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ENVIRONMENTAL RESEARCH BRIEF

Waste Reduction Activities and Options for an Autobody Repair Facility

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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 an autobody repair facility. A site visit was made in 1990 during which several opportunities for waste minimization were identified. These opportunities include alternative spraying systems to improve transfer efficiency, increased use of water-based paints, and onsite distillation to permit recycling of solvents. 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.

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 facility that repairs automobile bodies (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 of involvement of the NJIT team varied according to the ease

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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.

The Autobody Repair Facility

The process used is fundamentally one of removing damaged parts and repairing or replacing them as necessary. The surface is then prepared for repainting by grinding, filling with special autobody fillers (if necessary), and sanding until smooth. The area is primed with a coating to promote adherence of the paint and then painted.

The choice of paint type and color is guided by manuals which are issued by the automobile manufacturers. Several different paint companies provide the coatings used in this field so the facility management must choose the best combination of compatibility, price, and service. The paint is usually solvent-based because this is the type of paint used by the original manufacturers of the automobile, and the desire is to achieve as close a match of appearance and color as possible. There may be some choice of primer but it is most frequently a solvent-based material as well.

This facility purchases only as much coating as is required for a particular job. This practice reduces the quantity of waste which must eventually be disposed of offsite. The paint is thinned (often about 1:1) with solvents and then applied by spraying. Depending upon the original coating of the car, a clear lacquer finish is sometimes applied.

The operations of a facility such as this are very demanding. Business usually comes in as a result of a low bidding process or at a price set by an outside insurance adjuster. The customer expects fast turn around and is usually very demanding about the appearance of the final product. The staff of the facility is highly dependent upon suppliers of parts and other essential needs to complete the job. In addition to these concerns, they must be aware of and in compliance with numerous environmental regulations.

Waste Streams and Existing Waste Management

The facility is a relatively small generator of hazardous waste. About 25 gal of mixed solvent and paint residues are sent offsite annually for treatment. This represents the small amount of paint residues left in the equipment and the solvent used to clean the equipment, particularly the paint spraying equipment.

Another loss to the facility is evaporation of solvent in the paint due to overspray. It is estimated that about 30% of the paint is lost to overspraying. A source of emissions which is harder to quantify is the evaporation of solvents in the paint as the paint dries.

The filters in the spray booth are fiberglass and it is planned to send them offsite for disposal as industrial non-hazardous waste. Because the spray booth is brand new, there is no information available about quantities of this stream.

The company has already developed an understanding of environmental issues related to the operations of its industry and has taken positive actions. For example, any tires which must be removed from vehicles being repaired are sent for recycling. Also, the new spray booth will provide better capture and recovery of oversprays.

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.

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 times are given in the table. The quantities of waste currently generated at the facility and the possible waste reduction depend on the level of activity of the facility. All values should be considered in that context.

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 duplication of savings that would result when the opportunities are imple-

mented in a package. Also, no equipment depreciation is factored into the calculations.

The most effective option in terms of reducing environmental risk would appear to be a change from solvent-based coatings to water-based coatings. However, such a change cannot be carried out by a facility such as this alone. The manufacturers of paints for this industry produce materials which must match with the original paint on the vehicle. And the original coating is usually solvent-based.

The original coating is chosen by the automobile manufacturer, and the choice is based upon several criteria including cost, appearance, durability, and ease of application. The automobile manufacturers are somewhat dependent on the type of coatings which are available to them from coating manufacturers.

In this complicated situation it is not clear who needs to make the move to water-based coatings. Some manufacturers have started production of water-based primers where appearance is not so critical. It is suggested that where performance requirements permit, this facility shift to the use of such primers.

Because solvent-based paints will be needed for some time to repair older model cars, it is suggested that the facility consider purchase of a small distillation apparatus allowing recovery and reuse of most of the solvent currently sent offsite for disposal.

Finally, it is suggested that a modified spraying system using high-volume low-pressure (HVLP) technology be investigated. Such equipment in similar applications has reduced overspray (and the resultant waste) by 10% to 30%.

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Table 1. *Summary of Current Waste Generation*

Waste Generated	*Source of Waste*	*Annual Quantity Generated*	*Annual Costs*
Mixed Solvents	*Paint wastes and equipment cleaning*	*25 gal*	*$450*
Volatile Solvents	*From drying of solvent based paint*	*200 gal (estimate)*	*$ no cost (fugitive emissions)*
Volatile Solvents	*Waste from overspray*	*60 gal*	*$2,400 (Includes loss of value of paint as well.*

Table 2. *Summary of Waste Minimization Opportunities*

Waste Stream Reduced	*Minimization Opportunity*	*Annual Waste Reduction*		*Net Annual Savings*	*Implementation Cost*	*Payback Years**
		Quantity	*Percent*			
All Solvents	*Change to water based coatings. This is a desirable option, but is not possible for this facility yet due to non-availability of needed materials.*	*285 gal*	*100%*	*$2,850*	*$0*	*immed*
Mixed Solvents	*Install a distillation capability, recover, and reuse solvents from equipment cleaning.*	*22.5 gal*	*90%*	*$550*	*$1,000*	*2.0*
Overspray	*Change to high volume low pressure spray painting technology*	*12 gal (of paint)*	*10%*	*$240*	*$1,500*	*7.0*

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

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