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ENVIRONMENTAL RESEARCH BRIEF

Waste Reduction Activities and Options for a Manufacturer of Commercial Dry Cleaning Equipment

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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 facility that manufactures machinery used for commercial dry cleaning operations. A site visit was made in 1990 during which several opportunities for waste minimization were identified. Options identified for waste reduction included improvement of spray painting operations and recycling opportunities for wood scrap. In addition there is an option mentioned to encourage the change of refrigerant to a non-CFC chemical. 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 assessment.

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.

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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, New Jersey Department of Environmental Protection and Energy, 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 the New Jersey Institute of Technology (NJIT) assisted in conducting the assessments. This research brief presents an assessment of the manufacturing of machinery used for commercial dry cleaning operations (1 of the 30 assessments performed) and provides recommendations for waste minimization options resulting from the assessment.

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 inhouse staff of the facility, the degree

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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.

No sampling or laboratory analysis was undertaken as part of these assessments.

Facility Background

The facility is a manufacturer of equipment for commercial dry cleaning operations. The facility is responsible for the design and fabrication of the components used to construct the equipment. The components are shipped offsite for assembly and for application of the prime coating. Then the assembled units are transported to this facility where they are tested for operational capability and the final painting is done. Approximately 500 units are produced each year.

The facility is located in an urban area and employs about 35 people.

Manufacturing Processes

The only production process which occurs at this facility is the final painting of the dry cleaning equipment. The painting is carried out in spray booths using a commercially available high-solids, solvent-based paint. The spray booths use fiberglass filters to capture overspray. The units are shipped into the facility in wooden packing materials. These packaging materials generate another waste stream.

Existing Waste Management Activities

There are only two waste streams which are generated at this facility. The filters from the spray booth are made of fiberglass and must be changed and disposed of at regular intervals when air flow becomes difficult because of clogging of the filters. The facility uses about 1500 filters each year. The size of the filters is 20"x20"x1". Although the filter system captures solids, it does not have the ability to retain volatile organics from the solvent. On average, the facility uses 6 gal of paint each day. The filters are sent offsite for disposal. While it appears that the waste stream from this portion of the activity is the used filters, the waste stream is actually that portion of the paint that does not adhere to the surface to be coated. Therefore, the waste management activity and costs include purchasing the filters and the disposal of the spent filters.

The other waste stream that is generated at this facility is wood scrap which results from the packing materials used to ship the units to and from this facility. Presently, the facility produces about 100-125 yd^3 of such crating wood scrap annually. The landfill disposal cost for this material is about $2000/yr.

Waste Minimization Opportunities

The type of waste currently generated by the facility, the source of the waste, the quantity of the waste and the annual treatment and disposal costs are given in Table 1. This particular facility presents an interesting challenge in determining waste minimization opportunities since the potential opportunities present themselves in several ways and are instructive to other types of companies.

At the level of the operations at the facility itself, an evaluation of improved painting procedures and of alternative uses for wood scrap, could have a favorable impact upon the quantity of waste generated. At another level, a significant portion of the production of the dry cleaning units is accomplished offsite. This portion of the production also includes a painting step. While having the painting carried out elsewhere limits emissions at this facility, the management should be encouraged to require a waste reduction opportunities assessment to be carried out at the offsite facility as well. Ideally, every production step for any product should be designed and operated to minimize waste and emissions.

Dry cleaning units overall were redesigned to include the capability to distill and reuse the solvent in response to earlier pollution prevention concerns. This redesign involves both a heating and cooling unit. The dry cleaners who purchase and use this equipment have a desire to minimize use and loss of the solvent, perechloroethylene, used for dry cleaning applications.

While this type of unit provides distinct pollution prevention advantages for the dry cleaners, it comes with a disadvantage.

The cooling unit for the distillation capability uses CFC-502 as a refrigerant. This material is recognized as an ozone-depleting agent. While this is not a pollution prevention issue for this facility per se, it does present a potential problem for the buyers of the units—the commercial dry cleaners. However, the manufacturer of the units buys the refrigeration units from another manufacturer.

