



# ENVIRONMENTAL RESEARCH BRIEF

## Waste Reduction Activities and Options for a Manufacturer of General Purpose Paints and Painting Supplies

Alan Ulbrecht and Daniel J. Watts\*

### 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 both oil-based and water-based paints for general purpose use. The paint is produced by mixing solvent, pigment, and other ingredients, all of which are purchased from vendors. The facility already practices many pollution prevention concepts. A site visit was made in 1990 during which several opportunities for waste minimization were identified. Options identified include improved scheduling techniques, reuse of rinses, and formulation of residues into other products. 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 the New Jersey Institute of Technology (NJIT) assisted in conducting the assessments. This research brief presents an assessment of the manufacturing of paints for general purpose use (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. Be-

\* New Jersey Institute of Technology, Newark, NJ 07102



cause 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 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 oil-based and water-based paints sold for general purpose use. In addition, the company produces painting supplies such as spackle and caulking compound. The company purchases solvents, pigments, and additives and blends them in the proper formulation to create their product line. The materials are then packaged. In order to maintain quality and product consistency, it is necessary to clean the mixing and filling equipment to prevent contamination.

The facility is located in an urban area and employs about 125 people. This particular facility has been in operation for more than 50 years. Substantive pollution prevention concepts have

already been introduced into the operations of this facility, including distillation and reuse of waste solvents.

## Manufacturing Process

The production of oil-based paints is accomplished by combining and blending the required raw materials such as pigments, resins, co-solvents, and additives with the paint solvents such as toluene or xylene to achieve the required product specification. When color or production changes are made, the tanks and equipment are washed with solvents. The finished products are packaged and prepared for shipment from the facility.

The production of latex or water-based paints is similar except that different types of raw materials are used in production and that the solvent used is water. As in the oil-based production, color or production changes require washing of the tanks and equipment, in this case with water. The finished products are packaged and prepared for shipment from the facility.

The facility also produces other types of products for the painting industry including spackling compounds and caulking materials. The production process for these types of materials are similar—raw materials are purchased, formulated, and blended according to specifications, packaged, and shipped from the facility. The major difference is that these products are solids rather than liquid, so the use of solvents and equipment cleaning needs are substantially different. At the request of the facility, this assessment focussed on the paint manufacturing area.

## Existing Waste Management Activities

The company has already instituted a program of pollution prevention. This is perhaps best illustrated by the addition of distillation equipment for recovery and reuse of waste solvents. The current waste management activities at the facility demonstrate an awareness of pollution prevention concepts.

For the oil-based paints, the first identified waste stream is the waste solvent used in the washing of the equipment. This waste stream which contains paint pigments and other additives is generated at a rate of about 1100 gal/wk. The stream is distilled onsite in a 300-gal capacity still. The still bottoms, about 110 gal/wk, is a very dry material which is sent offsite for disposal as hazardous waste. Any filters or dust collectors used to filter batches of paint are collected, dried and sent out for disposal as nonhazardous waste based upon their lack of content of hazardous material. VOCs from evaporating solvent is another waste stream but the volume could not be estimated.

For the water-based paints, the first identified waste stream is the washings from cleaning the equipment between batches. This wash water contains pigments and other additives and in many ways can be considered to be very dilute paint. The wash waters are segregated by color in 55-gal drums prior to onsite processing. The individual drums are combined in a 1000-gal tank and a polymeric flocculent is added to remove the solids. The flocculated mixture is passed through a drum filter, the solids are removed and dried and the liquid is discharged to a POTW. The approximately 1500 lb/wk of dried solid is sent offsite for disposal as nonhazardous waste. Any filters or dust collectors used to filter batches of this type of paint are collected, dried and sent out for disposal as nonhazardous waste. They are maintained separately from the similar materials from the oil-based paint production.

Care is taken at the facility in the movement and transfer of the organic solvents to minimize fugitive emissions of these materials. There are opportunities for remixing and reuse of some product returns. Others can be inserted in the waste management stream at the facility allowing the solvent to be recovered or the solids to be removed from the water prior to discharge to the POTW.

### 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 pollution prevention challenge in describing waste streams. The existence and use of the distillation capability addresses successfully one of the major pollution prevention opportunities for manufacturers of this type. The procedure used for the removal of solids from the aqueous washings does, in fact, reduce the burden which is sent to the POTW. From that perspective, the practice is a pollution prevention exercise, however, by simply removing the solids from the water medium to a solid waste medium, no net benefit has been achieved. Pollution prevention options which identify a use for the material would be preferred.

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.

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 asso-

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

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

### Regulatory Implications

There are no significant regulatory issues which would impede the application of additional pollution prevention initiatives at this facility, with the possible exception of any air permit modifications. Changes in air regulations, tightening the use of VOC's, may accelerate changes in manufacturing operations in the coating industry as a whole, both in their own practices and in changing consumer requirements. Some suggestions about beneficial secondary reuse of materials recovered from these processes may be difficult to implement because of current hazardous waste regulations. Some options identified require retention of various washings onsite until a similar batch of material is again manufactured. Such retention requires storage onsite of larger quantities of material than is presently done. Such additional quantities may initiate regulatory compliance. Potential situations such as this indicate that society sometimes demands a balance when good objectives compete with each other.

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:

Pollution Prevention Research Branch  
Risk Reduction Engineering Laboratory  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268

**Table 1. Summary of Current Waste Generation**

<i>Waste Generated</i>	<i>Source of Waste</i>	<i>Annual Quantity Generated</i>	<i>Annual Waste Management Costs</i>
<i>Still Bottoms</i>	<i>Distillation of solvent from equipment washings</i>	<i>104 drums</i>	<i>\$26,500</i>
<i>Latex Paint Solids</i>	<i>Solids recovered by flocculation of latex paint washings</i>	<i>78,000 lb</i>	<i>3,500</i>
<i>Aqueous Effluent</i>	<i>Supernatant liquid from flocculation of latex paint washings</i>	<i>195,000 gal</i>	<i>550</i>
<i>Paint Filters</i>	<i>Removal of dust or impurities from product</i>	<i>3 drums</i>	<i>120</i>

**Table 2. Summary of Recommended Waste Minimization Opportunities**

Waste Stream Reduced	Minimization Opportunity	Annual Waste Reduction		Net Annual Savings	Implementation Cost	Payback Years *
		Quantity	Percent			
Still Bottoms	The best way to reduce this stream is to reduce the volume of solvent-based washings which are sent for recovery. Reuse of some as make up solvent for a future batch of a similar or color-compatible product, or going from lighter to darker batches would lower the quantity of this stream.	26 drums	25	\$6625	\$600	0.1
Solids from Latex Paint Washings	Similarly this stream could be reduced by use of the washings as make up water for future batches. The practice is already to segregate washes by color. Retention and scheduling should facilitate such reuse. An assumption of 25% savings is conservative and would lower disposal costs.†	19,500 lb	25	875	0	immed
Aqueous Effluent	The same as above.	48,750 gal	25	138	0	immed
Paint Filters	Investigate the use of cleanable filter screens, although volumes of solvent and wash water will increase.	3 drums	100	120	2,000	16

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

† A state-of-the-art paint manufacturing facility in the Netherlands creates almost no waste by using computerized mixing and dedicated color hoses.

United States  
 Environmental Protection Agency  
 Center for Environmental Research Information  
 Cincinnati, OH 45268

Official Business  
 Penalty for Private Use  
 \$300

EPA/600/S-92/054

BULK RATE POSTAGE & FEES PAID EPA PERMIT No. G-35
--