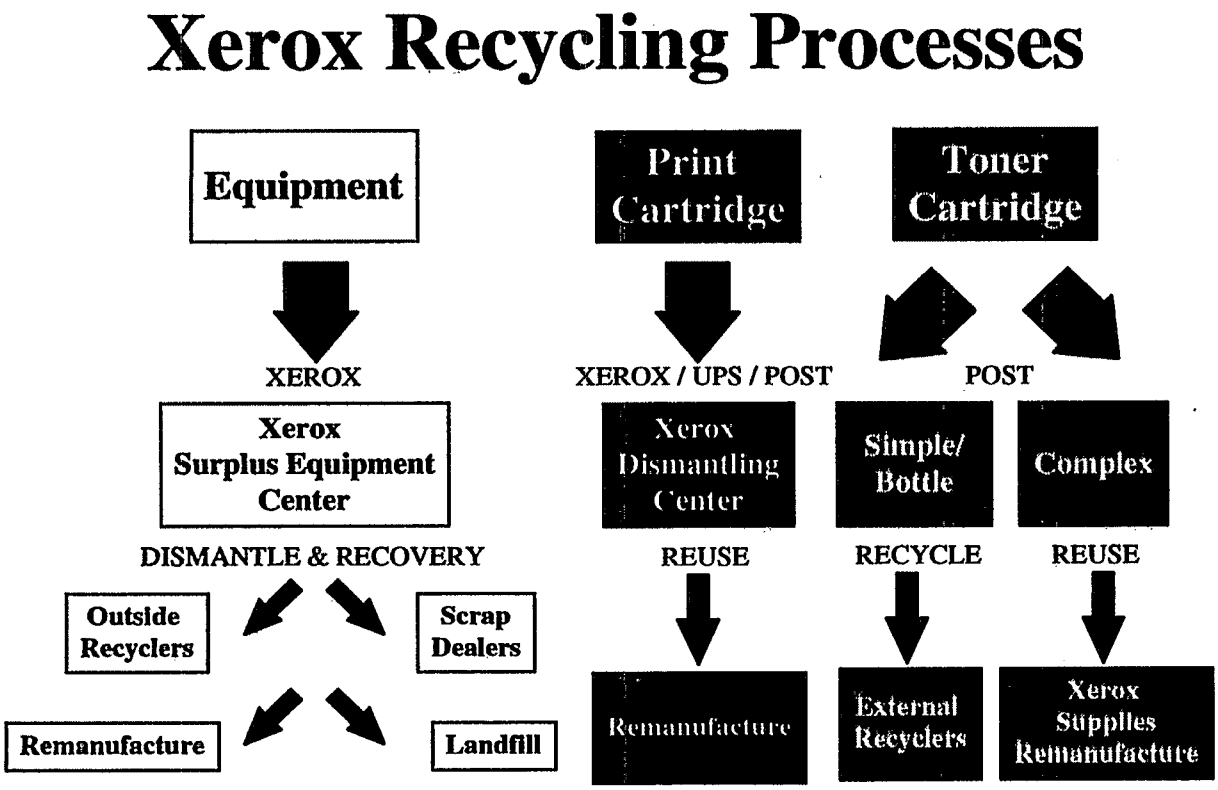

FIGURE 1

By incorporating environmental and remanufacturing considerations into its product delivery process, Xerox not only assumes extended responsibility for its products, but realizes higher financial returns as well. The success of ARM is largely due to positive monetary returns for both Xerox and its customers. With estimated savings exceeding several hundred million dollars in 1995, ARM has the potential to save even more in the foreseeable future.

PROJECT PARTICIPANTS

Product Manufacture

- Xerox Corporation

Product Return

- Canada Poste
- United Parcel Service
- U.S. Post Office

Dismantling, Recovery, Reuse

- Bayer Corporation
- Copco Recycling
- Lucent Technologies
- Seneca Iron & Metal

PROJECT GOALS

- Achieve zero percent material disposition to landfill to minimize the impact on the environment; maximize resource reuse; lower production costs; and improve return on assets.
- Attain "waste-free" factories by 1998 by achieving a 90% decrease in municipal, hazardous, and chemical waste; a 90% decrease in air emissions; a 50% decrease in water discharges; a 25% increase in purchases of post-consumer materials; and a 10% increase in energy efficiency when compared to each facility's baselines.

PROJECT DRIVERS

- European product take-back proposals (Germany, Netherlands, Sweden, etc.).
- Cost savings potential from remanufacturing & ARM.
- Customer satisfaction and loyalty, as determined from market research.

PROJECT BENEFITS

- ***Solid waste reductions*** -- A 45% reduction between 1991 and 1995 for 17 largest sites.
- ***Enhanced utilization of natural resources*** -- Recycled content in products more than doubled in five years.
- ***Competitive advantage*** -- Created through remanufactured product line in Rank Xerox.
- ***Cost savings*** -- Over $200 million in annual savings.
- ***Quality*** -- Improved product reliability for remanufactured products.

OVERCOMING PROJECT OBSTACLES/BARRIERS

Internal to Xerox

- Modification of product delivery process to incorporate asset management was achieved by gaining senior level commitment of resources.
- Requiring design teams to consider end-of-life management in product design is being facilitated through a remanufacturing design training program and by standardizing remanufacture and environmental coding processes for all machine parts.

External to Xerox

- Unacceptability of remanufactured products due to "used equipment" misconception is being overcome through sales force education and customer communication.
- Ill-defined/outdated procurement standards and purchasing guidelines in the marketplace are being addressed through cooperative efforts with government procurement and government environmental organizations.

PROJECT PREVIEWS

- **Harvard Business School** -- 1994 case study documents ARM and DFE at Xerox. The case study is used in an academic setting to discuss the viability of Xerox' waste-free objectives and strategies.
- **Massachusetts Institute of Technology** -- Currently reviewing the progress of the waste-free initiatives at Xerox.

PROJECT PRESENTERS

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Georgia-Pacific Corporation

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PRESIDENT'S COUNCIL ON SUSTAINABLE DEVELOPMENT

WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY

1-Name and Description of Project-

Georgia-Pacific Corp. Recycled Urban Wood, Martell CA-

This project is an example of Georgia-Pacific Corp. efforts to better utilize different wood products in a manner that increase their economic and environmental value added. The recovery , processing and recycling of urban wood waste has been initiated in several G-P wood product locations, such as Martell CA, Bancroft ONT and are in different planning and development stages in Georgia. The descriptiom of the Martell CA project provides an accurate view of this type of Extended Product Responsibility projects.

This Martell CA project reflects different pressures and objectives of the G-P's Martell particleboard and G-P's resources division operations. The reduction of timber harvest from the U.S. Forest Service in California has caused a reduction in the lumber production and the residual fiber supply that results as a by-product of the lumber manufacturing process. This is the primary fiber supply used in the production of particleboard at Martell. To augment this shrinking wood supply source, we have turned to the post-consumer waste wood supply that has been used for fuel in cogeneration plants in California producing steam and electricity or has gone to the landfills.

In addition, California mandates a 50 percent reduction in solid wastes by year 2000. Local governments have the responsibility of achieving this mandate or be subject to penalties. California provides some incentives for those located in recycling market development zones, whenever such determination is made.

Both of the pressures described above reinforced Georgia Pacific's internal goals of product stewardship and pollution prevention. Consequently, Georgia-Pacific has made agreements with local and national recycling companies, operating in a radius of approximately 100 hundred miles from the Martell plant, to purchase multi-specie wood recovered from the commercial disposal or general urban solid waste. This approach has resulted in an alleviation of the abovementioned pressures and the achievement of internal company sustainability goals. It assures a steady raw material supply for particleboard production and adds economic and environmental value to the final product by reducing costs and further improving its environmental soundness.

Georgia- Pacific at Martell, has agreements with five (5) recycling and processing companies that operate within a 100 miles. The recyclers/processors, receive this wood by allowing delivery at their sites for a fee, by placing collection boxes or dumpsters at selected commercial locations and by recovering wood waste for a fee. However, this wood supply is contaminated with dirt,

plastic , metal, etc. The contaminants are hand removed and the cleaner wood waste sorted at the collection areas. The wood is ground to Martell's process specifications and further removal of contaminants takes place. Ferrous and other magnetic metals are removed by a system of magnets. Finally, the ground wood is screened prior to its transportation and delivery to the Martell plant.

2- Project Participants

There are five major participants or actors in this project, all sharing responsibility for its success. To help ascertain the breadth of the project and identify different actors sharing responsibilities, we will group them in five major classes that reflect stages in the product's life cycle. They represent varying ranges of activities, depending upon their vertical and horizontal integration.

Wood Waste Producers:

Truss, pallet, crating, packaging, wire reel manufacturers/users
Construction and demolition debris
Commercial wood waste (furniture)
Cut-to-size lumber operations

Collection system

Dumpsters located in selected areas and hauled to processing areas
Tipping fee system at the processing sites

Processors used by G-P Martell

Larson Pallet- Milpitas, CA
L&K debris Service- Union City, CA
Multiple Services Inc.- Lathrop & Fresno, CA
Stockton Wood- Stockton, CA
Waste Management Inc. - Sacramento, CA

Transportation

Different contractors, shippers and haulers

End Users

-G-P Martell plant- Production of particleboard.
-Martell dedicated cogen facility supplying energy to the Martell plant and others
-pulp mill operations.
-other industrial uses

3- Project Goals

The project addresses different goals. It meets one of the criteria for selection of EPR projects as stated in the recommendation of the Eco-efficiency Task Force to the PCSD.It reduces the contribution to the solid waste entering land on a material which accounts, in the United States, for around 7-8 % of the total solid municipal waste stream and which is recovered at a level lower than 10 percent. It really breaks new grounds in solid waste practice and wood products technology.

Goals of the project are,

a) to increase available wood supply for particleboard production, cogen operation and pulp production,

b) to contribute to the G-P's internal goals of product stewardship and utilization of wood wastes.

(c) to contribute to the mandate reduction in the solid waste stream; and,

d) to add economic and environmental value to the products of the Martell operation by reducing the cost of the furnish and improving on the final products' environmental attributes.

4- Project Drivers

The drivers of the project are various. The project was initiated as a result of shortage of good dry fiber for the particleboard plant as well as good fuel material for the cogen operation. Also, as the cost of landfilling the material arose, we started looking for other ways to dispose of our wood wastes and the potential to accommodate other disposers' waste. The state of California mandate for solid waste reduction was another driver. Finally, G-P's internal goals for pollution prevention and resource utilization, facilitated further justification for deploying of resources to study and plan an expansion of the wood fiber supply with the inmediate objective- to ensure adequate supply to the plant. They all were, and are, drivers moving this project forward.

5- Project Benefits

The recovered wood fiber adds to the overall fiber supply in California and the Northwest. This additional supply comes at a critical time of shrinking fiber supplies due to government and other restrictions and regulations on timber harvest from federal forests. The timber harvest reduction has had a direct impact on the volume of lumber being produced and in the subsequent reduction of fiber residuals generated from the lumber production operations. The price of the new urban wood supply is competitive in high priced markets. However, the expensive process of collecting, sorting and reprocessing the recovered wood could detract from the attractiveness of the source in markets where the fiber price is low or supplies are plentiful.

6- Project Obstacles/ Barriers

They could be categorized as technical and commercial in nature.

Technically, contamination of metal, grit, stones, plastic, paper as well as moisture content variability, are the most likely problems encountered. As the percent of this type of recovered furnish increases, considerations of product performance and quality become more evident at the present state-of- the- art level. Screening of the ground wood and paving the handling floors, are the two single most effective techniques to control contamination.

Commercially, market conditions could drive the price to unattractive levels. At present, markets conditions are suitable for the continuation of the project with the shared responsibility and interest of all participants.

