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POLLUTION PREVENTION

IN RHODE ISLAND

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

Electroplater 1,1,1- trichloroethane

Electroplater replaces 1,1,1-trichloroethane used in vapor degreasing with an aqueous cleaning system.

Industry\Contact

SIC Code: 3471 reel-to-reel contract electroplater, Rhode Island.

Contact: Company #9

Technology Description

The company employs 23 people. It is principally engaged in nickel, copper and tin electroplating for the electronics industry. Most of the plating is reel-to-reel, although some barrel and rack plating are also performed.

Until 1989, 1,1,1-trichloroethane was the predominant degreasing agent for all metal parts. After attending a solvent reduction workshop (co-sponsored by DEM's Pollution Prevention Section) the company began to investigate solvent substitution alternatives. The company's search eventually resulted in the purchase of an ultrasonic cleaning system (manufactured by Lewis Corporation of Oxford, Conn). The ultrasonic unit was initially installed on one reel-to-reel plating line. It was later modified into a mobile unit so that it could be used at other locations within the plant.

The new ultrasonic unit has the capability of running at a maximum speed of 60 feet per minute. Although the company has not operated the unit at this speed, it has approached the 30 feet per minute mark with some products. To maintain compliance with OSHA standards when using 1,1,1-trichloroethane, the vapor degreaser could only be operated at 10 feet per minute.

Feedstock Materials

1,1,1-trichloroethane, cooling water

Feedstock Reduction

Annual feedstock savings: @ \$4.98 per gallon (1989 dollars), the total purchase cost for 1,1,1-trichloroethane was \$17,604. Annual cooling water costs for vapor degreaser: @ 2 gallons per minute, 960 gallons per day, was \$126.00

Wastes

1,800 gallons per year of spent 1,1,1-trichloroethane

Costs \ Capital

Lewis ultrasonic cleaning system cost: \$22,000.

Operation \ Maintenance

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

Savings

Annual cost savings for trichloroethane transportation and off-site treatment costs: \$1,100.00.
Annual energy savings: \$780.00.

Payback Period

Approximately 1.2 years

Impact

The company no longer purchases or uses 3,500 gallons per year of 1,1,1 trichloroethane for vapor degreasing. The company has found that the new ultrasonic cleaning system is able to do a better job - at a higher rate of production - than was previously possible with the solvent vapor-degreasing unit. The ultrasonic unit has been used on all reel-to-reel plating lines, and the plating manager has more confidence in its cleaning ability. Laboratory tests have shown that the material processed through the new unit is thoroughly cleaned and that, in most cases, it is cleaned with a much lower failure rate than was experienced before. Since starting the project, the company has purchased two additional ultrasonic units: a \$12,000 Branson unit and a \$7,000 Westinghouse unit.

With the help of DEM's technical assistance staff, testing is now underway to develop a soap-and-water recycling program using ultrafiltration membrane technology. With the replacement of 1,1,1-trichloroethane, a new, though less-hazardous, waste stream has been created. Oily wastewaters can be processed through ultrafiltration (or other membrane technologies) so that soap and water can be reused and that the oil can be concentrated for off-site treatment. The advantages of membrane technology are that no hazardous chemicals are used and that operating costs are low.