

# POLLUTION PREVENTION

## IN RHODE ISLAND

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

### Jewelry Mfg. Copper Cyanide Plating

**Jewelry manufacturer uses ion-exchange to recycle rinsewater, employs electrolytic recovery to capture copper metal from a copper cyanide 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, copper metal ions captured in the ion-exchange resins are regenerated with sulfuric acid, generating a low-volume, highly-concentrated copper sulfate solution. Regenerant is sent to an electrolytic metal recovery unit where copper is recovered as metal and sold for scrap.

#### **Feedstock Materials**

Rinsewater flow rate: approximately 1 1/2 gallons per minute (170,000 gals. annually).  
Waste treatment chemicals: Caustic, Acids, Flocculants, Cyanide destruct.

## **Wastes**

1 1/2 gallons of rinsewater per minute sent to sewer.

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

## **Costs**

Copper ion exchange system: Approximately \$7,200

Regeneration station: 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 copper 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 copper recovery.)

## **Operation \ Maintenance**

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

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

Sodium Hydroxide, 10 gallons per month: \$150/yr

(Regeneration station services many different plating lines)

## **Savings**

The company eliminated the purchase of rinsewater from the city saving 170,000 gallons per year for a cost savings of \$3,200. 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 as does the spent electrolytic recovery fluid.

Approximately 20 pounds of copper are recovered per year.

## **Payback Period**

Estimated to be 6 1/4 years.

## **Impact**

The company has eliminated the purchase of city water for the copper plating rinses. In addition, treatment and disposal costs have decreased as has the dependence of the facility on its chemical treatment system. Copper is captured and recovered as metal. The company has also installed similar systems on their other plating lines to further reduce water and waste treatment chemical use (**See case study #'s 38-42**).