7- Project Reviews

No external or even integrated review of the project has been conducted. At this moment, the project operates without government subsidies or assistance and indicates solutions based on private sector initiatives

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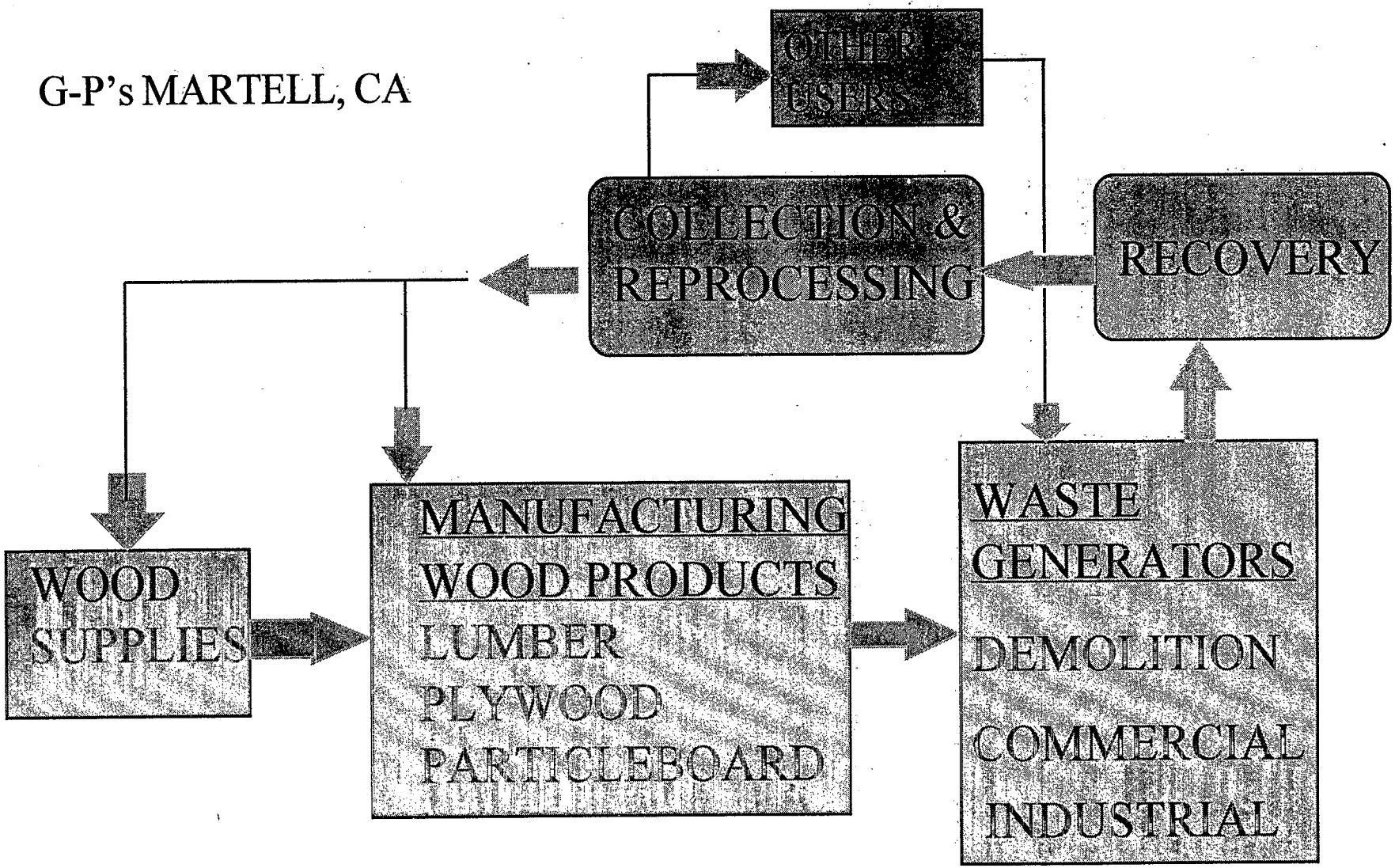
RECYCLE OF URBAN WOOD WASTE
THE PRODUCT SYSTEM AND "EPR" ACTORS

G-P's MARTELL, CA



S.C. Johnson Wax Company

Presented by:
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William Heenan, Jr., Steel Recycling Institute
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Extended Product Responsibility

Case study submitted by:

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1. Name and Description: "America Recycles Aerosols"/product stewardship

The nearly 17,000 community recycling programs across the country typically collect steel cans among other recyclables. But communities have not taken the step to include aerosol cans in their recycling programs. Since there are 3 billion aerosols produced domestically each year, SC Johnson Wax ("SCJW"), which manufactures many of its products in aerosol form, views this as a missed opportunity for resource conservation and solid waste reduction.

In 1991 SCJW formed a partnership with the Steel Recycling Institute (SRI) to educate and influence consumers and federal, state and local waste management officials that empty aerosols can and should be recycled along with other steel cans. An important need was research to conduct the necessary educational campaign. A project was initiated in a residential recycling program to gather data on consumer disposal to confirm that aerosol containers are empty just like other containers presented for recycling. Research was conducted with the insurance industry to address questions about perceived worker safety during the recycling process. SCJW, SRI and the Chemical Specialties Manufacturers Association (CSMA) then developed a multi-level strategy which delivered educational materials responding to these concerns, formed partnerships with national, state and local organizations, developed a turnkey citizen education campaign to assist communities which accept aerosols within their recycling programs, and made hundreds of visits to local and state officials to educate them on environmental and economic benefits accruing from recycling, rather than landfilling, of aerosols.

As a result of this partnership effort, EPA and an increasing number of state and local regulators have decided that recycling is the preferred means to handle aerosols. A growing number of communities – more than 3,700 nationwide including Los Angeles, Chicago, Pittsburgh, Philadelphia, Houston, Boston, Sacramento and the states of Michigan, Illinois and Delaware – now accept aerosols in their curbside programs.

Several other countries have emulated this effort and are successfully initiating programs in their countries. For instance, in Canada in just two years nearly 150 cities have included aerosols in their residential recycling programs. Germany, Australia and the United Kingdom have programs underway as well.

2. Project Participants

Aerosol manufacturers

- SC Johnson Wax
- Chemical Specialties Manufacturers Association member companies: marketers and contract fillers
- CSMA member companies: component and formulation material suppliers

Steel industry/can suppliers

- Steel Recycling Institute
- Crown Cork & Seal, U.S. Can; Can Manufacturers Institute
- CCL Industries

Waste Processors

- Private [e.g., Waste Management, Inc. (WMX)]
- Public [e.g., Lake Oswego, NY]

State/Local Government

- Environmental Protection Agency
- U.S. Conference of Mayors
- Michigan Department of Agriculture
- Illinois Environmental Protection Agency
- Solid Waste Association of North America
- American Public Works Association
- State and Local Solid Waste Managers

Others

- Keep America Beautiful
- National Recycling Coalition

3. Project Goals

- Resource conservation through reuse of steel;
- Waste reduction through diversion of cans from landfills, and;
- Enhanced public perception of aerosols.

4. **Project Drivers**

- Consumer perception of aerosol product form;
- State and local government recycling goals, and;
- Potential landfill bans, product taxes, environmental "preferability" procurement guidelines, and product take-back proposals.

5. **Project Benefits**

- Resource/energy conservation. Every **ton** of steel recycled saves 2,500 pounds of iron ore, 1,000 pounds of coal, and 40 pounds of limestone. For each **pound** of steel recycled, 5,450 BTUs of energy are conserved.
- Community benefits/cost savings. Adding aerosols to existing recycling programs reduces costs of landfilling these containers, and increases revenues from sale of recyclables with no cost increase.

6. **Project Obstacles/Barriers**

- Aerosol "myths. There exist considerable misunderstandings about aerosols (i.e., they contain CFCs, that a pump spray is "more environmental" than an aerosol, etc.) and, although the aerosol is the preferred packaging form for many product categories, consumers and others often do not view aerosols as recyclable. SCJW, CSMA and SRI find it necessary to do basic education about aerosol products to overcome these negative perceptions.

- Perceived worker safety concerns. Some waste processors were concerned that aerosols collected in curbside programs could pose a hazard when crushed and baled if they contained residual product. SCJW and SRI initiated research in Houston, Texas to confirm that aerosol containers are almost always empty when discarded and just like other containers presented for recycling. SCJW, SRI and CSMA worked with Factory Mutual Research Corporation (FMRC) and studied operations at processing facilities to evaluate flammability and other risks associated with recycling. This research has reaffirmed for WMX and other processors that the risks associated with recycling aerosols are no different than other materials found in a recycling facility.

7. **Project Reviews**

While there has been no review of the project at this time, it is important to note that considerable research has been conducted re-affirming the feasibility and value of including aerosols in the residential recycling programs throughout the nation. The most

comprehensive research on the operational feasibility to date is the Factory Mutual Research Corporation's report entitled, "Recycling Aerosol Cans: A Risk Assessment." The most comprehensive policy document encouraging the addition of aerosols in residential recycling programs is "Missing A Resource? Maximize Steel Collection With Aerosol Recycling," U.S. Conference of Mayors and the Municipal Waste Management Association.

8. **Project Presenters**

- Tom Benson, Environmental Actions Manager – U.S., North American Consumer Products, SCJW, and Chair, Aerosol Recycling Steering Committee, CSMA (product manufacturers)

- Bill Heenan, President, Steel Recycling Institute (upstream supplier)

- Ed Skernolis, Director of Regulatory Affairs, WMX Technologies (downstream waste processor)

Rochester Midland Corporation

Presented by:
Stephen Ashkin, Rochester Midland Corporation
Norma Edwards, WECO Cleaning Specialists
James Foley, U.S. Environmental Protection Agency
Nelson Palma, U.S. General Services Administration

WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY CASE STUDY

presented by:
Rochester Midland Corporation
WECO Cleaning Specialists
U.S. General Services Administration
U.S. Environmental Protection Agency

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1. Name and Description of Project: Rochester Midland Corporation is a chemical specialty manufacturer which competes in a very mature and competitive marketplace. Strategically, our focus is on developing innovative new products which incorporate a tight environmental and human safety criteria, educating customers and the broader marketplace, working closely with product users, and developing a team approach to substantially differentiate ourselves from the competition. Rochester Midland is implementing this strategy throughout each of our five chemical divisions domestically, and is evaluating similar opportunities internationally.

This specific demonstration project is a result of an initial contact by the President of WECO Cleaning Services (WECO) in their effort to address building occupant complaints. This initial contact took place as a result of a paper presented by Rochester Midland on its Indoor Environmental Program at the *Building Services Contractors Association Convention and Trade Show.*

To illustrate the implementation of our strategy, Rochester Midland entered into an informal partnership with the cleaning service provider (WECO), the building owner (U.S. General Services Administration - GSA) and the building tenants (U.S. Environmental Protection Agency - EPA). The office building is located at ***290 Broadway, New York, NY*** and is a beautiful 3 year old, 36 story office complex housing offices for the U.S. Environmental Protection Agency (Region 2) and other federal government agencies. It is important to note that while this particular demonstration was undertaken at a GSA owned building with EPA as the tenant, that the strategy is applicable for any building regardless of the owner or tenant.

Initial discussions, team development and planning for the project began in May, 1996, followed by occupant interviews, cleaning product and procedural reviews. Trial of the improved process was implemented on June 1, 1996 and completed July 31, 1996. Final evaluations were completed in August 1996. Full implementation and continual improvement procedures are underway. All parties view the program as an unqualified success.

2. Project Participants (Team Members): The participants / team members in this project include the following components of the chain-of-commerce:

Rochester Midland Corporation - cleaning chemical and equipment supplier
WECO Cleaning Specialists - cleaning personnel (product users)
U.S. General Services Administration (GSA) - building owners
U.S. Environmental Protection Agency (EPA) - tenant representatives

Furthermore, it is important to note that those representing the tenants (EPA) included several layers within the organization. These layers included senior managers of EPA, representatives of the employee Health & Safety Committee, and those individuals who were particularly affected.

3. Project Goals: Rochester Midland set out to develop the project with all stakeholders and developed a project team. Through project team meetings, the following goals were identified:

A). Demonstrate that a focus on human health & safety and the environment would positively affect building occupants and could be done within cost and other performance requirements.

B). Address the needs of those individuals adversely affected by the cleaning products and processes. Identify potential hazardous products and processes. Identify opportunities to reduce risk to occupants.

C). Address the needs of the cleaning personnel by identifying processes that were potentially hazardous and to reduce those risks. Identify training and communication requirements on product use, storage and disposal.

D). Address the use of cleaning products to identify opportunities for upfront source reduction in terms of both quantity and toxicity, and to utilize engineering controls for consistent quality.

E). Identify alternative cleaning product that met all requirements, including economics, efficacy and other opportunities consistent with the fundamental objectives of the tenant and building owner. These additional objectives include the use of products that met the "spirit" of Executive Order (EO) 12873 for "environmentally preferable" products *(products and services which have a lesser or reduced effect on human health and the environment when compared to other products and services that serve the same purpose)* and EO 12856 for pollution prevention opportunities.

4. Project Drivers: This project had several sets of drivers. Those drivers include:

A). Initial complaints from building occupants.

B). The desire of the building service contractor (WECO) to meet occupant needs and to further their environmental and safety initiatives.

C). The needs of the building owners (GSA) to fully satisfy their tenants requirements for a safe, productive and complaint free indoor environment.

D). An opportunity for the tenant (EPA) to meet the needs of their personnel and to support organizational mission objectives (I.E. pollution prevention).

E). Further educational and communication opportunities.

E). Opportunity for Rochester Midland to create a new market for cleaning services, not just products; and to sell new, safer cleaning products.

F). Demonstrate Rochester Midland's leadership in the marketplace.

5. Project Benefits: The project benefits can be divided into multiple areas:

A). Reduced exposures to highly affected individuals from the cleaning products and processes. In addition to the obvious health benefits to those individual, this improvement also resulted in improved productivity for the building occupants due to their reduced absenteeism.

B). Reduction in tenant complaints and the corresponding increase in tenant satisfaction.

C). Reduced risks to the cleaning personnel associated with cleaning product usage, plus an increase in their pride and professionalism.

D). Improved training and communication for cleaning personnel which will reduce the potential of worker injuries, and improved customer satisfaction which will increase the companies marketing opportunities.

E). Reduction (projected at 50%) in chemical cleaning products used to clean the building, a significant reduction in the amount of packaging waste requiring disposal, and reduced air (VOCs) emissions.

F). Demonstrated benefits in the free market, requiring no additional legislation, regulations, compliance or other requirements. This project clearly demonstrates when extend product responsibility makes good business sense and is a winner for all affected stakeholders.

G). Demonstrated that a focus on health and safety would not only result in a "greening" of the environment, but a "greening" of the financial bottom-line.

