United States
Environmental Protection
Agency

Risk Reduction Engineering
Research Laboratory
Cincinnati OH 45268

Research and Development

EPA/600/S2-90/031 Aug. 1990

EPA

Project Summary

Waste Minimization Opportunity Assessment: Fort Riley, Kansas

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 and various parts of the Department of Defense (DOD), Department of Energy (DOE), 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.

Fort Riley, Kansas, was a WREAF site chosen for a waste reduction assessment. Maintenance operations carried out at one of the U.S. Army Forces Command (FORSCOM) Fort Riley facilities generates waste battery acid and metals-contaminated alkaline wastewaters. Acid from car and truck batteries requiring maintenance or disposal is currently collected in drums and shipped from Building 8100 to the Defense Reutilization and Marketing Office (DRMO) at the installation for disposal as hazardous waste (DOO2, DOO6, D008). The metal-contaminated waste detergent solution results as automotive parts are cleaned with hot aqueous alkaline detergent in a batch washer at the installation. This waste, currently being reclassified as RCRA, DOO7, and DOO8, is drained to an onsite nonhazardous waste evaporation pond.

The waste minimzation asseess-ment at Ft. Riley developed the following recycling options for these RCRA wastes:

1. **Filtering, restrengthening, and recycling waste battery acid as a replacement for virgin battery acid.**
2. **Purifying and reusing alkaline detergent solution for further automotive parts cleaning.**

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

Introduction

Results of the Fort Riley, Kansas, waste minimization assessment identified two waste reduction opportunities in a multipurpose building (Building 8100) used for automotive subassembly rebuilding, lead acid battery repair, and a number of other Army maintenance operations. The two waste reduction opportunities are summarized below.

Waste Battery Acid

Battery acid (32% to 37% sulfuric acid) containing trace concentrations of lead and cadmium is currently drained from both dead batteries and batteries requiring repairs (e.g., replacement of battery terminals) and shipped in 15-gal. drums to the DRMO storage facility at the installation for ultimate disposal as a hazardous waste. The WREAFS Program instead proposed that the waste acid be gathered in a holding tank, filtered to remove any particulates, and adjusted in concentration to 37% sulfuric acid (using 60° Baume commercial sulfuric acid) as needed for reuse in reconditioned or new batteries. To prevent buildup of dissolved

metal impurities in this recycling system, part of the acid would be purged from the system. This assessment assumes that 25% of the acid would be purged and 75% reused. The acid being purged would be neutralized, treated to remove trace heavy metal, and disposed of onsite to a lagoon as a nonhazardous waste. Figure 1 presents a schematic of the proposed equipment for this waste reduction option.

Automotive Parts Washer Wastewater

The dirty aqueous alkaline detergent solution that results from cleaning automotive parts contains trace concentrations of lead, chromium, and cadmium at a pH >12 as well as the oils, grease, and dirt removed from the automotive parts. Currently, the solution is drained to an onsite nonhazardous waste evaporation pond. This waste, heretofore regarded as nonhazardous, is being reclassified as a RCRA hazardous waste because of its characteristics (D007, D008). When reclassified, it will have to be disposed of as a hazardous waste through DRMO. The proposed waste minimization option for this stream would involve using equipment external to the automotive parts washer, as shown in Figure 2. The proposed process would include emulsion breaking to cause emulsified oils to float, removal of de-emulsified oils and other tramp oils and grease by skimming, filtration to remove particulates in an inline cartridge filter, and addition of fresh alkaline detergent as necessary. The cleaned washwater would then be recirculated to the automotive parts cleaner. Buildup of impurities in the recycled washwater would be prevented by purging 25% of the used alkaline detergent and recycling 75%. The material being purged would be neutralized with an appropriate amount of waste battery acid (in the equipment shown in Figure 2), treated to remove precipitated trace heavy metal impurities, and disposed of as a nonhazardous waste.

Some inplant experimentation would be needed to determine the type of filter elements that are best suited for this operation, whether multiple cartridge filters are needed, how many cycles can the recovered wastewater effectively clean automotive parts, etc. The uncertainty in the proposed procedure is reflected in a 25% contingency in the capital cost estimate.

Results of Waste Reduction Audit

The results of the waste reduction audit are summarized in Tables 1 and 2.

Observations and Recommendations

The waste reduction options identified in this study are recycle/reuse options. Source reduction would require the decreased use of motor vehicles by the infantry division stationed at Fort Riley and is not a realistic waste reduction option.

Since the expected payback periods for the two waste reduction options are very short, it is recommended that these options be implemented. It should be noted that successful application of these options at Ft. Riley creates the potential for applying similar waste minimization options in at least 10 other U.S. Army FORSCOM installations.

The full report was submitted in fulfillment of Contract 68-C8-0061 by Versar, Inc., under the sponsorship of the U.S. Environmental Protection Agency.

