

POLLUTION PREVENTION

IN RHODE ISLAND

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

Jewelry Mfg. Nickel Plating

Jewelry manufacturer uses ion-exchange to recycle rinse water and recover plating solution in a nickel plating operation.

Industry \ Contact

SIC Code: 3471 Electroplater, Rhode Island

Contact: Company #14

Technology Description

The company is a costume jewelry job shop that employs about 45 people. The primary operation of the company is electroplating.

After plating, product is rinsed in four tanks. The first three tanks are static rinse tanks which are replenished in a counter current fashion, i.e.; freshwater feeds the third tank, the third tank feeds the second tank, etc., with the contents of the first, most-concentrated tank being returned to the plating bath. The fourth and final rinse was originally sent to the company's chemical treatment system and discharged to the sewer. Ion-exchange has been installed to recycle the water in the final rinse, thereby eliminating this discharge.

In addition, nickel metal ions captured in the ion-exchange resins are regenerated with sulfuric acid, generating a low-volume, highly-concentrated nickel sulfate solution which is re-used as plating solution. The ion-exchange column services all of the rack and barrel nickel lines in the facility (7 rack lines, 5 barrel lines), which all use the same rinse tank pattern.

Feedstock Materials

Rinsewater flow rate: approximately 3,024 gallons per day (730,000 gals annually).

Waste treatment chemicals: Caustic, Acids, Flocculants.

Wastes

3024 gallons of rinsewater per day sent to sewer.

Nickel sludge volume difficult to estimate as the treatment system services many different plating lines. Also, increased production and additional treatment required by NBC in 1994 complicates sludge reduction estimates.

Costs

Nickel ion-exchange system plus regeneration station: Approximately \$25,000

Operation \ Maintenance

Pump power: \$60/yr

Regeneration: Sulfuric Acid, \$150/yr

Sodium Hydroxide, \$200/yr

Savings

The company eliminated the purchase of rinsewater from the city-730,000 gallons per year (\$730 savings/year)

Nickel bath chemical purchases have decreased.

Treatment chemical use has decreased.

Treatment/Disposal costs have decreased along with sludge volume due to diminished use of the pretreatment system. Regeneration of the anion column still requires chemical treatment.

Payback Period

Not determined; estimated to be 3 -4 years.

Impact

The company has eliminated the purchase of city water for the nickel plating rinses. In addition, treatment and disposal costs have decreased, as has the dependence of the facility on its chemical treatment system. Nickel is captured and returned to the plating tanks, thereby minimizing the purchase of chemicals for bath formulation.