6. Project Obstacles/Barriers: These barriers/obstacles included:

A). Product development. New products had to be formulated that met a tight criteria (Enviro Care^{R} Criteria) for safety for product users, building occupants and the environment.

B). Organizational inertia. It is difficult to implement any change, but success came only after the inertia was overcome at multiple levels. These barriers included:

- RMC's own internal competition for R&D resources
- Contractor's relationships and familiarity with previous supplies and products
- Building owner's established contracts and priorities (cleaning is rarely a high priority for building management)
- Tenant / building occupant to get involved with change.

C). Product biases. The need to overcome the belief that products which are safer for the user and the environment are either too expensive or lack the performance/efficacy of traditional products.

D). Lack of clear definitions and criteria. The general lack of agreement as to the definitions/attributes of "environmentally preferable" products and how to implement a holistic approach to improve the indoor environment.

7. Project Reviews: The success of this project is measured by a reduction in occupant complaints. Note that complaints went down while there was an increased effort to solicit criticism.

8. Project Presenters: While Rochester Midland has worked extremely hard to develop, organize and implement the demonstration of our strategy, it is clear that without the support and ardent commitment of the building service contractor (WECO), the building owner (GSA) and the building occupants (EPA) this project would not have been successful.

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Safety-Kleen Corporation

Presented by:
Bill Constantelos, Safety-Kleen Corporation

Developing Product Take-Back Systems Through Solvent Recycling

F. Henry Habicht
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Safety-Kleen Corp.
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Safety-Kleen Corp. has been involved in Extended Product Responsibility from the very beginnings of the company, well before the phrase became popular. Our company was founded on the concept of leasing a piece of parts washer equipment and the solvent needed to run it. This leasing concept was coupled with the periodic servicing of the machine and exchanging clean solvent for the dirty material. The company has developed many additional products and services on this concept. For example, we have developed our Oil Services systems to both supply a recycled/re-refined product and collect used oil after it is dirty and no longer useful as a lubricant. The Oil Services system is described in a separate case study. Both systems focus on providing not only materials, but more importantly, a timely service to the customers to help them deal with the used materials in an environmentally appropriate manner. This case study will examine the development of Safety-Kleen's Parts Cleaner system as it applies to the concept of Extended Product Responsibility.

Minimizing waste solvent volumes

Name and Description of Project: Safety-Kleen initiated it's enhanced product responsibility efforts with a solvent take-back program in 1968. At that time, the company introduced the concept of machine and solvent leasing in order to make it convenient and safe for the automobile repairman to do his parts cleaning. The customer would lease both the machine and the contained solvent, and Safety-Kleen would periodically return to service the machine and exchange clean solvent for the by-now dirty material. A schematic of the service is shown in the attached figure.

The design for the parts cleaner itself dates back to 1954. It was developed as one man's answer to the safety problems associated with his cleaning of parts in pans of gasoline at the family's sand and gravel business. The machine featured a solvent with an elevated

flash point, making it safer to use in the maintenance setting. It also had a lid that would be self-closing to snuff-out a fire in the event that one started. The name Safety-Kleen was used almost from the start since the machine was safe and it cleaned parts.

When the Safety-Kleen machine's patent was purchased from the initial inventor and the company from the subsequent owner, relatively few machines had been sold and the periodic service aspect was not emphasized. The concept of offering a total service including the use of equipment, solvent, and cleaning of the equipment on a regular service interval launched this successful business. The market, distribution network, and the infrastructure to support this new system were developed with a great deal of effort and forethought by the company founders. It filled a market's need. Safety-Kleen was expected to show up to do the service, and we did. The quality of the service was the key issue which allowed the other recycling services of the system to expand.

The closed-loop recycling system was born in 1970. Safety-Kleen introduced the concept of solvent recycling as a means of managing the used solvent and reducing the amount of virgin solvent purchased and used each year. The closed loop refers to the fact that Safety-Kleen delivers a volume of clean solvent to the customer and removes the dirty solvent which is sent to a company recycle center for recovery. The clean, recycled solvent is then returned to the customer on the next service, closing the loop. By 1975, the company was processing over 10 million gallons per year of parts cleaner solvent. Over 90% of the spent solvent was recovered into a recycled product which was re-delivered to the parts cleaner customers. By 1993, customers were generating over 50 million gallons per year of spent parts cleaner solvent from almost 500,000 units at more than 300,000 customer locations in the United States.

In 1993, the evolution of Safety-Kleen into extended product responsibility and take-back continued. A new parts cleaning machine was introduced that was designed to minimize the amount of waste solvent generated, and thereby reduce the amount of clean solvent used. The new service employs a premium solvent with a higher flash point and much tighter specifications on organic impurities. In addition, a patented cyclonic separation technology that continuously removes dirt particles from the solvent during use was integrated into the company's waste minimization parts cleaner - the Green Machine. The company spent more than $2 million and over 4000 man-hours developing and testing the efficiency of the new product.

With the new cyclonic parts cleaner service, customers need service less frequently and generate less waste on an annual basis. The solvent stays cleaner longer, extending the life of the solvent and reducing the number of annual solvent changes. Green Machine customers generate between 50% and 80% less waste with the same parts cleaning capabilities. In 1995, customers generated 11 million fewer gallons of waste parts cleaner solvent as a result of the waste minimization features of the new service. Due to the purity of the solvent, careful use allows the solvent to remain non-hazardous even when returned for recycling.

Project Participants: Safety-Kleen has worked closely with our parts cleaner customers to develop and refine the service system. The types of customers range from small service stations and auto dealerships to a wide variety of medium to large industrial facilities. Customers in the Washington D.C. area include the White House Motor Pool, the CIA, several military bases, the Smithsonian Institution, and the U.S. Mint.

Project Goals: Back in 1968, the primary goal in developing this service was, obviously, creating a system that generated profits. This was to be done by taking advantage of small business customers' needs for a parts cleaning system that was convenient, safe and cost efficient. At the same time, we realized that a new system was needed to give the users a viable alternative to pouring the dirty solvent down the drain or out in the back yard. The solvent take-back system met those goals.

In 1970, providing a means to recycle the dirty solvent became a major goal. Expenditures for virgin solvent supplied with each service were driving up costs. This goal was met by creating the first Safety-Kleen solvent recycle center in Elgin, Illinois, and has grown to a total of 7 Safety-Kleen facilities recycling parts cleaner solvent. The recycling process allows over 90% of each gallon of dirty solvent to be returned as clean solvent for each future service.

Project Drivers: There were several issues driving the development of the initial parts cleaner system. Safety was a key concern of small business people who needed to clean parts and had concerns with open containers of solvent or gasoline. They also wanted a system that they could use and forget and not invest their own time and effort in maintaining and servicing the equipment. The main issues were safety, convenience, and reliability, all in a cost efficient package.

New environmental laws have also served as project drivers. The Resource Conservation and Recovery Act (RCRA) brought with it the concept of "cradle to grave" management of wastes. This caused businesses, especially the smaller ones, to look for a service provider that could give them peace of mind as to how the waste was being managed. Later, the liabilities associated with Superfund caused the users to look for waste management partners who could ensure that their wastes were handled in a safe and secure manner. Safety-Kleen has lived up to this promise, protecting its customers from Superfund-like liability associated with the handling of spent solvent material.

In 1990, Congress added pollution prevention concepts into waste management laws. The Pollution Prevention Act of 1990 introduced a waste management hierarchy that placed "source reduction," or not producing the waste in the first place, at the top of the ladder. If wastes could not be prevented, they were to be reused, recycled, treated or disposed, in that preferential order. The take-back and recycling nature of the Green Machine with its extended service interval provided customers with credit for pollution prevention and source reduction.

Project Benefits: Integrating the parts cleaner machine with a take-back solvent service has provided many additional benefits. It has significantly improved safety in most of the maintenance shops in the U.S. by reducing the risk of fire from parts cleaning operations. The service has conserved non-renewable oil resources by reducing virgin solvent purchases through an effective closed loop recycling system. Waste generation volumes have been reduced substantially, allowing customers to take advantage of reduced regulations on smaller waste generators. The system also reduces impacts on surface and ground waters by providing a means to appropriately manage the solvent rather then pouring it into the sewer or onto the ground. The company also benefits financially from this system since the fully loaded cost of producing a unit of recycled solvent represents a 30% savings compared to producing the solvent from virgin stocks.

Project Obstacles/Barriers: Development of the original parts cleaner system was challenged by the historic lack of a nationwide distribution system to service the machines and recycle the solvent. Safety-Kleen overcame this by creating a multi-layered distribution system that is able to move large volumes of materials in both bulk and container volumes to almost any location in the continental U.S. and recover it, even down to a single drum from an isolated location.

Unfortunately, some RCRA regulations create significant storage and handling impediments to managing recyclable wastes. Safety-Kleen established its recycling system 16 years before RCRA started significantly influencing the parts cleaner business (1984). Since that time, significant money and effort has been expended to meet the regulations. A "contingent management" system for recyclable wastes could be much more cost-effective while ensuring equivalent levels of environmental protection.

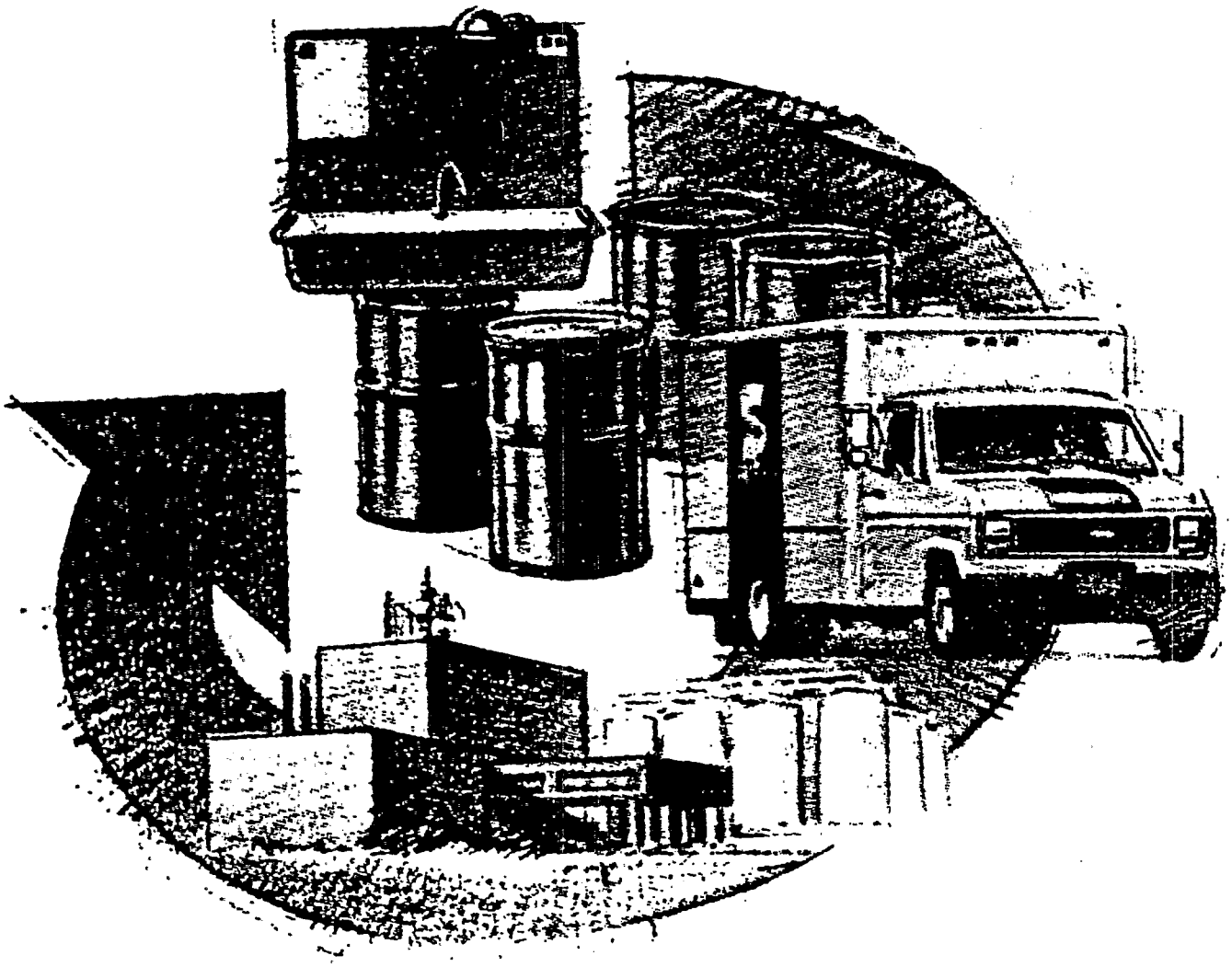
EPA's used oil regulations (40 CFR Part 279) have actually made it more difficult to promote solvent recycling. These rules make it easy for parts cleaner solvent to be mixed in to used oils and legally burned. This is inconsistent with EPA's waste management hierarchy, Pollution Prevention Strategy, and their 1993 Waste Minimization and Combustion Strategy. Consequently, many businesses have chosen the cheaper burning outlet over the more environmentally preferable recycling and reuse option.