Table 1. *Summary of Fort Riley, Kansas, Building 8100 Waste Reduction Assessment*

Source of Hazardous Waste Stream	Waste	Current Disposal Cost	Current Raw MaterialCost
Battery repair shop	7,200 gal/yr D002, D006, D008*	$27,900/yr	$11,530/yr
Automotive parts washing	29,000 gal/yr D007, D008†	$112,000/yr‡	<$100/yr

* D002--Corrosive waste (<2 pH >12).
D006--Cadmium-containing RCRA characteristic hazardous waste.
D008--Lead-containing RCRA characteristic hazardous waste.
† D007--Chromium-containing RCRA characteristic hazardous waste .
‡ Although this waste currently is drained to an onsite evaporation pond, if it were disposed of as a RCRA hazardous waste via DRMO at the same cost per gallon as the waste battery acid , the costs and savings would be as indicated

Table 2. *Summary of Economic Analysis for Proposed Waste Minimization Options at Fort Riley, Kansas, Building 8100*

Source of Hazardous Waste Stream	Waste Reduction Option	Capital Investment	Operating Cost Saving, $/yr	Payback, yr
Battery repair shop	Recycle of restrengthened battery acid	$15,200	$36,000	0.42
Automotive parts washing	Recycle of purified alkaline detergent solution	$19,800	$107,100	0.18

