United States
Environmental Protection
Agency

Risk Reduction
Engineering Laboratory
Cincinnati, OH 45268

Research and Development

EPA/600/S2-91/031 Oct. 1991

EPA

Project Summary

Waste Minimization Opportunity Assessment: Optical Fabrication Laboratory, Fitzsimmons Army Medical Center, Denver, Colorado

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The Waste Reduction Evaluations at Federal Sites (WREAFS) Program consists of a series of demonstration and evaluation projects for waste reduction* conducted cooperatively by the U.S. Environmental Protection Agency (EPA) and various parts of the Department of Defense, Department of Energy, and other Federal agencies. The WREAFS program focuses on waste minimization research opportunities and technical assessments at Federal sites. The objectives of the WREAFS Program include (1) conducting waste minimization workshops, (2) performing waste minimization opportunity assessments, (3) demonstrating waste minimization techniques or technologies at Federal facilities, and (4) enhancing waste minimization benefits within the Federal community.

One of the sites chosen for performance of a waste minimization opportunity assessment (WMOA) under the WREAFS Program is the Fitzsimmons Army Medical Center Optical Fabrication Laboratory (FAMC/OFL) in Denver, Colorado. Glass lens fabrication operations at the OFL generate three RCRA hazardous wastes (waste lead-bearing lens blocking alloy (RCRA D008), alkaline washwater from ground and polished lens cleaning and deblocking operations (D002), and spent Stoddard solvent from the tool cleaning operations (D001)) and one nonhazardous waste (ground glass fines from lens grinding and polishing operations). The waste lead-bearing blocking alloy particulates are reclaimed and recycled at the OFL (to the extent possible); the alkaline washwater is discharged to the wastewater treatment plant and ultimately used on the FAMC grounds for irrigation; and spent Stoddard solvent is recycled offsite through a Safety-Kleen, Inc., operation. The nonhazardous ground glass fines are collected from the present onsite grinding coolant filtration operations and disposed of at a local sanitary landfill.

The present WMOA at the OFL was concerned with two of these RCRA hazardous wastes, first, the residual lead-bearing glass lens blocking alloy and the alkaline washwater from lens deblocking/cleaning operations, second, and the nonhazardous ground glass from lens grinding operations. A waste minimization option was developed for each of these wastes, as summarized below.

(1) Filtration of the alkaline washwater from glass lens deblocking/washing operations to recover and recycle residual lead-bearing blocking alloy particulates contained in this washwater. Potentially, as much as 500 lb/yr of lead-bearing alloy is reclaimable.

(2) Substitution of lead-free glass lens blocking alloy for the lead-bearing material presently in use.

(3) Offsite recycling of the nonhazardous fine glass particulate waste gener-

*The terms "reduction" and "minimization" are used interchangeably in this EPA Project Summary.

ated in the lens grinding operation and currently disposed of in a sanitary landfill.

This Project Summary was developed by EPA's Risk Reduction Engineering Research Laboratory, Cincinnati, Ohio, to announce key findings of the waste reduction assessment that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

To promote waste minimization activities in accordance with the national policy objectives established under the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act of 1976 (RCRA), the Risk Reduction Engineering Laboratory (RREL) of the USEPA Office of Research and Development is supporting the WREAFS Program, which consists of a series of demonstration and evaluation projects for waste reduction conducted cooperatively by EPA and various parts of the Department of Defense, Department of Energy, and other Federal agencies. The WREAFS Program focuses on waste minimization research opportunities and technical assessments at Federal sites. The present project focused on a waste minimization opportunity assessment (WMOA) conducted at the Fitzsimmons Army Medical Center (FAMC) Optical Fabrication Laboratory (OFL) in Denver, Colorado.

Results of the WMOA conducted at the OFL identified three waste minimization opportunities involving materials in use at the OFL. These options are summarized below.

Waste Minimization Opportunities

Waste Alkaline Washwater

Alkaline washwater from the glass lens cleaning/deblocking operation is currently discharged from the OFL after passing through a trap to collect large particulates of the lead-bearing lens blocking alloy. This wastewater is discharged periodically from the glass lens washing machines at the rate of approximately 200 gal/mo, at a pH of about 13 to 14, and is drained to the FAMC onsite central water treatment facility. Although this waste is not discharged offsite, it is ultimately used as part of the FAMC grounds irrigation water at the site and could be ultimately discharging lead (both as dissolved lead and submicron particulates) to the groundwater under the site. It is proposed that this possibility be avoided in one of two ways:

(1) Use of a source reduction technique—the substitution of a non-lead-bearing blocking alloy.

(2) Use of a recycling technique—introducing a cartridge filter in the line leaving the trap from the lens washing/deblocking operation in order to catch the submicron-size alloy particulates. This technique could recover up to 500 lb/yr of particulate material that would ultimately be recycled to the lens blocking operation.