The new generation of waste minimizing parts cleaners has also created challenges in addition to the benefits. Costs of the cyclonic Green Machine are nearly twice that of the original parts cleaner machine due to the higher technology employed. In addition, the new non-hazardous, higher flash point solvent does not always meet the parts cleaning needs of all customers. The company continues to explore methods of meeting these challenges.

Project Reviews: The waste minimizing Green Machine has been selected for several awards, including its selection by Plant Engineering magazine as one of its "Products of the Year" for 1994. The machine has received the Michigan's Chamber of Commerce Environmental Quality Award and the Wisconsin Governor's Award. The unit has also been recognized by the U.S. EPA as a waste minimization product in its Waste Minimization Plan issued in November 1994.

Summary

Providing our customers with the opportunity to participate in product take-back programs has been profitable for both them and Safety-Kleen. These programs encourage the conservation and reuse of non-renewable natural resources, provide the generators with convenient options to improve the environment by managing the wastes appropriately, and meet a growing demand by our customers for "green" products and services that can be translated into improvements in their bottom lines.



Developing a Product Take-Back Program Through Oil Re-refining

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Safety-Kleen Corp. has been involved in Extended Product Responsibility from the very beginnings of the company, well before the phrase became popular. The Oil Services program supplies re-refined lube oil products and collects used oils after they are dirty and no longer useful as lubricants, an extension of the product take-back concept. The program focuses on providing not only materials, but more importantly, a timely service to customers to help them deal with used materials in an environmentally appropriate manner. This case study will examine the development of Safety-Kleen's Oil Services program as it relates to the concept of Extended Product Responsibility. A separate case study has been prepared describing the company's Parts Cleaner system.

Re-refining Used Oil

Name and Description of Project: Safety-Kleen has developed a used oil management program that collects and recycles over 170 million gallons each year of used oil. A large percentage of this used oil is re-refined in Safety-Kleen's two re-refineries in the U.S. and Canada, which are the largest in North America. Safety-Kleen possesses over 80% of North America's total re-refining capacity. The re-refining process produces a base lubricating stock that is equal in quality to virgin base oils and meets all applicable standards in the industrial and vehicle markets. Safety-Kleen has spent over $200 million on the plants and infrastructure to be able to bring this product and service to market.

About 1.4 billion gallons of used oil is generated by industries, businesses and consumers in the United States each year. Currently, only 900 million gallons of used oil is collected each year for processing. Of this, only 10% is re-refined by 2 U.S. re-refineries, one of which is owned by Safety-Kleen, with the remaining 800 million collected gallons being burned as fuel. The other 500 million gallons of used oil generated each year is not collected and often causes environmental damage to surface and ground waters.

Re-refining used oil helps reduce air pollution that might otherwise be created by the burning of used oil. Used oils are generally burned in units with no air pollution control equipment so that contaminants (metals, sulfur and ash) are released directly into the atmosphere. Re-refining captures the majority of these contaminants, preventing their release. Further, re-refining recovers a non-renewable natural resource by reducing reliance on additional virgin lube oil.

Safety-Kleen, and in fact the entire re-refining industry, has faced significant challenges in overcoming the stigma of poor product quality. This stigma was a hold-over from older lower-technology processes that were unable to respond to the changing nature of the contaminants and additive packages found in the modern lubricating oils. In 1974, there were over 150 companies in the U.S. recycling oil into various types of lubricating products. In 1996, there are now only 2 oil re-refineries in the U.S. producing lubricating base oils, primarily due to the substantial capital investment required to produce the current high-quality product.

A key step in developing the used oil product responsibility program has been gaining the trust and confidence of the consuming industries. This has taken significant time and effort working with and achieving the certifications of standards-setting organizations such as the ASTM and SAE. In addition, Safety-Kleen has worked closely with equipment manufacturers such as the railroads, automobile manufacturers, and hydraulics manufacturers to gain acceptance of the product for use in their equipment. These efforts have allowed the re-refined lube oil product to be accepted as equivalent to virgin products, plus it has begun to develop a market among the consuming public for a "green" motor oil.

Project Participants: Safety-Kleen Corp. has worked with many different groups to develop and implement this program. The company has worked diligently with many Federal Government organizations as part of the President's 1993 Executive Order on recycled products to increase the amount of recycled products used within the federal system. This includes a highly publicized event with the National Park Service on the Capital Mall on Earth Day, 1996, and a closed loop system with the U.S. Postal Service and several state and municipal governments. In addition, over 60,000 small businesses that generate used oil currently participate in the used oil collection program. Major lubricant organizations, specification writers and retail consumers of lubricating oil products have also played a significant role in making the re-refined oil the accepted and trusted product that it is today.

Project Goals: The primary goal of this project was to develop an economical oil collection and processing program that can generate revenues and profits for the company on an acceptable level. The program would build on the company's strengths in infrastructure and distributions systems. The program must also be able to service the country's vast number of small to medium sized businesses by providing a way to help them protect the environment in a cost efficient manner.

Creating markets and demand for the collection and re-refining program was another major goal of this effort. First, the fact that re-refined oils were equal to virgin lubricating oils must be established. Then, industrial, commercial, and retail customers must be convinced of the quality so that they will accept the re-refined product and have the opportunity to select it based on it's recycled content. Finally, the public must want to participate in the program by having their automobiles' oil changed at a facility that will have the used oil re-refined.

Project Drivers: Public and government attitudes towards recycling helped drive the development of this oil recycling program. The President's 1993 Executive Order for recycled products supported the development of demand within the Federal government that has increased the visibility of the re-refined product. The public's increasing belief in recycling non-renewable resources and supporting energy independence has also driven the demand for the "green" products and collection services.

Consumers on an industrial, commercial and retail level have also been instrumental in providing the opportunities for this program. Customers have expressed the need for a used oil collection program which they are confident will minimize their potential future CERCLA liabilities. Safety-Kleen has been able to meet this need through the financial stability and size of the company.

Project Benefits: The development of the closed loop oil collection and re-refining program has provided numerous benefits to the company and to our customers. Based on $18 per barrel crude oil, production costs of a gallon of lube oil made from our re-refining process is 40% to 50% less expensive than production from virgin crude oil in a typical conventional lube refinery. It has also expanded customer acceptance of the quality and consistency of the lube products as shown by the increasing sales of "green" motor oils, such as Safety-Kleen's top-quality motor oil, America's Choice. Partnerships with major retailers such as Wal-Mart and Goodyear automotive centers have also increased the public's acceptance of and access to re-refined oil products.

The program also has significant benefits to the nation and society as a whole. Increasing public awareness of the convenience and availability of used oil collection programs lessens the impacts on surface and ground water due to improper disposal. It also reduces the country's dependence on foreign crude oil by not needing to create additional virgin lube oils, saving a valuable non-renewable resource. In addition, the relatively new re-refining technology eliminates the significant waste disposal volumes associated with the older re-refining technologies.

Project Obstacles/Barriers: Perceived quality issues of the re-refined product have been a significant obstacle to the development of markets for the re-refined oils. The perception of inferior quality was due to the out-dated stigma from uneven quality control in early oil recycling processes. This led to a lack of acceptance by equipment manufacturers in allowing the use of re-refined lube oils in their equipment without voiding the warranty. A great deal of work was done with these groups to overcome the resistance of specification writers to acknowledging the equivalency of the re-refined product to virgin lubricating stocks.

As much as the environmental movement has created opportunities for this program, sections of the RCRA regulations have also provided impediments to the development and expansion of the program. EPA's used oil regulations have incongruously placed burning of used oil on the same preference level as re-refining, contrary to EPA's Pollution Prevention Strategy and its waste minimization hierarchy.

Summary

Providing our customers with the opportunity to participate in product take-back programs has been profitable - for the customers as well as Safety-Kleen. These programs encourage the conservation and reuse of non-renewable natural resources, provide generators with convenient options to improve the environment by managing wastes appropriately, and meet a growing demand for "green" products and services.

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OIL
We Recycle.
WE CARE!
We Use Safety-Kleen
Environmental Services.

Rechargeable Battery Recycling Corporation

Presented by:
Jefferson Bagby, Rechargeable Battery Recycling Corporation

PRESIDENT'S COUNCIL ON SUSTAINABLE DEVELOPMENT

WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY

1. Name and Description of Project: The Rechargeable Battery Recycling Corporation's (RBRC) "Charge Up to Recycle!" program for used nickel-cadmium (Ni-Cd) batteries. RBRC is a nonprofit public service corporation dedicated to educating the public as to the need to collect and recycle used Ni-Cd batteries. RBRC also funds and facilitates Ni-Cd recycling programs nationwide in the United States, and soon throughout Canada as well.

2. Project Participants: The "Charge Up to Recycle" program is funded by over 200 companies worldwide that manufacture rechargeable products for sale into North America (list attached). Key players are the owners of RBRC: Energizer Power Systems, Sanyo Energy (U.S.A.), Panasonic Industrial Company, Saft America, and Varta Batteries. Other participants include INMETCO, where the batteries are recycled, and numerous consolidation facilities and trucking firms. Batteries are collected from all market sectors including consumers, businesses, public agencies, institutions, etc.

3. Project Goals: Used Ni-Cd batteries have been identified by the U.S. EPA as a principal contributor of the toxic heavy metal cadmium into the solid waste stream. The "Charge Up to Recycle!" program is to educate the public that used Ni-Cd batteries should be recycled, thus reducing environmental risk and conserving natural resources. All parts of the used Ni-Cd battery are recycled and reused. No part re-enters the solid waste stream.

4. Project Drivers: Initial Ni-Cd collection was driven by state laws in Minnesota and New Jersey that required industry sponsored and funded collection pilot projects. It became clear to rechargeable product manufacturers that unless a voluntary industry funded program was established nationwide, Ni-Cd batteries would either be banned or subjected to a prohibitive deposit. Once the pilot programs were operational and industry members saw they could be successful, the RBRC program was established and received widespread industry support.

5. Project Benefits: In 1995, the first full year of the "Charge Up to Recycle!" program operation, over 15% of the used Ni-Cd batteries available for recycling were recycled. By the year 2000 we hope to attain a recycling rate exceeding 70%, with 100% collection the ultimate goal. In addition to protecting the environment, the program provides significant subsidies to those recycling Ni-Cds. RBRC pays for retail Ni-Cd collection containers, for all shipping back to recycling by retailers, and all Ni-Cd recycling charges. For counties and municipalities, RBRC pays for the shipping back to recycling and all Ni-Cd recycling charges. For businesses and public agencies, RBRC pays for all Ni-Cd recycling charges. RBRC operates a toll free number where anyone can call to find out how and where to recycle Ni-Cds. Call 1-800-8-BATTERY.

6. Project Obstacles/Barriers: The most significant obstacle to used Ni-Cd collection are the hazardous waste transportation and manifesting requirements found in RCRA. EPA recognized these obstacles and promulgated the Universal Waste Rule at 40 CFR Part 273 to remedy the problem. Because Part 273 is deregulatory, each state had to adopt the rule before it took effect. For this reason Congress passed the "Mercury Containing and Rechargeable Battery Management Act" in early 1995, which allowed Part 273 to take effect immediately in all 50 U.S. states. A similar process is underway in Canada. The deregulatory effort in the U.S. took about five years.

   The free-rider issue has also been a problem in the U.S. and Canada. Today an RBRC recycling fee is paid on over 75% of the new Ni-Cd batteries sold into the U.S. market. This will continue to be an ongoing problem.

7. Project Reviews: Recent project reviews have been conducted by Bette Fishbein of INFORM, Inc., for the University of Tennessee, and by Michael Bender, in Waste Dynamics of the Northeast. The "Charge Up to Recycle!" program has been endorsed by a number of members of Congress, including Rep. Frank Pallone, D-NJ, "This is a good first step in limiting toxic metals in our environment."

8. Project Presenters: The project is presented by Jefferson C. Bagby, RBRC Vice-President & General Counsel, 2046A Jefferson Davis Highway, Stafford, Virginia, 22554. Phone (540) 720-9225.

RECHARGEABLE BATTERY RECYCLING CORPORATION

Stafford Square - Suite A; 2046 Jefferson Davis Highway; Stafford, Virginia 22554-7219; Phone (540) 720-3668; Fax (540) 720-9324
Prestige Park - Suite 300; 2233 Northwest 41st Street; Gainesville, Florida 32606-6643; Phone (352) 376-6693; Fax (352) 376-6658

"CHARGE UP TO RECYCLE!" PROGRAM FUNDING

as of October 11, 1996

The companies and brand names listed below are actively demonstrating their commitment to the preservation of our environment by voluntarily funding the RBRC "Charge Up to Recycle!" program. These companies are paying a license fee to place the RBRC Seal on their Ni-Cd powered products. License fees fund a nationwide public education program about battery recycling. They also fund the environmentally sound collection and recycling of used Ni-Cd batteries.

