

3.8.2 Electronics Manufacturing: Semiconductors

Tip Sheet #1

WASTE ORIGINS: Semiconductor Production Processes (Crystal Preparation, Wafer Fabrication, Final Layering, and Cleaning Assembly)

WASTE TYPES: Spent Process Baths, Sludges, Rinse Waters, and Aqueous Metals

WASTE REDUCTION AND RECYCLING OPTIONS:

! Process or equipment modification examples:

! Installing a system (e.g., the CALFRAN process) to *reduce pressure of vaporization* at cooler temperatures, recycle water by condensing the vapors in another container, and concentrate and precipitate solutes. **Waste Savings/Reduction:** reduce volume and quantity of aqueous waste solutions by recovering pure water.

! Reducing *chrome waste generation* by:

! Treating on-site with caustics and sodium bisulfite to reduce *chrome VI liquid to chrome III* sludge.

! Repairing *water leaks* in process rinse tank to reduce chrome waste.

Capital Investment: \$30,000 for the rain cover, pipe repairs, and on-site treatment system. **Waste Savings/Reduction:** Savings: \$15,000/year in disposal costs, and reduce 95 percent of chrome wastes from 6,000 gallons to two or three drums generated per quarter.

! Raw material substitution examples:

! Replacing *chlorinated solvent baths* with a non-hazardous product to reduce, and later eliminate chlorinated solvent use.

! Recycling examples:

! Converting an *open-top still* into a closed loop system to recycle Freon 113. Costs: \$20,000. **Waste Savings/Reduction:** \$57,000/year in disposal and feedstock costs, and reduce waste volume by 85 percent.

! Using an "Athens" system to *reprocess sulfuric acid* generated during wafer fabrication operations. The acid is heated to boil off water and other impurities, purified through distillation, and pumped back into wet stations to continue wafer processing. **Annual savings/Reductions:** \$2.9 million from not purchasing sulfuric acid and 28 percent reduction in sulfuric acid generated in 1993.

Sources:

EPA Sector Notebook Project: *Electronic and Computer Industry*, U.S. EPA, Office of Compliance, September 1995, EPA/310-R-95-001. (Also accessible via the Internet at the EPA Sector Notebook Home Page address, <http://es.inel.gov/comply/sector/index.html>.)