

POLLUTION PREVENTION

IN RHODE ISLAND

Case studies of the Rhode Island On-Site Technical Assistance Program

Fastener Manufacturing 1,1,1-Trichloroethane

Fastening tool fabricator replaces 1,1,1-trichloroethane with an aqueous-based cleaning system.

Industry \ Contact

SIC Codes: 3499, 3471, 3496 Fastener Manufacturer, Rhode Island.

Contact: Company #26

Technology Description

The company manufactures nails and staples, along with the tools used to drive these fasteners. The fastening tools are composed of aluminum, magnesium, and carbon steel. The average employment of the company is 1000.

Until mid-1987, 1,1,1-trichloroethane was the primary agent used in the degreasing of all metal parts. Replacing 37-1,1,1-trichloroethane locations with 10 Ramco aqueous washing systems and 3 Ford Hollandies spin dryers helped create a more centralized, efficient cleaning process.

The substitution of 1,1,1-trichloroethane with the aqueous cleaner Simple Green (manufactured by Sunshine Makers Inc. of Huntington Harbor, CA) significantly reduced hazardous waste concerns. The aqueous cleaning systems left the company with a large volume of soapy wastewater. In-house treatment of the soapy water by an ultrafiltration unit, manufactured by KOCH Membrane Systems of Wilmington, MA, followed by a pH adjustment allowed the company to recycle its wash water in a closed-loop system.

In 1988, the company was the first Rhode Island manufacturer to play an active role in DEM's Pollution Prevention employee training program for industry, a program that encourages a company team approach. As a result, the company used this participative approach to reduce its use of 1,1,1-trichloroethane. The company also relied on the DEM and the University of Rhode Island Chemical Engineering Department's expertise to recycle its wash water using the ultrafiltration technology.

Feedstock Materials

1,1,1-trichloroethane, non-contact cooling water

Wastes

45,000 gallons per year of spent 1,1,1-trichloroethane.

Costs

Capital costs include: 10 Ramco aqueous washing systems, 3 Ford Hollandies spin dryers, a KOCH ultrafiltration unit, tanks, and piping.

Total capital costs: \$88,000.

Operation \ Maintenance

Annual operation/maintenance costs: 20" bag filters, 100 gallon tank @ 150 degrees F, 6000 W heater, 3/4 HP pump motor @ 8 hours per day, 93 lbs. of cleaner (\$1.12/lb) and titration tests for a total cost of \$759.00.

Savings

Virgin 1,1,1-trichloroethane consumption reduced from 45,000 gallons in 1986 to 1,000 gallons in 1991, for a total savings of \$21,000.

Annual cost savings for trichloroethane transportation and off-site treatment costs: \$1,100

Annual cost savings for waste absorbent disposal: \$30,000.

Payback Period

Approximately 1.2 years

Impact

The company has reduced its consumption of 1,1,1-trichloroethane by 97% for metal parts degreasing. By replacing its 37 1,1,1-trichloroethane solvent processes with 10 aqueous wash systems and 3 spin dryers, the company has found that the aqueous wash systems provide a more centralized, efficient process for cleaning metal parts. In addition, by reducing its use of 1,1,1-trichloroethane, the company has improved the health and working conditions of the employees.

The ultrafiltration technology used in conjunction with the aqueous wash systems allows much of the soapy wash water to be recycled while generating only small amounts of waste. The ultrafiltration system is an economical way to recycle the company's wash water in a closed-loop system without using any hazardous chemicals.