Access
ADI Communications Corp.
Advanced Fox Cellular
Alexander Mfg. Co.
Alexander Battery Company West Inc.
Andis Company
Anton/Bauer, Inc.
Applied Power, Inc.
Aero Design, Inc.
Allied Signal Inc.
Aromat Corporation
AT&T Corp.
Aull Battery Company
A.V.T.
Avex Electronics Corp.
Batteries Plus
Battery Assemblers, Inc.
Battery Fabricators, Inc.
Battery Specialties
Bausch & Lomb
Bissell
Black & Decker
- Consumer Power Tools
- DeWalt
- VersaPak
- Outdoors Products
- B & D Industry & Construction
- Mac Tool
- Matco
- Household Products
- Industry & Construction
- Quantum
- Ranger

Brandt Services, Inc./BSI Batteries
Braun Inc.
BRK Brands, Inc.
- First Alert
- Ready Life
- Family Gard
- BRK Electronics

Brother International Corporation
Burdick Inc.
Burndy Electrical Corporation
Canon U.S.A., Inc.
CAR-GO Battery Co.
Casio, Inc.
Cell-Con Inc.
Centurion International Inc.
Cermark
Cobra Electronics Corp.
Comtec Information Systems Inc.
DC Battery Products
D & D Battery
Digi-Key Corporation
Du-Bro Products, Inc.
Duracell Inc.
- DynaCharge

Energizer Power Systems
- Energizer
- Eveready
- Millennium
- Generator

Energy Sales, Inc.
Engineered Assembly Corporation (EAC)
Epson America, Inc.
Ericsson Inc.
- Ericsson
- GE

Evergreen (C.P.) U.S.A., Inc.
Fedco Electronics
Fluke Corporation
Forte Networks
Fuji Photo Film U.S.A., Inc.
- Fujix-Photo Film Co., Ltd.

Fujitsu Limited
- Fujitsu Network Communications, Inc.
- Fujitsu Business Communications Systems, Inc.
- Fujitsu Personal Systems, Inc

Fully Power International Limited
Futaba Corporation
Generation Electronics
General Electric Sanyo
Golden Power Industries Ltd.
GP Batteries (USA)
- Gold Peak

GSL Engineering, LTD
Harvest Master Inc.
Hewlett-Packard Company
Hilti, Inc.
Hitachi Home Electronics (America), Inc.
Hitachi Power Tools U.S.A. Ltd.
Hi-Watt Battery Industry Co., Ltd.
- Nil

HM Electronics
Hobbico - Hobby Corporation of America
- Duratrax
- Hobbico
- Tower Hobbies

Homelite (A Division of Deere & Company)
The Hoover Company (Maytag Corporation)
House of Batteries
Icom America, Inc.
Illinois Tool Works
- ITW Paslode
- ITW Ramet

Industrial Scientific Corporation
Integrated Display Technology Ltd.
Iota Engineering Company
Iwatsu America, Inc.
Izumi Products Company
JBRO Batteries, Inc.
- JBRO Batteries
- Telepower
- Enercell

JTECH Inc.
John Manufacturing LTD.
JVC Corporation (US)
JVC Company of America
JVC Professional Products Company
JVC Service & Engineering Company
Kenwood Americas Corporation

Printed on recycled paper with soybean inks.

LG Electronics, Inc.

Liebert Corporation

LSM International

Lumedyne, Inc.

LWC Distributors, Inc.

Mag Instrument, Inc.

Makita U.S.A., Inc.

Makita Corporation of America

Makita Corporation, Ltd.

Matsushita Electric Corporation of America
- Panasonic
- Technics
- Quasar

Maxell Corporation of America

Maxon America, Inc.
- Maxon

McDaniel R/C, Inc.

SPM / Micro Power Electronics. A Division of BACE Mfg.

Micro Precision Inc.

Milwaukee Electric Tool Corporation

Minolta Co., Ltd.

Minolta Corporation

Mita Copystar America, Inc.

Mitsubishi Electric America, Inc. (MEA)

Mitsubishi Consumer Electronics America (MCEA)

Mitsubishi Electronics America, Inc. (MELA)

Mitsubishi International Corporation (MIC)

Monarch Marking Systems

Motorola, Inc.

Multiplier Industries Corporation

National Custom Enterprises. Inc. (NCE)

National Power Corporation
- National Power
- Maxell Corp.

NEC America, Inc.

NEC Technologies, Inc.

NESCO Battery Systems
- Nesco Batteries
- Combat
- Fonbat
- Laptop

Nikko America, Inc

Nintendo of America Inc.
- Nintendo
- Gameboy

Norand Corporation

Norelco Consumer Products Co.

Ohm Div. Resource Electronics

Olympus America, Inc.

Omnidata International

Orion Sales, Inc.

Pentax Corporation

Pentax Technologies Corporation
- Pentax Pocketjet

Periphex, Inc.

Philips Consumer Electronics
- Magnavox
- Philips

Physio-Control Corporation

Plainview Batteries, Inc.

Plantronics, Inc.

Porter-Cable Corporation

Pro Battery, Inc.
- Protronics

Professional Dental Technologies, Inc.
- Pro-Dentec

Progressive Technologies, Inc.

Promark Electronics Division, Electronics Marketing Corporation

Quadmark, Ltd.

Recoton Corporation
- Ambico
- Discwasher
- Interact
- Performance
- Recoton

Remington Products Company

Resistacap, Inc.

Richey Cypress Electronics

Rickbery Battery Industrial Co., Ltd.

RICOH Corporation

Rose Electronics Distributing Company, Inc.

Royal Appliance Mfg. Co.
- Royal
- Dirt Devil

Ryobi North America, Inc.

Ryobi Outdoor Products, Inc.

Ryobi Motor Products Corp.

Ryobi America Corp.

SAFT America Inc.
- Again & Again
- Infiniti
- SAFT Nicad

Sanyo Energy (U.S.A.) Corporation

Sanyo Fisher Service Corporation

Sanyo Fisher (USA) Corporation

Sanyo North America Corporation

S-B Power Tools
- Skil
- Bosch
- Dremel

Sealand Holdings Co., LTD.

Sears
- Craftsman

Seiko Instruments USA Inc.

Sharp Electronics Corporation

The Singer Company Limited

Snap-On Incorporated
- Snap-On
- Sioux Tools

Southwest Electronics Energy Corporation

SpectraLink Corporation

SR Batteries, Inc.

Stark Electronics, Inc.

Streamlight, Inc.

StrenuMed Inc.
- STR-2000
- STR-3000

Sunbeam Corporation
- Sunbeam
- Oster

Tandy Corporation
- Radio Shack
- Realistic
- Tandy

Teac Corporation

Techsonic Industries, Inc.
- Humminbird

TechTronic Industries Co., Ltd.

Tekcom Industries Limited

Telecommunications Devices, Inc (TDI Batteries)

Teledyne Water Pik

Texas Instruments Incorporated
- TravelMate

3M

TNR Technical Inc.

ToCad America Inc.
- ToCad
- Sunpack
- Encore

Thomson Consumer Electronics, Inc.
- GE
- RCA

Toshiba America, Inc.

Trinity Products Inc

TSA Systems, Ltd.

Uniden America Corporation
- President
- Impulse
- Bearcat
- Regency
- Uniden
- Sea Ranger
- West Marine
- Extend-A-Phone

Unique Display Inc.

U.S. Robotics Access Corp.
- U.S. Robotics

Varta Batteries Inc.

Victory Battery Company

VidPro Corp.
- AC Delco Rechargeables

Vtech Communications Ltd.

Wagner Spray Tech Corporation

Wahl Clipper Corp.

WAXCOA, Waxing Corp. Of America, Inc.
- Craftsman

WEN Products Inc.

Windmere Corporation

Xuzhou E-Tech Electronics Co., Ltd.

Yams' Electronics Factory Ltd.

Yuasa Corporation

Zenith Electronics Corporation

Zip Charge Inc.

Interface Flooring Systems, Inc.

Presented by:
Joan Reynolds, Interface Flooring Systems, Inc.
Graham Scott, Interface Flooring Systems, Inc.

PRESIDENTS COUNCIL ON SUSTAINABLE DEVELOPMENT

WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY

CASE STUDY

1. Name and Description of Project:

The Evergreen™ Program, offered by Interface Flooring Systems, Inc.; LaGrange, Georgia, is an embodiment of the "Product of Service" concept found in Paul Hawkens' book *The Ecology of Commerce,* originally brought to the United States by McDonough Braungart Design Chemistry. Interface manufactures carpet tiles, a natural resource based product, for commercial and institutional use. As an alternative to a conventional purchase of flooring needs, our clients have the option to "lease" the services (functionality, color, design, aesthetics) of a modular carpet system without taking ownership or liability for the disposition of the products at the end of their useful life. A bundled service package is offered inclusive of design layouts, product selection (choosing the right products for the right place), carpet, access flooring (Interface Architectural Resources), furniture lift (Renovisions), installation (Re: Source Americas) ongoing maintenance and ultimate removal for reclamation or recycling.

The Evergreen Program is perpetual in nature. Financial parameters break it into building blocks of three seven-year cycles or leases. In the first cycle, design and product selection are established with long term objectives. Designers are encouraged to use a *Product Selection Procedure* that matches product performance to the anticipated traffic and maintenance demands. The *Product Selection Procedure* begins with a traffic survey, the results of which automatically provide a list of appropriate product lines for clients to consider. After selection, products are subjected to wear simulations on an Appearance Retention Tester that forecasts appearance after 5- 10- 15 years. This procedure helps clients choose those products that perform and meet expectations. The Evergreen Program encompasses a complete installation with design allowances for periodic change-outs of track off areas (exterior access, lobby or transition from hard surface) incorporated into the plan. In the second cycle, a new lease is engaged for areas needing renovation such as the 20 percent high traffic aisleways (which generally receive 80 percent of the wear) and periodic change-outs of track off areas are again included. In a third cycle, a combination of new and existing product may be reconfigured to rejuvenate the facility. The modular "free-lay" nature of our carpet tile lends to the flexibility of design and functional change as needed, thereby prolonging the useful life of the carpet and utilizing less natural resource based material and energy overall.

Under the terms of the Evergreen Program, Interface has a clear and perpetual responsibility for the on-site condition of the carpet and its eventual and environmentally correct disposal or re-use. Returns can be ground into a powder for injection and molding processes or can be recycled into Interface backing structures via mixing and extrusion systems.

2. Project Participants:

Interface Flooring Systems, Inc. and her sister companies Bentley Mills, Inc., Prince Street Technologies Ltd., Interface Architectural Resources, Renovisions, Inc., and Re:Source Americas are networked to provide an unprecedented synergy of flooring products and services which are all integral to the success of this program. Additional participants include Linc Anthem Corporation of San Diego, California, who is our financial partner on Evergreen Programs. Carpet Maintenance Service, Inc. (Dallas, TX) and Interior Preservation, Inc. (Oakland, NJ) are our agents through Re:Source Americas managing the carpet maintenance programs needed. Raw material suppliers such as BASF Fibers and Dupont can provide yarn products with partial post industrial recycled content as required. In addition, Dupont has a used product collection network feeding a recycling plant in Chattanooga where old material is sorted, recycled or converted into energy. Other partners in our recycling effort include Freudenberg, LaGrange Molding and Ogden Martin.

To date, two customizations of the Evergreen Program have been implemented with the Energy Resource Centers of Southern California Gas and the City of San Diego. The ERC of Southern California Gas is one of California's first "recycled" buildings. Materials used to make the carpet products for both of these facilities were inclusive of some recycled post-industrial waste in the fiber and backing systems. Inquiries regarding the Evergreen Program for use in healthcare networks and major corporate entities are increasing. We are working on several specific opportunities in the market place today.

3. Project Goals:

The goals of the Evergreen Program are to save non-renewable natural resources, extend our products' useful life for the benefit of our customers. Create a closed loop sustainable industry standard and shoulder a "cradle to cradle" responsibility for the manufacturer, installation, use and recycling of all our products.

4. Project Drivers:

The driving force behind this program is the vision of our chairman and CEO, Ray Anderson for Interface to become a sustainable corporation. He coined an acronym in 1994, PLETSUS®, Practices LEading To SUStainability, when he challenged all of us to pioneer the way to "do the right thing" environmentally and share the knowledge accumulated in the process with others. Our QUEST Program (Quality Utilizing Employee Suggestions & Teamwork) internally strives for zero waste not only in manufacturing, but in all facets of our business. We firmly believe "we can do well by doing good." The Evergreen Program is a step toward sustainability.

5. Project Benefits:

The environmental benefits of the program are many, some of which are immediate and others are long term. Our commitment to divert carpet products from already overburdened landfill systems is the first benefit. Interface is producing carpet products with less nylon face fiber without compromising quality or design, and in some cases, improving it! The "less is more" philosophy applies well. In '93, our average face weight was 25.2 ounces of nylon per square yard. Today, our average is 23.6 ounces per yard. At our LaGrange, GA facility this represents a reduction of one million pounds of nylon fiber per year, and the trend is continuing. During the same period our performance index on a scale of 1 - 10 improved from an average of 6.5 to 7.8. Interim uses of carpet waste as a raw material for another industry's products reduces the amount of new petroleum based resources needed in general. Ultimately, the systematic depletion of tomorrow's natural resources for our own use should end when the technology exists to re-use our "harvested" carpet tiles of yesteryear in the manufacture of new ones.

The potential cost savings to our customers are long term and contingent on their participation in all three leases and interest rate variables. The "one source" service partner concept coupled with a monthly service fee is an attractive option versus large capital expenditures for many companies. Budgeting for a monthly expense is easier than tying up large lines of credit or cash flow. Facility managers are very receptive to having the program for use on the most abused fixture in their building, the floor. Partnering with our customer on a lease of services allows for constant interaction on a regular basis with that customer which otherwise wouldn't necessarily happen on a straight purchase of product only. The Evergreen Program is an asset management tool.