While there is a general agreement that a different refrigerant would be desirable, it is not clear who has responsibility for making the first step to develop the technology to make the change. The refrigeration equipment manufacturer may say that change is not possible until the producers of the refrigerants can supply a non-ozone-depleting refrigerant. While some alternative refrigerants are now available, they require modifications of the cooling units to be effective. It is not clear at this point how far any of the companies involved in this technical issue can go independently to address the concerns. It is also not clear that effective technical alliances have been made to encourage the desired changes.

Similarly, a dry cleaning process which did not use perchloroethylene or some other chlorinated solvent would also be desirable. The facility manufacturing the dry cleaning units does not have the technical resources to develop such a new system. It is also not clear if such technology can be developed.

Table 2 shows the opportunities for waste minimization recommended for the facility. The type of waste, the minimization opportunity, the possible waste reduction and associated savings, and the implementation cost along with the payback time are given in the table. The quantities of waste currently generated at the facility and possible waste reduction depend on the level of activity of the facility.

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

It should be noted that the economic savings of the minimization opportunity, in most cases, results from the need for less raw material and from reduced present and future costs associated with waste treatment and disposal. It should also be noted that the savings given for each opportunity reflect the savings achievable when implementing each waste minimization opportunity independently and do not reflect savings that would result when the opportunities are implemented in a package. Also, no equipment depreciation is factored into the calculations.

Regulatory Implications

The potential regulatory implications of pollution prevention initiatives at this facility will affect the manufacture of this product as well as its use at dry cleaning shops. Changes in permitted levels of VOC emissions might have an impact on the spray painting operation. However, at 6 gal/day of paint, this is not a major emitter. The upcoming restrictions on the production and use of CFC's will have a significant impact on dry cleaning units made by the facility which may require a design change on the part of the facility as well as retrofitting of the units already in the field. Similarly, any regulatory restrictions on the use of perchlorethylene will necessitate substantial changes in the design and operation of such dry cleaning units.

This Research Brief summarizes a part of the work done under cooperative Agreement No. CR-815165 by the New Jersey Institute of Technology under the sponsorship of the New Jersey Department of Environmental Protection and Energy and the U.S. Environmental Protection Agency. The EPA Project Officer was Mary Ann Curran. She can be reached at:

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Table 1. *Summary of Current Waste Generation*

Waste Generated	*Source of Waste*	*Annual Quantity Generated*	*Annual Waste Management Costs*
Contaminated Filters	*Capture of overspray from painting booth*	*1,500 filters*	*$ 17,000*
Scrap Wood	*Residue from wooden packing crates*	*100-125 yd³*	*2,000*

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Table 2. *Summary of Recommended Waste Minimization Opportunities*

Waste Stream Reduced	Minimization Opportunity	Annual Waste Reduction Quantity	Annual Waste Reduction Percent	Net Annual Savings	Implementation Cost	Payback Years *
Contaminated Filters	Reduce the quantity of overspray in the painting operation. A change to a high volume low pressure spray gun has the potential to improve transfer efficiency from the usual 20% to 40 % to 65% to 85%. This means that more paint is on the unit and less is in the filter. The change will also reduce the emission of VOC's by about 50% because the volume of paint used is reduced.	750 filters	50	8500	$5000	0.6
	Consider change from fiber glass filters to multi-layered chemically treated paper filters. Such filters are claimed to be 99% efficient as contrasted to 92% efficiency for the fiber glass filter. While the paper filters are about twice as expensive as the glass ones, they are claimed to last about 2.5 times as long. This extra use time has the potential to reduce the volume of waste produced.	900 filters	60	7000	This represents a simple change from one type of filter to another. There is no real implementation costs. The cost savings are immediate and are estimated as a function of reduced disposal costs and higher purchase costs for the filters.	
Scrap Lumber	Identify area companies which recycle scrap wood. The cost of disposal by this route is substantially less.	100-125 yd^3	100	1500	0	immed.

* Savings result from reduced raw material and treatment and disposal costs when implementing each minimization opportunity independently.

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