4.5.1 Metal Fabrication: Finishing

Case Study #1

BUSINESS: **Gehl Company; West Bend, Wisconsin**
WASTE ORIGIN: **Paint Stripping**
WASTE TYPES: Paint Wastes and Sodium Hydroxide Contaminated with Stripped Paint

COMPANY BACKGROUND
Gehl manufactures agricultural implements.

MOTIVATION
Large volumes of paint wastes were classified as hazardous wastes due to high pH levels. This required special handling and expensive disposal costs.

STRATEGIES:
Strip paint using plastic media blasting.

ORIGINAL PROCESS
Gehl stripped paint from parts rejected by quality control before remanufacturing them. These parts were soaked in a hot sodium hydroxide bath to strip paint as a batch process, creating the contaminated wastes.

NEW PROCESS
A plastic media blasting cabinet replaced the stripping bath. The abrasive action of small plastic particles fired at a painted surface strips paint without damaging the surface texture. The paint chips and spent blast media is a non-hazardous solid waste that is landfilled (4,000 pounds per year).

RESULTS

Waste Reduction

Eliminated 19,000 pounds per year of paint-contaminated sodium hydroxide.

Economics

Savings: $32,000 estimated annual waste disposal costs.
Capital Cost: $8,000 for the plastic media blasting unit.
Operating/Maintenance Cost: Information not available.
Payback Period: Three months based on estimated disposal costs.

HEALTH & SAFETY BENEFITS
Worker exposure was significantly reduced by eliminating sodium hydroxide, a corrosive irritant to skin, eyes, and mucous membranes. It is also moderately toxic if ingested.

Source:
U.S. EPA Project Summary: *Reduction of Total Toxic Organic Discharges and VOC Emissions from Paint Stripping Operations Using Plastic Media Blasting.*

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Case Study #2

BUSINESS: **Snap-on Tools; Kenosha, Wisconsin**
WASTE ORIGIN: **Sheet Metal Fabrication**
WASTE TYPE: Ethylene Glycol Monobutyl Ether (Butyl Cellusolve)

COMPANY BACKGROUND

Snap-on Tools is a hand tool and tool storage rollaway manufacturer.

MOTIVATION

Company operations were discharging large amounts of butyl cellusolve to the local publicly-owned treatment works (POTW), even though the POTW had no difficulty handling the extra strength wastewater.

STRATEGIES

Recover butyl cellusolve through a process modification called ion exchange.

ORIGINAL PROCESS

The company uses an electrocoating paint line with water-based coatings. Ultrafiltration recovers process paint from the rinse tank's effluent, producing concentrated paint for return to the paint bath. The remaining waste rinsewater contained 2 to 3 percent butyl cellusolve that was lost when sewered.

NEW PROCESS

The recycle loop to the rinse is now closed due to the ion exchange technology which removed a contaminant (isopropyl amine) which used to build up in the system and ruin the rinse bath.

RESULTS

Waste Reduction

Reduced butyl cellusolve in wastewater from 190,000 pounds in 1989 to 3,500 pounds in 1992.

Economics

Savings: $54,900 per year due to butyl cellusolve recovery.
At least $18,000/year on sewer fees.
Capital Cost: $150,000 in 1989.
Operating/Maintenance Cost: Information not available.
Payback Period: Two years based on total savings of $72,900/year from butyl cellusolve recovery ($54,900/year) and sewer fee savings ($18,000/year).

HEALTH & SAFETY BENEFITS

Butyl cellusolve is moderately toxic if inhaled, is a skin and eye irritant, can cause experimental teratogenic and reproductive effects, and is a flammable liquid when exposed to heat or flame.

PROBLEMS

Closing the wastewater loop entirely depended on complete removal of isopropyl amine. Build up of this contaminant in the rinsewater could degrade the quality of the electrocoating finishing.

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Case Study #3

BUSINESS: **Swing-N-Slide Corporation, Newco Fabrication Division; Janesville, Wisconsin**

WASTE ORIGIN: **Custom Metal Fabrication**

WASTE TYPES: Spray Painting Wastes, Oversprayed Liquid Solvent-based Paints, Solvent Cleaners and Paint Sludges, and Volatile Organic Compound (VOC) Air Emissions

COMPANY BACKGROUND

Newco, with 50 employees, is the leading manufacturer of do-it-yourself swing sets in the nation. The company also is a custom fabricator supplying a variety of industries with components and finished assemblies used in playground equipment, power tools, shelving, hardware, and many other industrial and consumer products.

MOTIVATION

Operations generated large volumes of hazardous paint wastes and air emissions regulatory non-compliance issues.

STRATEGIES

Replace toxic, solvent-based paints with powder paints.

ORIGINAL PROCESS

The company's liquid spray painting operations created large volumes of overspray paint wastes. Air emissions of VOCs from this process were not in compliance, and equipment clean up and color changes generated a lot of hazardous wastes.

NEW PROCESS

In January 1993, a powder paint coating system was installed featuring ten automatic and two manual paint guns. This allows the powder to adhere to the metal parts electrostatically. The finish is made permanent by baking parts in an oven.

RESULTS

Waste Reduction

Eliminated 100 percent of oversprayed liquid paint.
Eliminated 100 percent of solvent cleaners and paint sludge.
Reduced process hazardous wastes by 33,550 pounds/year.
Reduced VOC emissions by 22,500 pounds/year.

Economics

Savings: At least $140,670/year.
At least $41,000 per year savings due to elimination of hazardous waste streams.
$99,670/year savings on labor and materials, including $23,000/year savings on paint filter

cleaning. Production output tripled.
Capital Cost: $200,000 for powder paint booth.
Operating/Maintenance Cost: Information not available.
Payback Period: 14 months**.**

HEALTH & SAFETY BENEFITS

Employee exposure to hazardous materials was significantly reduced after elimination of suspected cancer-causing chlorinated solvents.

TECHNOLOGY TRANSFER

A Nordson NHC-S8 Down-Draft Powder Coating Booth was installed to significantly reduce coating wastes. Most powder paints are sprayed at a 96 percent efficiency rate, as opposed to 50 percent efficiency with sprayed liquid paints. The remaining 4 percent waste powder is captured, containerized, and sold to another firm using powder paint.

PROBLEMS

Minor problems occurred due to lack of employee training using the new paint booth. Powder coatings do not have universal application properties.