6. Project Obstacles/Barriers:

The primary obstacle to the acceptance of the Evergreen Program is rooted in the economic justification of the program within the current market structure. A paradigm shift from short term disposable materiality to long term deliverable products of service must be recognized. Clients need to be educated about the environmental responsibility and liability of product ownership. Over a twenty-one year period it is possible to justify the economics and environmental benefits of this program.

Additional barriers exist in the current lack of technology to break down the components of the carpet tile after its useful life is exhausted and "purify" the fibers for re-use in the raw material loop of subsequent carpet products. The backing system can be re-used now but finding the means to pelletize and extrude it in mass quantities for standard production has not been resolved. Interim solutions are being investigated such as re-using these materials in other industries as raw materials for their products such as automotive parts. Waste to energy systems can also be used with the ash residual being re-used in our backing process.

The recycling of nylon is not very well established. Most, if not all, is recycled from postindustrial material. Despite the claims, very little, if any, post consumer material is being closed loop recycled. Our big disappointment is that many of the recycling paths we follow lead nowhere and we are fast concluding that we are probably going to have to establish the path alone, at least for the time being.

Another hurdle is the low cost of energy. Until energy costs are higher, there is no real incentive to reduce consumption. Within the next two years, we could manufacture closed loop recyclable products that require far less energy and material. Such products would be radically different and until something, perhaps high energy costs, makes these products attractive we will have great difficulty marketing them.

Finding progressive financial partners who embrace the perpetual theory has been difficult. We are currently negotiating with several financial institutions to partner with us and embrace the leasing of service concept. The standard seven year limit for a lease of this nature is too short. As a result, the "value" for the carpet product's service is paid for in the first lease but the useful product "life" is only partially expired. The possibility of extending the lease terms to ten years is gaining interest and acceptance by potential financial partners. Monthly payments would be based on ten years with an option to pay-off or refinance at the end of year seven.

7. Project Reviews:

The Evergreen Program is starting to spark interest in many sectors. Corporate, healthcare and educational markets are eager to learn more about the logistics of the program. This is the direct result of exposure through multiple medias. Ray Anderson has delivered compelling speeches on environmental responsibility to many groups including The U.S. Green Building Council (Aug. 14, 1995). Our affiliation with environmental consultants, Bill McDonough, John Picard and Paul Hawken, who advise us and communicate our efforts to their clients has greatly helped bridge the gap between manufacturer and potential consumer. The Evergreen Program concepts have been featured in *The Green Business Letter* (Oct. 1995), *The Austin American Statesman* (Oct. 10, 1995; pg. e4), *Floor Focus* (Jan./Feb. 1996), Green Seals's *Choose Green Report* (Oct. 1996) and on National Public Radio's *"Market Place"*, as well as CNN's *"Mother Earth News"* (Sept. 22, 1996)

8. Project Presenters:

Graham Scott; Interface Flooring Systems, Inc., 1-800-336-0225, EXT. 6243

Joan Reynolds; Interface Flooring Systems, Inc., 1-800-336-0225, EXT. 6228

Nortel

Presented by:
Ginny Snyder, Nortel

Nortel Case Study Summary for Extended Product Responsibility Workshop
US President's Council on Sustainable Development

1. Name and Description of Project

Product Life Cycle Management (PLCM)
Nortel approaches its PLCM program strategically. Consistent with corporate operating principles, the program aims to create customer value and industry leadership. Customer value takes many shapes, including: lower lifetime costs of product ownership through resource efficiency; partnerships with customers to improve their environmental performance; and value-added recycling of products at the end of life. PLCM also strengthens strategic alliances with suppliers, which are of growing importance to Nortel's overall business strategy.

In support of its philosophy, Nortel reoriented it's corporate programs to guide and stimulate PLCM efforts throughout the company. This new function has fostered a philosphical change to how Nortel approaches its environmental responsibilities. Instead of acting only as a steward of regulatory action, through the PLCM project Nortel Environmental Affairs has become a proactive business development unit active in all phases of the corporations business.

Through the PLCM project, Nortel Environmental Affairs organizes its activities in two connected areas: 1) Product Technology and 2) Business Process Solutions. Both initiatives respond to internal operations opportunities as well as those in the marketplace. In Product Technology Development, activities focus on research and development of cutting-edge, environmentally superior technologies and high leverage product solutions. In Business Process Solutions, the activities focus on developing innovative new ways of supplying and managing operations to achieve resource efficiency throughout the supply chain. Examples of programs fostered by this scheme include:

Lean and Clean Manufacturing Technologies

Over the years, Nortel has made significant progress in reducing the environmental impact of manufacturing processes, including the elimination of CFCs and a reduction in VOC releases. Under the PLCM program, improvements in manufacturing continue; for example, in 1996 Nortel's Research Triangle Park facility installed a new VOC-free process technology, developed by Nortel's own process development teams. Research and testing are also underway on lead-free solders and alternative circuit board coatings.

Supply Management and Chemical Use Reduction

In an effort designed to reduce chemical use and lower costs, Nortel is embarking on an innovative business strategy with its chemical suppliers, designed to change the once competitive nature of the manufacturer/supplier relationship. Instead of the supplier seeking profit by encouraging Nortel to use more chemicals, under a "shared savings" relationship, Nortel and its chemical supplier will work together to minimize chemical use. In this new relationship, the supplier is responsible not only for supplying the needed chemicals, but also for providing services such as chemical process expertise and chemical management, storage and disposal for a fixed fee. As a result, the supplier has the incentive to help Nortel minimize chemical use by introducing innovations, searching for alternatives to hazardous chemicals, suggesting more efficient chemical processes, and delivering only the quantity of chemicals needed.

Extending Product Life Through Design

A modular philosophy was adopted for the new Vista telephone models, called Power Touch in the U.S. The new model allows the customer to upgrade the unit without buying a new one and scrapping the old one. The principle driver behind the design was to create "user value" by leveraging the customer's initial investment through a flexible and upgradeable design. The new model is designed in two parts -- a standard base with basic telephony features and an upgradeable slide-in module that can add features such as caller ID, call waiting, a larger screen size or a better graphics display. The base holds its design for a longer period of time, while the module can be replaced to provide the latest features at half the cost of replacing the telephone. This new design minimizes product obsolescence and reduces the volume of product headed for recycling or disposal.

New Packaging Concepts to Reduce Waste

For Nortel, packaging was an obvious and early target for waste reduction, as legislation worldwide focused attention on this waste stream and disposal costs skyrocketed. Packaging changes are springing up throughout Nortel, leading to significant cost savings and a 10 to 15 percent reduction in packaging volume. For example, shipping switching products in assembled mode, rather than packaging and shipping components separately for on-site assembly, saves $5 million annually. Known as "plugs in place" shipping, this method requires less packaging, and reduces installation time. Nortel also designed a new "clamshell" packaging system for shipping circuit boards that eliminates cardboard and foam waste, and is reusable. The packaging is also designed to improve handling and storage for customers. The clear plastic allows customers to scan product bar codes without opening the packaging and risking damage to the product. The nesting and stacking feature of the clamshell also saves space on the production floor.

Asset Recycling

Nortel operates three recycling facilities in North America and one in the United Kingdom. The reclamation operation provides Nortel divisions and customer with a full range of asset disposal and recycling services, from equipment test and refurbish to resale of useable components to recovery of precious and non-precious metals and plastics. Over 90 percent of the equipment processed at the facilities (by weight) is recovered for reuse or recycling. The operation has a good profit margin, with approximately 85 to 90 percent of the revenues being returned to business units, and even customers where applicable.

2. Project Participants

Nortel's PLCM project requires that the corporation team with a variety of partners to achieve its goals. For instance, Nortel's Chemical Strategies Project has the corporation partnering with the Pew Charitable Trusts as a project co-sponser and with two environmental consultants, the Tellus Institute and the California Environmental Associates. This project will soon see Nortel teaming with a chemical supplier to provide a wide range of chemical services to a Nortel facility in an initive to reduce chemical use. In addition, Nortel has worked with both Bell Canada and BT on its Product Take Back program. Teaming with a variety of outside participants, whether suppliers, customers, government agencies, universities, etc., is clearly required by Nortel's PLCM project and more partnering will surely take place in the future.

3. Project Goals

The basic goal of Nortel's PLCM is to improve the environmental performance of the corporation through changes in all stages of the product life cycle – design, supply management, manufacturing, marketing, distribution, and product disposal.

Nortel has developed guidance and tools to help product and system designers integrate environmental considerations into systems of the future. In 1995, design guidelines were made available on-line to design engineers. Development of a set of PLCM standards for new product design is underway. Like any Nortel standard, compliance with these standards will be required as part of the product development process.

Over the next several years, Nortel will develop and phase in PLCM standards as they acquire the necessary knowledge and experience to establish appropriate standards. Standards are currently proposed for:

- life cycle analysis, or Product Environmental Profiles;
- hazardous material use (e.g., eliminating use of lead in manufacturing, brominated flame retardants in plastics, chromate metal finishes);
- product packaging (for example, volume reduction, reusable designs);

- manufacturing emissions (for example, reducing VOC emissions which account for 50 percent of hazardous air emissions at Nortel sites);
- material reuse and recyclability (for example, material selection, design for disassembly); and
- product take back.

The first series of standards will include Product Environmental Profile, manufacturing emissions, and hazardous material use.

The Product Environmental Profile standard for example, will enable design engineers to characterize the product, identifying environmental issues and potential solutions throughout the life cycle, from technological, market, and regulatory perspectives. Information derived from the Product Environmental Profiles will also serve as a management tool to help focus Nortel's research and development efforts. Product Environmental Profiles will also be used in marketing and customer communications.

4. Project Drivers

Nortel's PLCM project has been sponsored by the most senior management in the company who recognized the ever growing requirements of stakeholders for sustainable products and production processes as a continuing redefinition of the relationship between industry and the environment and a unique opportunity for telecommunications. Nortel has recognized the value in this new approach to environmental protection through greater product responsibility. Besides customer and regulatory requirements, financial and business rationale often drives the integration of sustainability into the core business strategy and practices. This understanding at Nortel has giving rise to its PLCM project. In essence, the PLCM project has been driven by Nortel's commitment to social responsibility and industry leadership.

5. Project Benefits

The benefits of the PLCM project are numerous. Nortel believes that the PLCM project will not only improve environmental oerformance but also create other value for customers and themselves in terms of product and supply chain efficiency, enhanced customer loyalty and brand image. PLCM encourages Nortel to reduce material and energy use and waste, reduce chemical use, avoid/limit/replace/eliminate the use of hazardous substances, and think sustainably when designing products and processes.

6. Project Obstacles/Barriers

The greatest barrier to Nortel's PLCM project was changing the corporate environmental philosophy from compliance to product and process oriented and overcoming established business practices. The change from a philosophy of environmental stewardship to that of an active partner in all aspects of the corporations business was not an easy one.

7. Project Reviews
No third-party reviews of Nortel's PLCM project have been conducted as of yet. However, Nortel is working with a third-party, the Pew Charitable Trusts on its program to reduce chemical use through supply management.

8. Project Presenters
To be announced, however most likely Ginny Snyder, AVP for Environment, Safety and Ergonomics, or Murray Hamilton, Director, Business Development for Environmental Affairs.

U.S. CAR Vehicle Recycling Partnership

Presented by:
Terry Cullum, General Motors Corporation

Name and Description of Project:

The Vehicle Recycling Partnership (VRP) is one of twelve consortia between Chrysler, Ford and GM under the United States Council of Automotive Research (USCAR). The VRP is a pre-competitive consortium that was established in 1991. The VRP is structured to involve the domestic automotive manufacturers and "upstream" suppliers with the major actors in the "downstream" vehicle recycling infrastructure in a collaborative framework.
The research facility of the VRP is the Vehicle Recycling Development Center (VRDC) which is located in Highland Park, Michigan and operated by Automotive Dismantling Services (ADS). The center is funded and staffed with technical personnel from Chrysler, Ford, and General Motors. The automotive vehicle dismantling center was established in 1993 to support research and development efforts by the domestic big three automotive manufacturers in the area of vehicle dismantling and recycling.

Project Drivers:

The current vehicle recycling infrastructure processes 95% of all vehicles that are removed from service. This successful, market driven, infrastructure consists of the consumer, automotive dismantler, the automotive shredder, materials reprocessors and the municipal solid waste landfill. Other actors are the automotive manufacturer and the automotive supply chain. On average, 75% of a vehicle by weight is recycled. This represents the ferrous and non-ferrous content of the vehicle. The remaining 25% of the vehicle is currently landfilled. This fraction of the vehicle is referred to as automotive shredder residue (ASR) and is comprised primarily of plastics, rubber, fluids, and glass. ASR comprises 1.5% of municipal solid waste in the United States. A main driver of the VRP is to support and further develop economical recycling technologies to reduce the contribution of automotive shredder residue to municipal solid waste landfills. This approach is designed to continue the sustainability of the market driven vehicle recycling infrastructure while reducing the environmental impact of end of life vehicles.