Glass Fines from the Glass Lens Grinding Operation

The OFL presently generates about 37.5 ton/yr of a mixture of waste glass fines and water from the lens grinding operation. This material is not a hazardous waste under the RCRA definition. The OFL currently sends this waste to a local landfill, thereby incurring both the transportation and landfilling costs. These fines, when dry, could generate particulate emissions, thus creating possible inhalation problems, during transportation if they are transported in uncovered or improperly covered containers or at a landfill if they are improperly covered or managed. A potential use for this material is as feedstock in glass or ceramic tile production by a local facility. It is assumed that this facility would use the OFL waste material,

Table 1. *Summary of FAMC/OFL Waste Minimization Assessment Results*

Stream under consideration	*Volume consumed or generated*	*RCRA characteristics*	*Raw material costs ($/yr)*	*Current disposal costs ($/yr)*	*Options considered*
Nonhazardous Waste					Proposed Recycle Option
Glass fines from glass lens rough grinding	*300 lb/day (37.5 tons/yr)*	*None*	*Not applicable*	*Estimated at $50/ton at a local municipal landfill (or $1,875/yr)*	*Send fines to local glass or ceramic tile production plant for use as a feedstock in glass or ceramic tile fabrication.*
Hazardous Waste					Proposed WM Option
Alkaline washwater from deblocking and cleaning of glass lenses, containing small amounts of EP toxic metals, e.g., lead, as both particulates and dissolved metal.	*200 gal/mo*	*Characteristic D002 corrosive and D008 lead waste*	*Alloy: $2.34/lb (or $1,150/yr based on metal loss if attributable to alkaline solution disposal). There are also costs of under $5,000/yr for the alkaline cleaning solution.*	*Negligible since this waste stream is treated at the FAMC onsite biological wastewater treatment plant. The stream constitutes less than 0.1% of the flow to the wastewater treatment plant.*	*1. Alloy substitutions to eliminate use of lead and cadmium (source reduction).* *2. Installation of a filter in wastewater pipe from washing unit to reclaim additional alloy particulates (recycle/reuse).*

Table 2. *Summary of Factors Determining Technical Feasibility of Three WM Options Studied During the OFL Waste Minimization Study*

Option number	Waste and source	Summary of option	Factors determining technical feasibility
1	Glass particles from lens grinding	Sending waste to a glass or ceramic tile manufacturer for use as feedstock	Glass composition and compatibility of that composition with types of glass produced at a facility interested in accepting the particulates.
			Availability within a radius of 50 miles if a facility is interested in accepting the materials. Greater distances would increase transportation costs, thereby eliminating the economic benefit of this option.
2	Cleaning and deblocking washwater from glass lens production	Substitution of a lead- and cadmium-free alloy for the alloy presently used for blocking	No technical factors are involved. The substitute alloy is known by facility personnel to be a technically viable alternative. However, its higher cost may not be justified unless considered on environmental grounds.
3	Cleaning and deblocking washwater from glass lens production	Installation of a filter in the alkaline wastewer line	Particle size and concentration of fine alloy liquid droplets or particulates currently escaping in the discharged wastewater.
			Choice of alkali-resistant filtration equipment.

Table 3. *Summary of Cost Analysis Data for Three WM Options Resulting from the OFL Waste Minimization Study*

Material of interest in this study	Option	Capital investment	Net operating cost savings	Payback period (years)
Glass particulates from lens grinding	1. Sending to glass manufacturers for use as feedstock	None	Up to $1,000/yr (dependent on local transportation cost)	0
Cleaning and deblocking washwater from glass lens production	2. Alloy substitution	None	None. Will increase operating cost by about $33,000/yr	Indeterminate
	3. Installation of filter in wastewater line	Less than $500*	Up to $1,100/yr	1.5 yr minimum

** Less than $1,500 if labor costs are included for shutdown of present system, installation of new system, and checking of new system after installation.*

and, consequently, the land disposal cost could be eliminated.

Results of the Waste Minimization Assessment

The results of the WMOA are summarized in Tables 1 through 3.

Conclusions and Recommendations

Of the three waste-related opportunities developed at the OFL by the WMOA, two represent waste reduction for RCRA hazardous wastes, while the remaining option represents an opportunity to reduce or eliminate nonhazardous waste. A review of Table 3 shows that none of these options represent substantial capital outlays or appreciable operating cost savings. In fact, one waste minimization option—substituting a nonhazardous lens blocking alloy for the present hazardous material—represents a substantial operating cost increase. The only positive value of the option is the potential elimination of an environmental pollution problem if it can be shown at FAMC that a source of lead pollution in groundwater needs to be eliminated. The potential lead pollution problem also points out the need for R & D efforts to develop a lead-free lens blocking alloy.

The full report was submitted in fulfillment of Contract No. 68-C8-0061, Work Assignment 2-24, by Versar, Inc., under the sponsorship of the U.S. Environmental Protection Agency.

☆U.S. GOVERNMENT PRINTING OFFICE: 1991 - 548-028/40082

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The complete report, entitled "Waste Minimization Opportunity Assessment : Optical Fabrication Laboratory, Fitzsimmons Army Medical Center, Denver, Colorado," (Order No. PB91- 216 515/AS; Cost: $35.00, subject to change) will be available only from:

National Technical Information Service
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The EPA Project Officer can be contacted at:

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