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A Cooperative Project
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U.S. Environmental
Protection Agency
and the
Printing Trade
Associations
Nationwide

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SCREEN PRINTING PROJECT CASE STUDY 1

SCREEN PRINTING

Reducing the Use of Reclamation Chemicals in Screen Cleaning

Being responsive to the environment means learning new procedures and using new tools to do the same job with less negative environmental impact. Decisions about the purchase of equipment and chemicals for screen reclamation or other production processes depend not only on cost, availability, and performance, but also on whether environmental requirements can be met. Meeting environmental requirements means understanding the comparative human and ecological risks of the alternatives being considered.

This is the first in a series of screen printing industry case studies that illustrates how printing facilities can improve their environmental performance. This study describes a successful pollution reduction program at Romo Incorporated, a screen printer in De Pere, Wisconsin.

Other screen printers can learn from Romo's experience and from the way that the company searched for safer alternatives.

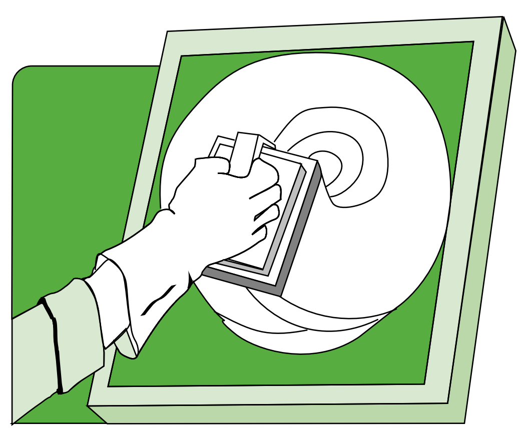
In particular, this case study shows:

- How a self-audit of ink remover products used in screen cleaning led to the substitution of more environmentally appropriate solvents at press side.
- How using a still to recover and reuse ink cleaning solvent saved the company money.
- How using a high-pressure water blaster and changing product application techniques allowed the company to decrease the use of its reclamation chemicals.

The story of this company's experience shows how problems can become opportunities and how environmental planning can be good for business.

Background

Romo is a commercial screen printer that produces a wide variety of products including decals, banners, point of purchase displays, and original equipment manufacture. About 60 percent of the company's printing is conducted with traditional solvent based inks and 40 percent of its printing utilizes ultraviolet (UV) curable inks



Over the 40 years of its operation, Romo has experienced increasingly stringent environmental and health regulations on local, state, and federal levels, many of which have required expensive changes or threatened high fines for noncompliance. A change in ownership in 1983 led company management to make a conscious decision to stay ahead of the regulations.

The result was a management and employee commitment to decreasing the environmental impact of Romo as much as possible without compromising profits and competitiveness.

The story of Romo has been one of continuous improvement. Romo began by making a number of changes to reduce its use of ink cleaning solvent and emulsion remover. Soon after, it began slowly introducing UV curable inks to reduce volatile organic compound (VOC) emissions. In early 1992, Romo joined Environmental Protection Agency's (EPA's) 33/50 Program, a voluntary pollution prevention initiative, targeting 17 high-priority chemicals. As part of the program, Romo has worked to reduce the use of two of these chemicals, toluene and methyl isobutyl ketone, which are key ingredients in the screen cleaning product that was used at the company. Romo is continuing its quest for further improvement by seeking methods to reduce its use of haze remover.

Target Opportunities For Change

In 1987, Romo began looking for pollution prevention opportunities, particularly in the screen reclamation process. Since screen reclamation is crucial to screen durability and the quality of printing, but also requires a number of expensive and harsh chemical products, the process seemed to provide a large potential to prevent pollution and save money. In addition, since wastewater from the reclamation process washed down drains directly to a sewage treatment plant, Romo wanted to be sure that the water contained no environmentally damaging chemicals.

Consider Possible Solutions

During its self-audit, Romo decided to concentrate on all three parts of screen reclamation: ink removal (screen cleaning), emulsion removal, and haze or "ghost image" removal. The company sought employee suggestions and cooperation for improvement in each area. The company management decided to search for ways to reduce chemical risk and prevent pollution through three strategies:

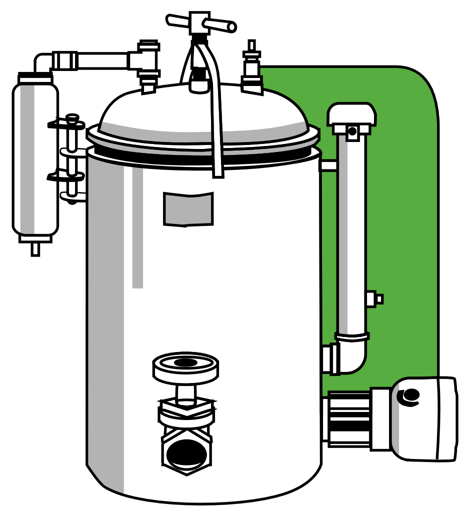
- Reducing the volume of all products used
- Testing alternative application techniques
- Experimenting with alternative formulations of traditional products.

