

4.7.2 Printing: Screen Printing

Case Study #1

BUSINESS: Romo Incorporated; De Pere, Wisconsin
WASTE ORIGIN: Screen Reclamation Processes (Ink, Emulsion and Haze Removal)
WASTE TYPES: Volatile Organic Compounds (VOCs), Solvent-based Inks, Screen Cleaners/Ink Cleaning Solvents (Toluene, Methyl Isobutyl Ketone) Emulsion Remover (Sodium Periodate), and Haze Removers (Xylene, Acetone, Mineral Spirits, Cyclohexanone)

COMPANY BACKGROUND

Romo is a commercial screen printing firm that produces a wide variety of products including decals, banners, point-of-purchase displays, and original equipment manufacture.

MOTIVATION

Over the 40 years of its operation, Romo has experienced toughening environmental and health regulations on local, state, and federal levels. Many regulations have required expensive changes or threats of high fines for noncompliance. The company also wanted to reduce its VOC air emissions and contaminated wastewater, while reducing expensive chemical costs and their expensive treatment and disposal.

STRATEGIES

Romo decided to stay ahead of the regulations. This included decreasing the environmental and health impacts of printing chemicals as much as possible without compromising profits and competitiveness. The company focused on three strategies: reducing the volume of all hazardous products used, testing alternative applications techniques, and experimenting with alternative formulations of traditional products. Romo targeted three major waste streams from the screen reclamation process: ink removal (screen cleaning), emulsion (stencil) removal, and haze (“ghost image” or remnant image) removal.

ORIGINAL PROCESS

About 60 percent of the company’s printing is done with traditional solvent-based inks and 40 percent with ultraviolet (UV) curable inks. Wastewater from the reclamation process was washed down the drains directly to a sewage treatment plant. Open tanks of solvent-based cleaning product allowed large amounts of VOCs to evaporate directly into the shop.

NEW PROCESS

An in-process recycling still recovers screen cleaning solvent for reuse within a closed system that does not allow VOC evaporation to the worker’s airspace. A less hazardous, better-performing alternative cleaner is used for press-side cleaning. Screen emulsion removal is primarily done with an extremely high-pressure water blaster instead of chemicals. Immediate cleaning of ink and emulsion drastically decreased the need for haze removal chemicals.

RESULTS

Waste Reduction

Solvent recovery reduced screen cleaning solvent use from 20 to 40 gallons/day to one 55-gallon drum every three to four weeks.

Hazardous press-side cleaning products reduced by 70 percent.

Toluene Use reduced from 12,382 pounds in 1991 to 3,611 pounds.

Methyl isobutyl ketone use reduced from 6,098 pounds in 1991 to 1,779 pounds.

Emulsion remover chemicals reduced by 75 percent through use of high-pressure water blaster.

Economics

Capital Costs: \$2,900 for a 5 gallon solvent-recovery still.

\$4,900 for a high pressure water blaster.

Operating/Maintenance Savings: Solvent recovery saves \$83 per day, or \$20,750 per year. Saved \$3,800 per year on reduced use of emulsion remover chemicals.

Payback Period: Seven weeks on the \$2,900 solvent-recovery still.

Fifteen months on the \$4,900 high pressure water blaster.

HEALTH AND SAFETY BENEFITS

Many of the solvent-based cleaners and inks used in the screen printing Industry pose adverse health effects to workers through direct skin contact or breathing the evaporating chemicals. Regular skin contact with ink, emulsion, or haze-removing chemicals will cause proven skin and eye irritation and tissue damage. Chemical vapors inhaled into the lungs on a regular basis can produce adverse health conditions. Systemic problems can range from headaches, internal organ damage, nervous system disorders, and possibly cancer. All of these liquids are highly flammable.

TECHNICAL ASSISTANCE

Romo was helped by local chemical suppliers to formulate less hazardous and more effective cleaners. The U.S. EPA's Design For The Environment (DfE) Program's Printing Project provided assistance through its 33/50 program. The DfE Screen Printing Project was assisted by the Screen Printing Association International (SPAI). To obtain other case studies or more information about the DfE Screen Printing Project, contact: U.S. EPA Pollution Prevention Clearinghouse (PPIC) at 202/260-1023, or fax 202/260-0178.

Sources:

U.S. EPA Design for the Environment Screen Printing Project Documents:

Screen Printing Case Study: Reducing the Use of Reclamation Chemicals in Screen Cleaning, 1993, EPA/744-F-93-015.

Screen Printing Case Study2: Technology Alternatives for Screen Reclamation, Draft, October 1994.

Screen Printing Case Study 3: Chemical Alternatives for Screen Reclamation, Draft, October 1994.

Screen Printing Case Study 4: Work Practice Alternatives for Screen Reclamation, Draft, December 1994, EPA/742-F-95-003.

Designing Solutions for Screen Printers, U.S. EPA, Pollution Prevention and Toxics, Design For the Environment Screen Printing Project, March 1995, EPA/744-F-95-003.