Project Participants:

There are several project participants that are involved with research at the VRDC and at other locations that support the activities of the center. The VRP works in collaboration with the main actors in the vehicle recycling infrastructure and with the upstream supply chain that represents the largest contribution of material to automotive shredder residue. Formal collaborative agreements are in place between the VRP and;

The American Plastics Council
Automotive Recyclers Association
Institute of Scrap Recycling Industries

A collaborative agreement is in process with the Aluminum Association. In addition to formal collaborative agreements, the VRP supports vehicle recycling research at the following institutions;

University of Detroit-Mercy
Michigan Molecular Institute
Carnegie Mellon University
National Research Council of Canada
University of Florida-Tampa
Michigan Technological University
Georgia Institute of Technology
Michael Biddle Associates
University of Windsor
Massachusetts Institute of Technology
Phillips Environmental

In addition to the above institutions, a pilot pyrolysis unit is being built at an automotive shredder to demonstrate the viability of the technology.

The VRP also joined with the American Plastics Council in a Cooperative Research and Development Agreement (CRADA, C9201501) with Argonne National Laboratories. This CRADA involves the development of technologies to provide for the effective recycling of scrap automobiles. The scope of the research includes:

- the examination of the issues and factors which prevent total recycling of scrap vehicles
- identification of desirable but undeveloped or unavailable technology which, if successfully developed and implemented, would enable recycling of currently non-recycled components of scrap cars,
- development of separation technologies to recover materials and resources from automotive shredder residue (ASR),
- examination of options for design modifications which could provide for more effective disassembly of components for recycling,
- examination of alternative materials to increase materials recycling.

Project Goals:

The VRP developed mission statements to describe the priorities of the working groups that formed to address specific areas in the vehicle recycling infrastructure.

VRP MISSION

The mission of the Vehicle Recycling Partnership is to develop, implement, and communicate research and pre-competitive pilot programs, which promote an integrated approach to the handling of End of Life Vehicles, with technical and economic efficiency, in North America for the Global marketplace.

DISASSEMBLY WORKING GROUP

To enable the efficient disassembly of components from vehicles that have value for re-use, to recover valuable materials for recycling, and to remove potentially harmful materials prior to becoming auto shredder residue.

SHREDDER RESIDUE WORKING GROUP

To reduce the total environmental impact of auto shredder residue through socially responsible, economically achievable solutions such as resource recovery and secondary uses.

DESIGN GUIDELINES WORKING GROUP

To develop material selection and design guidelines to facilitate re-use, recycling, or reclamation of materials and components from post-consumer vehicles.

The VRP established enabling technologies to guide research and development efforts of the VRP working groups.

REDUCE	Reduction in demand for natural resources. Elimination or reduction of contaminants in automobile waste. Reduction of the quantity of non-recyclable waste going to landfills.
RE-USE	Design for efficient assembly/disassembly Use of materials that retain value (corrosion and damage resistant). Efficient and environmentally sound serviceability of components.
RECYCLE	Materials coding methods and recognition sensors. Efficient and environmentally sound shredders, refiners, and rejuvenators. Development of infrastructure and markets for recycled materials.
RECLAIM	Recovery of valuable additives, chemicals, and energy. Development of markets for reclaimed materials. Reduction of undesirable landfilling of automotive residue.

Project Benefits:

Benefits of the project include;

A sustainable market driven vehicle recycling infrastructure
Reduction of solid waste from end of life vehicles
Reduction of substances of concern from end of life vehicles
Potential for creation of jobs to support the expanding vehicle recycling infrastructure

Project Obstacles/Barriers:

The current vehicle recycling infrastructure is set up to recover metals. The recovery of non-metallic materials requires a different approach than metals recovery. It is difficult to interest the current infrastructure in materials that are unfamiliar and therefore have uncertain profit potential. A major issue is whether non-metallic materials are removed from the vehicle prior to going to the automotive shredder or if the materials have any value after processing by the shredder. The VRP supports research into both of these scenarios to determine the technological and economic barriers to recovering these materials.

Project Reviews:

Quarterly project reviews are conducted with all VRP collaborators to evaluate technical projects and discuss strategy for the VRP. Annual workshops are held with the international vehicle recycling community to share technologies and discuss regional vehicle end of life policies. The VRP recently contracted with a consultant to provide a third party view of the accomplishments of the VRP and to assist in the development of a five year business plan.

Project Presenters:

Terry Cullum	GM Alternate on the VRP Management Committee Chair of the VRP Communications Group Chair of the American Automobile Manufacturers Vehicle Recycling Task Group Telephone #: (313) 556-7826
Irv Poston	Chair of the VRP GM Member on the VRP Management Committee Telephone #: (810) 947-0700

Ford Motor Company

Presented by:
Anthony Brooks, Ford Motor Company
Michael Patalan, Ford Motor Company

FORD MOTOR COMPANY BUMPER TAKE-BACK AND RECYCLING PROGRAM

1. Description of Project

The Ford Motor Company take-back and recycling program for bumpers has evolved from unique partnerships between Ford and its material supplier, GE Plastics, and between Ford and an automotive plastics recycler, American Commodities, Inc., as well as a network of automotive dismantlers. Ford started its bumper recycling program in the U.S. in 1993 as a pilot program to recycle plastic bumper material into tail light housings. Today the program is recycling post-consumer bumper material back into bumpers.

Since around 1986 most Ford bumpers have been made of Xenoy resin, an engineered plastic produced by GE Plastics. Xenoy is a blend of polyester and polycarbonate resins, which is well-suited for use in bumpers because of strength and flexibility throughout the range of conditions faced by automobiles.

The bumper take-back and recycling program began with an arrangement between GE Plastics and Ford to test bumper recycling at its Atlanta assembly plant. Ford began by using material salvaged from Ford plastic bumpers from Taurus, Sable, Tempo, Topaz, Aerostar, Escort, and Tracer models to mold new tail light housings for the Ford Taurus and Mercury Sable wagons. Each recycled bumper yields about 30 new tail light housings. The plastic bumpers were converted into clean plastic flake, which GE Plastics regenerated into pellets. The recycled resins were molded into tail light housings by Ford's Sandusky, Ohio, plastics processing plant. Ford found that the tail light housings made from recycled bumper material met stringent quality and safety standards while costing less to produce.

In the pilot program GE Plastics took post-use Ford Xenoy bumpers from Ford dealers and bumper shops and from automobile dismantlers and supplied them to a plastics recycler, Recycling Separation Technologies, Inc., of Lowell, Massachusetts. The purified regrind was sent back to GE Plastics, which recompounded it and sold it to Ford for reuse.

Ford also began a partnership in 1992 with American Commodities, Inc., a plastics recycler from Flint, Michigan. American Commodities previously recycled plant scrap for Ford before approaching Ford to participate in the bumper recycling program. The company had developed a process for paint removal from Xenoy plant scrap and expanded that process to make it applicable to the variability of post-consumer bumpers. American Commodities reprocesses post-use bumpers turning them into compounds called Enviralloy, which Ford reuses in new automobile parts, using proprietary technologies to remove up to 99.7 percent of paint residue and to "rejuvenate" and enhance material properties.

In order to collect bumpers for recycling American Commodities has developed a network of 400 dismantlers across the country for the take-back program and has provided them with a written specification on methodologies for dismantling and product identification. The

company pays dismantlers $4.00 each for the bumpers and has 25-30 regional collection points for transport of the bumpers to the American Commodities recycling plant.

The bumper recycling program currently recycles bumper material into new bumpers and is recycling approximately 1.5 million pounds of Xenoy plastic per year. Ford is not currently using recycled Xenoy from GE Plastics, but is relying entirely on American Commodities for its supply.

Ford found that greater cost savings were achieved in recycling bumper material back to bumpers, instead of tail light housings, because the virgin Xenoy material for bumpers is more expensive than the virgin ABS material that has traditionally been used by Ford for tail light housings. As of 1995 Ford began making guide brackets (a non-crash component) for new bumpers using 100 percent recycled Enviroaloy from American Commodities. In 1996 Ford began using 25 percent recycled Xenoy in new Xenoy bumpers for box beam applications. The recycled material is currently being used for Contour and Mystique bumpers. Ford is also planning to use recycled Xenoy at a rate of approximately 0.5 million pounds per year in service parts for bumpers for all models of Ford cars.

American Commodities collects and recycles more Ford bumper material than is currently reused by Ford. The company is currently recycling 6-8 million pounds per year and sells the recycled material Ford does not use to other manufacturers. The material is sold at a 25-30 percent cost savings as compared to virgin Xenoy.

2. Project Participants

The participants have included:

Ford Motor Company
GE Plastics
American Commodities, Inc.
400 Automotive Dismantlers

3. Project Goals

Ford's Manufacturing Environmental Leadership Strategy contains the following goals reflecting a commitment to Extended Product Responsibility: (1) "prevent pollution at the early stages of process and product development;" (2) "reduce or eliminate use of materials of concern;" (3) promote and plan for recyclability;" and (3) "obtain supplier support and involvement." Ford has developed Worldwide Recycling Guidelines to increase the use of recycled content and the recyclability of the materials used in the automobile and has decided on an across-the-board target to achieve a minimum 25 percent post-consumer recycled content of the plastic materials used in Ford cars.

The Ford bumper take-back and recycling program is one specific instance of Ford's promotion of recyclability. Other Ford recycling projects include the use of more than 50

million recycled PET bottles to make parts of the front grill, luggage racks, and door padding for new vehicles and recycling approximately 1 million polypropylene battery cases per year into splash shields for 325,000 cars.

4. Drivers for and Benefits of the Project

The bumper recycling program was driven first by Ford's commitment to recycling and recycled content for its cars. This commitment is an important part of Ford's environmental strategy and has been emphasized by high-level management. The pull from a major customer, Ford, was sufficient to interest GE Plastics in participating initially. Ultimately, the profit motive was the driver for American Commodities' participation in the program.

Benefits to Ford include:

1. Ford is saving money. The recycled Xenoy is cheaper than virgin Xenoy and also cheaper than other virgin resins with similar properties that could be used for the applications in which Ford is using the recycled resin. Recycling of Xenoy resin is economically attractive, because the virgin resin is relatively expensive. American Commodities sells Ford Enviralloy resin for 25-30 percent less than virgin prices. Ford estimates that it saves about $1 million per year.
2. Ford is demonstrating its commitment to environmental protection and to its recycling goals, which provide corporate image and marketing benefits.
3. Ford is also benefitting by demonstrating through increased recycling that potentially costly take-back and recycling mandates are unnecessary in the U.S.
4. The manufacturing and recycling processes for Ford cars benefit from the reduction in the total numbers of plastic resins used in the car through cascade recycling (reusing higher-quality materials in lower-quality applications).

The bumper recycling program at Ford represents approximately 125,000 bumpers that are being diverted from the ASR landfill stream. Additionally, American Commodities is diverting approximately 300,000 more bumpers per year. The use of recycled bumper material replaces the equivalent in virgin resin production, reducing resource and energy use as well as environmental releases during production.

5 Project Obstacles/Barriers

Significant barriers to implementation of the bumper recycling program have been technical, economic, regulatory, legal, and institutional. The primary technical barrier was the difficulty in removing paint and other materials from the plastic material to be recovered. Although paint removal processes have been developed, the use of recycled bumper material is still limited in visible surface applications because of this technical problem.

The economic barriers stem partly from this technical barrier and partly from the lack of an established infrastructure for getting the bumpers from dismantlers to recyclers. The cost of recovering and cleaning up the bumpers ultimately made the program less attractive for the large virgin materials supplier, GE Plastics, which partnered with Ford to initiate the program, than for a small plastics recycler with lower overhead, willing to develop the recycling infrastructure with dismantlers. When American Commodities offered a significant price discount for recycled material as compared to virgin, GE Plastics decided to place its participation in the program on hold.

The main regulatory barrier to the bumper recycling program has been the crash worthiness standard that requires extensive testing of recycled material to determine whether it performs as well as virgin material. For this reason, Ford chose initially to utilize 100 percent recycled material in parts that do not absorb crash impacts and to utilize only 25 percent recycled content in parts that are integral to impact absorption. Even with the limited recycled content used in impact-absorbing parts, Ford tested five times as many bumpers to demonstrate compliance with the crash worthiness standard than it would normally test for virgin material. The potential liability associated with supplying a recycled material that is expected to provide a measure of safety for vehicle occupants was also a concern of GE Plastics.

Finally, there were the institutional barriers to changes in the status quo that exist in most institutions and barriers to the types of life-cycle partnerships that are necessary for EPR to operate in such a large, diverse industry. Ford designers were concerned about any changes in material quality that might affect the performance of the bumpers. GE Plastics was concerned about handling potentially contaminated scrap in its clean virgin material manufacturing facilities. The success of the program depends upon the willingness of auto dismantlers to remove and clean the bumpers in a manner that facilitates recycling while being economically attractive to the dismantler. This partnership between American Commodities and the dismantlers would have been more difficult for larger companies, like GE or Ford, to develop directly.

DuPont Films

Presented by:
Len Jannaman, Jr., DuPont Films

SUBMITTAL OF

"EXTENDED PRODUCT RESPONSIBILITY" CASE

STUDY

1) PROJECT NAME AND DESCRIPTION

The project is known as "Petretec(sm)", DuPont's name for the technology we are practicing at our facility in Wilmington, NC. "Petretec(sm)" is derived from "PET (or, polyester) regeneration technology". Peripheral sites involved are Arden, NC, and Winchester, KY.

The vision of the DuPont Company and the Films business calls for the total elimination of landfilling of PET films worldwide. My company and others produce over 2 billion pounds per year of PET film annually around the world with about 1/3 of that total coming from operations in North America. Thus, the first step in DuPont's strategy is to work directly with our customers to establish systems to recycle their in-house ("post-industrial") waste generated during their consumption of our film.