Improving The Ink Removal Process

Begin In-Process Recycling

A new plant engineer who arrived in 1986 brought with him an idea for reducing Romo's consumption of screen cleaning product. His idea was to recover screen cleaning solvent for reuse through an in-process recycling still. At that time, Romo was using between 20 and 40 gallons of solvent per day. Used screen cleaning product drained through a trough into an open tank, then was lightly filtered and hosed back onto the screen. Unfortunately, the open tank allowed large quantities of solvent to evaporate, and an inefficient filtering system left the recovered solvent dirty and effective.

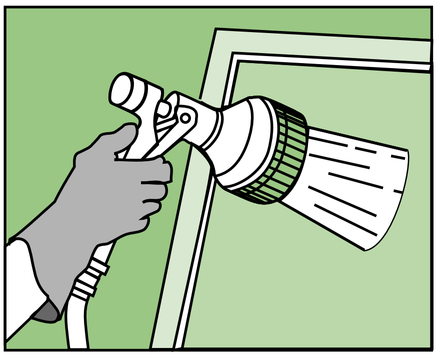
Management decided to act on the plant engineer's idea and install a still at a one-time cost of $2,900. This investment was recovered within seven weeks through reduced solvent costs. The new still is a closed system that utilizes a heating and filtering system to remove pigment before pumping solvent back for reuse. The 5-gallon still is cleaned once or twice per week; although the solvent becomes discolored over time, the same 55-gallon solvent container lasts for three to four weeks. When the solvent becomes too dirty to clean effectively, Romo disposes of the ink-contaminated solvent as a hazardous waste. Through the use of the still, Romo was able to reduce its consumption of cleaning product to only one 55-gallon drum every three to four weeks (even in conjunction with an increase in facility production). This saves the company $83 per day or $20,750 per year in solvent procurement costs alone. The decreased consumption in screen cleaning product also contributes to a healthier working environment, since employees are no longer exposed to large quantities of evaporated solvent.



Change To Alternative Application Techniques

By working together with company employees, Romo discovered new work practices that further reduced the volume of screen cleaning product needed. For years, the screen cleaning solvent was applied in the same way, by hosing the solvent onto the screen. One creative employee suggested adding an adjustable spray nozzle, like that on a garden hose, in order to provide more direct and efficient application of the product. The nozzle, paired with better use of brushes to loosen the ink, was able to reduce the amount of solvent needed for each screen.

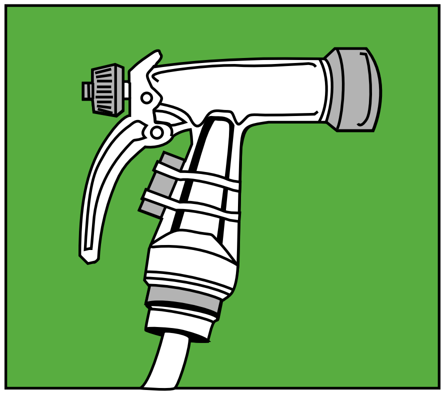
Further reductions in solvent use were made in 1991 by creating a pressure control device for the spray nozzle. The device was simply a small piece of wood secured under the handle of the nozzle by a locking band. Since the wood prevented the screen reclaimers from pushing the nozzle past a certain point, the amount of solvent being sprayed was controlled.



Investigate Alternative Products For Toxics Use Reduction

In keeping with their 1992 commitment to EPA's 33/50 Program, Romo decide to reduce its use of toluene and methyl isobutyl ketone by 50 percent by 1995. Management decided to test some alternative screen cleaning products that contained less of these ingredients.

Romo was aware of a number of press-side screen cleaning products claiming to be "biodegradable," "drain safe," or "environmentally safe." After ruling out several that contained toluene, methyl isobutyl ketone, and other chemicals listed by EPA's 33/50 Program as ingredients of environmental concern, Romo decided to test a few products that had been recommended by other screen printers. One particularly promising product, formulated for process cleaning at press side, primarily consisted of a mix of propy-



lene glycol monomethyl ether, propylene glycol monomethyl ether acetate, and cyclohexanone. Although expensive at $13 per gallon, as opposed to $3 per gallon for the solvent Romo was using at the time, the product performed well, and Romo decided to use the less hazardous product for press side cleaning. Savings generated by using less reclaiming solvent were used to fund the increased cost of the new press-side screen cleaning product.

In 1991, Romo used 12,382 pounds of toluene and 6,098 pounds of methyl isobutyl ketone. **By making the switch to the new press-side screen cleaning product, Romo was able to reduce its use of these chemicals by approximately 70 percent,** bringing the use of toluene down to 3,611 pounds and methyl isobutyl ketone down to 1,779 pounds.

