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EPA ENVIRONMENTAL RESEARCH BRIEF

Waste Reduction Activities and Options for a Local Board of Education in New Jersey

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Abstract

The U.S. Environmental Protection Agency (EPA) funded a project with the New Jersey Department of Environmental Protection and Energy, NJDEPE, to assist in conducting waste minimization assessments at 30 small- to medium-sized businesses in the state of New Jersey. One of the sites selected was a local Board of Education. The school's administration building and the high school were the focus of the assessment. Located at the administration building are the central warehouse for building and maintenance supplies, the vehicle repair and maintenance facility, and a wood shop for building and furniture repair. In the high school, waste is generated in the science laboratories, art classes, and vocational educational areas. A site visit was made in 1990 during which several opportunities for waste minimization were identified. The waste streams that were evaluated include paint, spilled chemicals and leaking containers, sawdust and wood scraps, solvent-based coatings, degreasing solvents, waste oil, antifreeze, laboratory wastes, and art project wastes. Implementation of the identified waste minimization opportunities was not part of the program. Percent waste reduction, net annual savings, implementation costs and payback periods were estimated.

This Research Brief was developed by the Principal Investigators and EPA's Risk Reduction Engineering Laboratory in Cincinnati, OH, to announce key findings of this completed assignment.

Introduction

The environmental issues facing industry today have expanded considerably beyond traditional concerns. Wastewater, air emissions, potential soil and groundwater contamination, solid waste disposal, and employee health and safety have become increasingly important concerns. The management and disposal of hazardous substances, including both process-related wastes and residues from waste treatment, receive significant attention because of regulation and economics.

As environmental issues have become more complex, the strategies for waste management and control have become more systematic and integrated. The positive role of waste minimization and pollution prevention within industrial operations at each stage of product life is recognized throughout the world. An ideal goal is to manufacture products while generating the least amount of waste possible.

The Hazardous Waste Advisement Program (HWAP) of the Division of Hazardous Waste Management, NJDEPE, is pursuing the goals of waste minimization awareness and program implementation in the state. HWAP, with the help of an EPA grant from the Risk Reduction Engineering Laboratory, conducted an Assessment of Reduction and Recycling Opportunities for Hazardous Waste (ARROW) project. ARROW was designed to assess waste minimization potential across a broad range of New Jersey industries. The project targeted 30 sites to perform waste minimization assessments following the approach outlined in EPA's *Waste Minimization Opportunity Assessment Manual* (EPA/625/7-88/003). Under contract to NJDEPE, the Hazardous Substance Management Research Center at NJIT assisted in conducting the assessments. This research brief presents an assessment of a Board of Education (1 of the 30 assessments performed) and provides recommendations for waste minimization options resulting from the assessment.

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Methodology of Assessments

The assessment process was coordinated by a team of technical staff from NJIT with experience in process operations, basic chemistry, and environmental concerns and needs. Because the EPA waste minimization manual is designed to be primarily applied by the in-house staff of the facility, the degree of involvement of the NJIT team varied according to the ease with which the facility staff could apply the manual. In some cases, NJIT's role was to provide advice. In others, NJIT conducted essentially the entire evaluation.

The goal of the project was to encourage participation in the assessment process by management and staff at the facility. To do this, the participants were encouraged to proceed through the organizational steps outlined in the manual. These steps can be summarized as follows:

- Obtaining corporate commitment to a waste minimization initiative
- Organizing a task force or similar group to carry out the assessment
- Developing a policy statement regarding waste minimization for issuance by corporate management
- Establishing tentative waste reduction goals to be achieved by the program
- Identifying waste-generating sites and processes
- Conducting a detailed site inspection
- Developing a list of options which may lead to the waste reduction goal
- Formally analyzing the feasibility of the various options
- Measuring the effectiveness of the options and continuing the assessment.