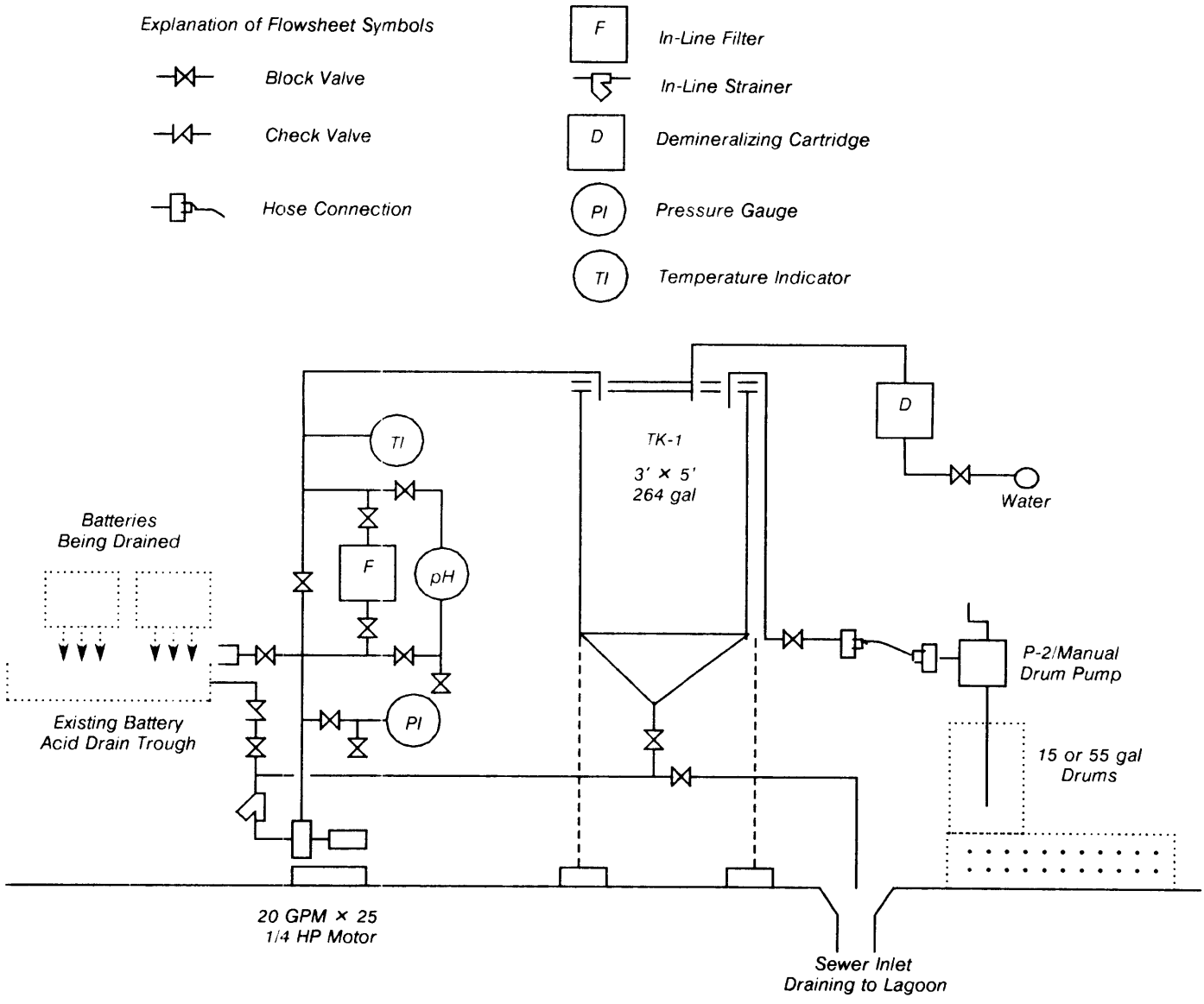

Figure 1. *Proposed equipment for waste battery acid option.*

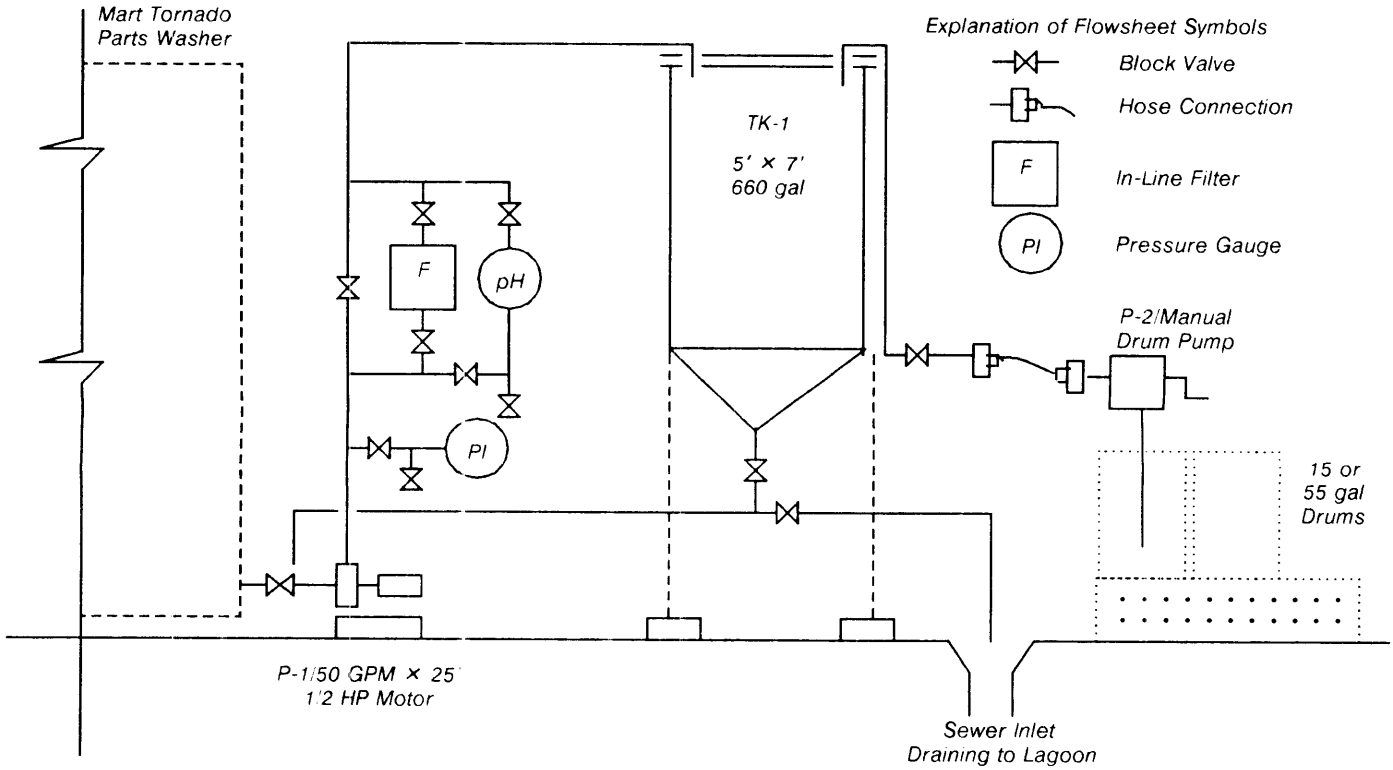

Figure 2. *Proposed equipment for tornado parts washer wastewater option.*

The authors are with Versar, Inc., Springfield, VA 22101.
***James S. Bridges** is the EPA Project Officer (see below).*
The complete report, entitled "Waste Minimization Opportunity Assessment: Fort Riley, Kansas," (Order No. PB 90-250 176/AS; Cost: $23.00, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

The EPA Project Officer can be contacted at:
Risk Reduction Engineering Laboratory
U.S. Environmental Protection Agency
Cincinnati, OH 45268

United States
Environmental Protection
Agency

Center for Environmental Research
Information
Cincinnati OH 45268

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

Official Business
Penalty for Private Use $300

EPA/600/S2-90/031