

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, employs electrolytic recovery to capture nickel metal from a nickel plating operation.

Industry \ Contact

SIC Code: 3911 Electroplater, Rhode Island

Contact: Herff-Jones, Inc.

Technology Description

The company creates and manufactures class rings, emblematic recognition awards, prestige trophy and plaque awards for motivation, recognition awareness and involvement in schools, hospitals, government, and industry and employs approximately 225 people. One of the primary operations of the company is electroplating.

After plating, product is rinsed in three tanks. The first two tanks are static rinse tanks which are replenished in a counter current fashion; i.e., fresh water feeds the second tank and the second tank feeds the first tank, with the first, most-concentrated tank being sent back to the plating bath. The third 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. Regenerant is sent to an electrolytic metal recovery unit where nickel is recovered as metal and sold for scrap.

Feedstock Materials

Rinsewater flow rate: approximately 2 gallons per minute (230,000 gals. annually).

Waste treatment chemicals: Caustic, Acids, Flocculants.

Wastes

2 gallons of rinsewater per minute sent to sewer.

Nickel sludge volume difficult to estimate, as the treatment system services many different plating lines.

Costs

Nickel ion-exchange system: Approximately \$6,200

Ion-exchange regeneration system: Approximately \$1,625

(The total cost of the regeneration station was \$6,500. Several different processes share the regeneration station; therefore, \$1,625 is the cost associated with nickel regeneration.)

Electrolytic recovery unit: Approximately \$2,170

(The total cost of the electrolytic recovery unit was \$6,500; \$2,170 is the amount associated with nickel recovery.)

Operation \ Maintenance

Pump power: Approx. \$50-\$70/yr

Regeneration: Sulfuric Acid, 3 gals. per month: \$50/yr

Sodium Hydroxide, 5 gals. per month: \$ 75/yr

(Regenerant volume services several columns at the facility)

Savings

The company eliminated the purchase of rinsewater from the city saving 230,000 gallons per year for a cost savings of \$4,000. Treatment chemical use has also 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, along with the dilute solution after electrolytic recovery. Approximately 20 pounds of nickel are recovered per year.

Payback Periods

Estimated to be 5 1/2, 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 recovered as metal. The company has also installed similar systems on other plating lines to further reduce water and waste treatment chemical use (**See Case study #'s 38-42**).