Not every facility was able to follow these steps as presented. In each case, however, the identification of waste-generating sites and processes, detailed site inspections, and development of options was carried out. Frequently, it was necessary for a high degree of involvement by NJIT to accomplish these steps. Two common reasons for needing outside participation were a shortage of technical staff within the company and a need to develop an agenda for technical action before corporate commitment and policy statements could be obtained.

It was not a goal of the ARROW project to participate in the feasibility analysis or implementation steps. However, NJIT offered to provide advice for feasibility analysis if requested.

In each case, the NJIT team made several site visits to the facility. Initially, visits were made to explain the EPA manual and to encourage the facility through the organizational stages. If delays and complications developed, the team offered assistance in the technical review, inspections, and option development.

Facility Background

The facility is a school district with a range of activities with potential for generation of waste which include vehicle maintenance and repair, building cleaning and maintenance, grounds keeping, instructional programs, and specialized programs such as science laboratories and art classes. The management was very cooperative in providing all available information about types and volume of waste streams generated as well as about existing activities related to waste reduction. The actual assessment and the development of options for additional pollution prevention were carried out by NJIT personnel.

Waste Generating Processes

The operations in the district are not centrally located. There is a common administration building which includes a supply warehouse and facilities for vehicle maintenance and repair and a wood shop for constructing equipment. In addition, there is a high school for about 1000 students, a middle school for about 500 students, and 6 elementary schools.

The assessment focussed on the administration building and the high school. Located at the administration building is a central warehouse for building and maintenance supplies including cleaners, floor care products, paints, and similar materials. The supplies are delivered to the individual buildings upon request by staff members. Also at the administration building is the vehicle maintenance and repair facility which is responsible for preventative maintenance and general repairs for the district's fleet of 36 school buses and vans, 16 maintenance vans and pickup trucks, and 4 automobiles. Large repairs are carried out by commercial garages. There is also a wood shop which has responsibility for building and repairing furniture and related items for use within the district.

At the high school, paper-, computer-, and video-based instructional activities occur. In addition, hands-on instruction in areas with potential for waste generation also occurs in science laboratories, art classes, and vocational educational areas.

Existing Waste Management Activities

The district has already instituted several practices which have a positive impact on pollution prevention. As a result of the "Community and Worker Right-to-Know" initiatives, the following procedures were emphasized: ordering only the quantity of materials that can be used in a single year, stocking the materials near the point of use, conversion to the use of dry copiers replacing the former solvent-based systems. In addition, there has been a concerted effort to change to water-based paints and cleaners from solvent-based products where possible and to identify and use other products with reduced potential toxicity factors in all areas. Moreover, in keeping with municipal initiatives encouraging recycling, cardboard, white paper, aluminum cans, glass containers, and used motor oil are collected and put into the recycling stream. In the industrial arts metal shop at the high school, cutting oil is recovered by allowing the metal fragments to settle and then filtering the decanted oil. No new oil for this purpose has been purchased since 1966.

Wastes such as laboratory wastes are treated as hazardous wastes and collected by a contractor for offsite treatment, as are other currently generated hazardous wastes such as solvents and spent antifreeze.

Waste Minimization Opportunities

The type of waste currently generated by the district, the source of the waste, the quantity of the waste, and the annual treatment and disposal costs (where known and available) are given in Table 1.

Table 2 presents the opportunities for pollution prevention which were identified during the assessment. The type of

Table 1. Summary of Generated Wastes

Waste Generated	Source of Waste	Annual Quantity Generated	Annual Costs
Empty Paint Cans	Painting and Coating	Hundreds	$500
Cleaning Products	Spills and Breakage	3 drums	$750
Solvent Wastes	Parts Cleaning and Degreasing	5 gal	$150
Used Motor Oil	Vehicle Maintenance	650 gal	$195
Antifreeze Solution	Vehicle Maintenance	165 gal of concentrate purchases annually for replacement	$600
Paper, Cardboard	Office, teaching and unpacking activities	Variable	none, except handling costs
Aluminum Cans and Glass Bottles	Food Service	Variable	none, except handling costs
Waste Chemicals	Science Laboratories	2 drums	$700