However, since many of DuPont's direct customers are often "converters", they simply process or modify our film and sell it to others who make the final products for ultimate consumption. Examples of final end uses for PET film include: specialty packaging (the inside of microwave popcorn bags or potato chip bags with a liner having a metallic appearance); audio, video or computer tapes; carrier films used in the manufacture of ceramic electronic parts; specialty films for the printing industry; release films used for applying labels to bottles; and common hospital or industrial X-ray film.

DuPont focuses initially on our direct customers where only about 5-10% of the film ends up as waste. Then, attention turns to others further downstream in the supply chain , all the way to collecting film after its final intended use. With the help of several associations, DuPont is aggressively pursuing an industry-wide collaboration to set up the systems required to achieve our goals. Over the next 5-10 years, we envision developing collection facilities to handle even household consumer goods that can and should be recycled. (For instance, we

envision drop-off collection spots for old video cassettes at convenient locations in major stores.)

This project didn't just happen. It is the culmination of decades of experience within DuPont in the area of PET recycling. We already recycle millions of pounds of clean PET film directly back into our own manufacturing facilities. In addition, we have been buying back over 20 million pounds per year of used X-rays from doctors, hospitals, and government agencies to recover the silver and PET base film. However, it is our new technology Petretec(sm) that really moves our project forward. In short, Petretec(sm) extends our capability beyond that of the simple but severely limited mechanical ***recycling*** techniques common to others. Petretec(sm) is a more forgiving and more complex ***chemical*** recycling process where the PET waste is actually ***regenerated*** back to the original raw materials used to manufacture PET, creating a potentially infinite loop of materials traveling along the supply chain.

The initial intent is to provide an environmentally friendly and economically self-sufficient method for DuPont and other PET film producers to reduce their own solid waste load to landfills. The potential is obviously still greater. By working along the entire supply chain, we can regenerate up to 100 million pounds per year of waste into chemicals that substitute for raw materials used to manufacture PET. The fact that the bulk of the waste that will be used will actually be returned from the PET film producers' direct customers or, ultimately, the final consumer in the chain, is of particular importance to this program. As a result, DuPont has placed great emphasis on working with industry-wide trade associations to develop reverse distribution systems to return waste from the end users.

2) *PROJECT PARTICIPANTS*

The Petretec(sm) manufacturing facilities and the technology itself are wholly owned by DuPont. The "suppliers" for this effort will include literally hundreds of downstream customers of various PET film and fiber producers.

Other major participants will include other PET film producers and various trade associations that represent those producers and their customers. In particular, AMPEF (The Association of Manufacturers of PolyEster Film) has been actively evaluating opportunities for participation in this program in the U.S. and in Europe. We are also

working with the International Recording Media Association and the Foil Stamping and Embossing Association - all groups that are comprised of PET film consumers.

3) *PROJECT GOALS*

The goals of this project are:

- To provide a means to eliminate (initially) up to 100 million pounds per year of waste PET film that would otherwise have to be landfilled or incinerated. Though many hundreds of millions of pounds of PET are recycled in the US annually (example: PET soft drink bottles), these efforts are limited to materials that are fairly "clean". The latter waste stream is usually not contaminated with other materials in the manufacturing processes of the ultimate consumers or others along the supply chain and are, therefore, more easily recycled. The Petretec(sm) program can handle PET that cannot be used by most other processes because of higher allowable contamination levels.

- To capture the chemical value of the waste PET film rather than just the energy value that is captured if it is incinerated (or, its negative value if it is simply landfilled).

- To reduce the industry's dependence on oil-derived feedstocks by regenerating the waste film into raw materials of virgin quality for use in the PET manufacturing process.

4) *PROJECT DRIVERS*

The drivers for this project include:

- Providing opportunity for PET film consumers to realize the additional value that their products made with recycle content may bring in the marketplace.

- Providing an opportunity to increase the growth rate of PET film globally by reducing the overall cost to use/dispose of it and by positioning it as the environmentally-friendly choice of film substrates.

5) *PROJECT BENEFITS*

The many benefits of this project include:

- Municipal landfills in the U.S. will see up to 100 million pounds less per year of solid waste, thus extending their useful life.

- This project affords our customers, most of whom today landfill their PET waste, an economically and environmentally acceptable alternative. It also may help shield them from the increasing public scrutiny placed on waste generators.

- With regeneration in place, it is our belief that everyone in the film supply chain can benefit by increased growth in consumption vs. alternative products that do not have similar post-use solutions.

- Such regeneration technology can produce raw materials for the production of PET film that are competitive with raw materials derived from traditional processes using virgin oil-derived feedstocks.

6) *PROJECT OBSTACLES/BARRIERS*

The main challenges facing this project - and, perhaps, ***any*** recycling business - are:

- Demonstrating the ability to handle a wide range of impurities in the waste stream. We feel the unique technology we are practicing allows us to overcome this challenge to an acceptable degree.

- Establishing an effective and efficient reverse distribution system to return waste from all participants along the PET film supply chain. We feel that we can overcome this barrier by working with multiple trade associations to leverage the entire industry's resources.

7) *PROJECT REVIEWS*

Their have been no third-party reviews to-date of this project.

8) ***PROJECT PRESENTER***

The presenter for this workshop will be Len Jannaman, DuPont Films' PET Films Recycle Business Manager at 615-847-6566 (fax = 615-847-6573).

CASE STUDY SUBMITTED BY:

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Monsanto Company

(Was not presented orally)

PRESIDENTS COUNCIL ON SUSTAINABLE DEVELOPMENT

WORKSHOP ON EXTENDED PRODUCT RESPONSIBILITY

CASE STUDY: Monsanto Company Marketplace Product Stewardship-Crop Protection Products

Author: Thomas J. Hoogheem, P.E., Field Environmental Operations Director, Crop Protection Technology, Monsanto Company

Overview

Over the last two decades, Monsanto Company's Crop Protection business has initiated numerous programs aimed at improving the environmental sustainability of our products.

These programs have been focused throughout the life cycle of the products. This case study describes efforts undertaken to address extended product responsibilities, in this case, stewardship programs aimed at the marketplace and concentrated at the customer/enduser level.

Crop protection products, in Monsanto's case herbicides designed to control unwanted vegetation, are used by customers in both cropping and noncropping markets. Unintended impacts can occur in all environmental media's-air, water, and soil. Programs to minimize or reduce such impacts have been implemented at the product design , manufacturing, distribution, retail and enduser stewardship levels.

Product Design

The reduction of potential environmental impact of our products starts at the product design phase. Focus areas include use rate, formulation and packaging.

Use rate-most new products are designed to be used at application rates that are lower than competitive products and or products that they replace. Known as higher unit activity chemistries, many such products are used at ounces/acre versus pounds/acre. Such product design allows for less and more environmentally friendly packaging. Examples within Monsanto include PERMIT® and MANAGE® Herbicides.

Formulation-Significant environmental improvement has been realized in a number of products by changing from solvent based to a water based formulations. Such improvement is also possible when formulations are moved from liquid to dry. Examples within Monsanto include BULLET® and HARNESS XTRA ®Herbicides.

Dry formulations offer sustainability value via reduced applicator exposures, more accurate mixing and, in some cases, reduced packaging. A product tested in the early 1990's, QUIK STIK®, was a tablet form of Roundup Herbicide for the homeowner market. The tablet allowed for minimal packaging, accurate mixing, no applicator exposure and reuse of spray containers.

Packaging-Significant sustainability improvement has been realized via new innovative packaging concepts. The use of water soluble packets allow for minimal packaging and near zero product residue on such packaging. Testing of this concept with MANAGE® Herbicide is currently underway.

With liquid formulations, a significant move to reusable/returnable containers has occurred in both the crop and noncrop markets. Most corn preemergent products are now sold to retail in bulk and then sold to endusers in returnable/reusable minibulk containers. This practice has eliminated hundreds of thousands of 2 ½ gallon one way containers. Monsanto products now sold in bulk to retail include LASSO®, BULLET®, HARNESS®, HARNESS XTRA®, ROUNDUP ULTRA® Herbicides among others.

Manufacturing

A number of programs have been initiated over the last decade to reduce emissions and discharges from all Monsanto manufacturing facilities. An initiative to reduce certain air emissions by 90% has been achieved; similar programs with hazardous waste reduction and water discharges have also been initiated. In the manufacturing of glyphosate, the active ingredient in ROUNDUP ULTRA ®Herbicide, new technology has been installed that greatly reduces or in some cases eliminates most air emissions, liquid discharges and hazardous waste generation.

Distribution/Retail

Monsanto's extended product stewardship efforts have been extensive at the distribution/retail levels. Proper transportation and storage to/from the retail level is critical to minimizing potential unintended environmental impacts.

Stewardship activities in transportation include extensive training of bulk transportation personnel in spill prevention, containment and control, satellite based tracking , and an incentive based reward program.

At the retail/dealer level, bulk products are stored in secondary containment structures and mixed and loaded on impervious concrete surfaces. Custom applicators are encouraged to have application equipment either cleaned in the field or on concrete rinse pads. Monsanto provides dealers training on minimizing cross contamination of reusable containers, complying with bulk repackaging regulations, emergency response procedures, and worker protection standards. Additional services include site audits and inspections.

Enduser

Programs aimed at the enduser level are the key to extended product stewardship with crop protection products. Monsanto programs focus on three general areas- 1) proper application, 2) groundwater protection, and 3) surface water protection.

Proper Application

We provide directly to applicators or work with state agencies training to assure proper application of our products. Certification is required on a number of our products and strongly encouraged with all products. Monsanto's Field Environmental Operations Team (FEET) has trained over 150,000 customers in the last decade, either via Monsanto sponsored seminars or as part of state sanctioned certification training meetings. Training includes proper mixing, loading, equipment cleaning, drift minimization, container cleaning and disposal, reentry requirements, posting, protective clothing, and emergency response procedures.

Groundwater Protection

The protection of groundwater from pesticide contamination is a key part of Monsanto's extended product responsibilities. The cause of such contamination is the focus of our programs. Point source contamination of drinking water wells at the farmstead level has been determined by both our and other's research to be caused from the mixing and loading of crop protection products next to wells that in many cases are old and poorly constructed. Farmers are now encouraged or required by product label not to mix products within 50 feet of any well unless the well is surrounded by an impervious pad.

However, because many farmers had done such mixing and loading of product next to such wells, some have been found to be contaminated. Monsanto has responded to such situations with our WELL ASSISTANCE PROGRAM. This program assists farmers in determining if their well is contaminated. If Monsanto products are found at levels above the drinking water standard established by the EPA, we provide financial assistance to replace the well. This unique to the industry program, established in 1991,

is well known to most all state agricultural and environmental agencies and has been extremely successful.

Some crop lands are known to be susceptible to groundwater contamination due to their soil texture and organic matter properties. HARNESS® and HARNESS XTRA® Herbicides contain a soil restriction on the product's label for soils with certain soil texture/organic matter combinations. Our stewardship efforts to help enduser comply with this restriction have involved the use of the Global Positioning System (GPS) and the Geographical Information System (GIS). Using these new technologies, we have identified for major corn growing states and counties where these soil restrictions exist. Copyrighted mapping technology has been sued to generate county maps that are then provided to retailers/dealers who serve those areas. All Monsanto sales people have also been provided such maps; now via Intranet access.

Surface Water Protection

The protection of rivers, streams and lakes from the unintended runoff of agricultural soil and nutrients is also a key part of Monsanto's extended product stewardship programs.

The focal point of our efforts is Operation Greenstripe. This program works with Future Farmers of America (FFA) to encourage farmers to plant and maintain grassy filter strips along bodies of water. Seed retailers donate wildlife- compatible grass seed and Monsanto gives an educational grant of $100 per buffer strip to FFA chapters (up to five per chapter). More than 80 chapters in 14 states are participating this year. In many states in the Midwest, the United States Fish and Wildlife Service, in partnership with Pheasants Forever, also contribute $100 per buffer strip over the first five strips planted. This money is also given to the FFA chapters. The program has been underway since 1992.

On September 25, 1996, Operation Greenstripe was named the first recipient of the National Watershed Award presented by the Conservation Fund and CF Industries. The award was presented in Washington DC by Deputy Secretary of Agriculture Richard Rominger.

Operation Greenstripe has also been recognized by the National Forum on Nonpoint Source Pollution and Renew America. Filter strips have been proven to be a key in reducing soil erosion and runoff of soil nutrients and inputs.

Monsanto has also been aggressively promoting the adoption of conservation tillage practices, yet another method of reducing unintended runoff.

Conclusions

Extended product responsibility with Monsanto crop protection products are focused all phases of product design, manufacture, distribution and use. Via innovation programs, initiatives in all phases, potential unintended environmental impacts have and will continue to be reduced and/or eliminated.

APPENDIX F

PCSD, NEW NATIONAL OPPORTUNITIES TASK FORCE: MEMBERSHIP LIST

PCSD, WORKING GROUP ON EXTENDED PRODUCT RESPONSIBILITY: MEMBERSHIP LIST

THE PRESIDENT'S COUNCIL ON SUSTAINABLE DEVELOPMENT

New National Opportunities Task Force:

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Task Force Coordinator:

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