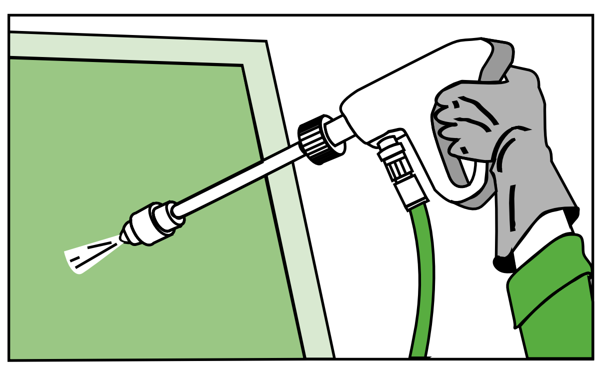
Change Emulsion Remover Approach

With a number of successes behind it, Romo continued its search for other potential pollution prevention opportunities by looking at the emulsion removal process. Following up on an advertisement, Romo tested and then bought an extremely high-pressure water blaster (290 pounds per square inch [psi]) for $2,450 that harnessed the physical power of water pressure to reduce the amount of chemical emulsion remover product used on each screen. Romo was concerned that the increased pressure might disturb screen tensioning or deteriorate the mesh. But after five years of successfully using the high-pressure blaster, Romo was confident enough that the equipment did not deteriorate the mesh that it bought another even higher pressure (1,500 to 4,000 psi) blaster for $4,900.

Another way Romo reduced the amount of emulsion remover needed was by diluting it with water before applying it to the screen. Although a ratio of 1 gallon of full strength emulsion remover to 3 gallons of water was previously used, the company found that a further dilution of 1 gallon of emulsion remover to 6 1/2 gallons of water was just as effective.

The company has gleaned even more savings by creating a new applicator for emulsion remover. Formerly, employees dipped a scrub brush into the sliced open top of an emulsion remover container before bringing the brush to the screen. Unfortunately, it was a messy practice, wasting expensive emulsion remover by dripping it on the floor. Instead, a Romo engineer modified a 15-gallon drum by adding a spray nozzle to evenly mist the emulsion remover onto the screen.

The plant engineer estimates that the combination of the change in emulsion remover application technique, further dilution of the emulsion remover, and use of the high-pressure water blaster has resulted in a 75 percent reduction in emulsion remover use. This reduction saved the company almost $3,800 per year, which means that the high-pressure water blaster paid for itself in approximately 15 months.



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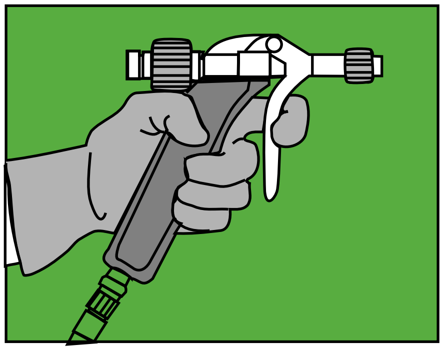
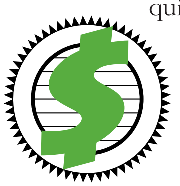


The Next Step: Change Haze Remover Use

Romo continues to seek environmental improvement by searching for ways to minimize its use of haze remover. Press operators concern that haze remover makes a screen mesh brittle and more likely to tear provides a built-in incentive for reduction of its use. **Romo has taken several steps to reduce the use of its haze remover.** First, the screen reclaimer applies haze remover precisely to the part of the screen that is stained. Second, employees try to remove ink and emulsion as quickly as possible, since the longer either material sits on the screen, the more likely it is that the operator will have to apply haze remover.



Third, Romo is looking for alternative chemicals by working with a local chemical supplier to formulate an emulsion remover that will eliminate ghost images and the need for haze remover. The company is also testing a method that the Screen Printing Technical Foundation believes can eliminate the need for a haze remover. The technique requires that the operator degrease and apply ink degradant to the screen before applying emulsion remover.

The Design for the Environment (DfE) Approach

This case study described how a company continuously improved its operations by identifying toxic use reduction and pollution prevention opportunities, encouraging creative new work practices, and trying out new methods and products. By changing work practice techniques and purchasing new equipment, the company realized substantial cost savings.

The result is a methodology that is affordable, effective, readily adaptable, and can be transferred to other printers. Environmental benefits demonstrated in this case study include reduced fugitive air emissions, less solvent discharged to the water system, decreased toxic chemical purchases, and a less hazardous work environment.

The EPA's Design for the Environment (DfE) Screen Printing Project seeks to provide information to printers and companies (often through their trade associations) about the comparative risk and performance of alternative chemicals, processes, and technologies. This will help printers to make more informed choices about the products they use in their facilities. Information on alternatives for screen cleaning and reclamation are available from the DfE Screen Printing Project.

If you would like more information about Romo's experience, contact:

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For More Information...

For copies of this bulletin, other DfE Screen Printing Project materials, or for more information about the project, please contact:

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