Table 2. Summary of Waste Minimization Options Identified

Waste Generated	Minimization Opportunity	Annual Waste Reduction Quantity	Annual Waste Reduction Percent	Net Annual Savings	Implementation Costs	Payback Years
Empty Paint Cans	Purchase Paint in Returnable Containers	Hundreds of Cans	100	$500	*	
	Reduce varieties of paint purchased by consolidation of uses. Consider acquisition of equipment for tinting and purchasing large containers of base colored paint and tinting to standard colors.	Hundreds of Cans	90	$450	$ 750	1.5
Spilled Chemicals and Leaking Containers	Store containers to allow for visual inspection, maintain appropriate distance between reactive or incompatible chemicals, store in separate sections to minimize cross contamination. Store materials near point of use.	2 drums	67	$ 500 †	0	immed
Sawdust and Wood Scraps	Residues from woodworking can be used for composting or for mulch.	5 drums	100	$200	0	immed
Solvent-based Coatings ‡	Continue to seek water-based substitutes with needed performance	Variable, but more opportunities becoming available				
Degreasing Solvents	Use contracted solvent supply and recycling service or consider acquisition of a distillation apparatus	5 gal **	100	$150	$2000	14
Waste Oil	Install collection/drip pans to recover spills	6.5 gal	1	$30	$50	1.6
Antifreeze Solution	Utilize technology for recovery, reconditioning, and reuse.	165 gal	100	$900	$5000	5.5
Laboratory Wastes ††	Modify student experiments to use smaller amounts of hazardous chemicals. Extend use of video material including interactive video disc laboratory materials.	1 drum	50	$350	0	immed
	Decline industrial gifts of chemicals which include materials which will not be used or quantities of materials larger than can be used within a reasonable time.					
	Develop a central inventory of chemicals to encourage sharing among high school laboratories and with elementary and middle school classes where appropriate.					
Art Project Wastes	Select and encourage use of non-toxic and hazardous materials to carry out art projects.##					

* The costs would be borne by the paint manufacturer for purchase of stronger containers and development of a return system. The system would work best for large consumers of paint who would be willing to limit choices of paint type and color.

† Plus value of material saved from spilling.

‡ Pollution prevention advantage would be reduced levels of atmospheric emissions from solvent evaporation.

** For this relatively small volume of solvent, a commercial recycling service may be more reasonable.

†† It should be recognized that substantial development costs may be incurred in redesigning laboratory work and in acquiring equipment for interactive video-disc instruction.

This will primarily result in reduced levels of solvent emissions to the atmosphere. The required art materials may cost more than the presently used supplies.

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waste, the minimization opportunity, and the possible waste reductions, are presented in the table. When available or estimable, the associated savings, and implementation costs along with payback times are also given. However, because the feasibility analysis was to be carried out by the staff of the district, that information is not always readily available.

Other Pollution Prevention Options

Other options were identified which could be considered by the district but which may be more pertinent later when use grows or commercial technology improves.

The district uses chlorofluorocarbons in refrigeration equipment and to a limited extent in motor vehicle air conditioning. There is already a commitment to change to substitutes with reduced impact upon the upper atmosphere. In addition, as mobile air conditioning becomes more common in district vehicles, a refrigerant recovery and reuse capability should be considered. In some areas such equipment may become a legal requirement.

Consideration could be given to joint acquisition with the municipal government of recycling equipment such as antifreeze recycling or degreasing solvent distillation equipment. Ideally, the equipment should be easily movable to allow it to be taken to the facility where the need exists.

* Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Regulatory Implications

There appear to be no significant environmental regulatory issues which would impede the implementation of additional pollution prevention initiatives at this facility. On the other hand, other regulatory groups, particularly the state educational authorities, have significant input into facilities, programs, and budgets for schools. Where a pollution prevention initiative may require a capital investment, it may not be possible to undertake it if permission is not granted to spend money in that way. Improved coordination between regulatory agencies about overall goals and strategies to achieve them is important to the development of a unified and efficient pollution prevention program.

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