

**Appendix B**  
**Stand Alone Case Studies for Owens-Illinois, Texollini and Powerhouse**

**LA MIRADA SCREEN PRINTER CONVERTS TO SAFER CLEANING  
ALTERNATIVE**

The Owens-Illinois Plastics Group has a facility in La Mirada that manufactures cosmetics bottles for a number of customers. The company uses a variety of plastic types for the bottles which hold shampoo and other personal products.

Owens-Illinois has a number of conveyORIZED decorating machines for printing on the bottles. The company is very progressive and has exclusively used ultraviolet (UV) curable ink for several years. These inks are a benefit to the environment because they contain no solvents.

On the decorating machines, the bottles pass under the screens. Squeegees applied to the top of the screen force the ink through the screen and the ink is printed on the bottles. The bottles then pass through an ultraviolet light which cures the ink. Owens-Illinois performs two types of cleaning. The workers clean excess ink from the bottoms of the screens periodically with a solvent laden rag. After the run is completed, the screens are removed from the machine and the workers clean the ink from both sides, again using a rag containing solvent. The screens are then recycled for reuse. In the past, the company used a high VOC solvent for both cleaning activities.

The South Coast Air Quality Management District (SCAQMD) regulates the VOC content of the solvents that are used for cleanup in the screen printing industry. SCAQMD Rule 1171 specifies that cleanup solvents used in this industry must have a VOC content of 100 grams per liter or less beginning in July 2005. IRTA began working with Owens-Illinois during a project sponsored by SCAQMD to test alternatives that would meet the future 100 gram per liter VOC limit. The company decided to convert to one of the low VOC alternatives during another IRTA project sponsored by Cal/EPA's Department of Toxic Substances Control and two wastewater discharge agencies.

In preliminary screening tests, IRTA found that soy based cleaners were effective in cleaning the UV curable ink used by Owens-Illinois. In scaled-up testing with the company, one soy cleaner called Soy Gold 2000 performed well. The VOC content of this cleaner, at 20 grams per liter, is well below the Rule 1171 future limit.

Owens-Illinois likes the new cleaner. Freddy Osorio, Decorating Process Specialist at the company, says "the cleaner performs as well as our high VOC cleaner. The most important thing to me is that it is better than our other cleaner for health and the environment." Owens-Illinois is investigating the new low VOC cleaner for their other U.S. screen printing facilities.

**Annualized Cost Comparison for Owens-Illinois**

	High VOC Cleaner	Soy Cleaner
Cleaner Cost	\$10,140	\$8,502
Total Cost	\$10,140	\$8,502

## **SCREEN PRINTING COMPANY ADOPTS LOW-VOC ALTERNATIVE EARLY**

Texollini, one of the most technologically advanced knitting mills in America, was founded in 1989. Located in Long Beach, California, the company is a vertically integrated knitting mill that provides fabric development, knitting, dyeing, finishing, fabric print design and printing capabilities to their customers. The product lines produced by Texollini include sportswear, bodywear, activewear, performance wear, intimate apparel and swimwear and the fabrics offered by the company are made of cotton, spandex and a variety of other knitted materials.

Part of Texollini's operations involve screen printing on the fabrics the company makes for their customers. For many years, the company has used water-based inks which they mix themselves on-site. The water-based inks are applied on a machine that conveys the fabrics; the inks are cured with heat in an oven. The screens, including the patterns, are on a cylinder on the conveyer.

The screens are cleaned using cold water in an automated system. Although much of the cleaning is accomplished with this water process, some of the screens are much more difficult to clean. In certain cases, the ink dries on the screen and cannot be removed with water. For these screens, the company's practice was to clean the screens with a VOC solvent using a hand-held high pressure spray device.

IRTA began working with Texollini as part of a project sponsored by Cal/EPA's Department of Toxic Substances Control, EPA Region IX, Los Angeles County Sanitation Districts, the City of Los Angeles Bureau of Sanitation and Southern California Edison. In this project, IRTA is working with several screen printing companies. South Coast Air Quality Management District (SCAQMD) Rule 1171 "Solvent Cleaning Operations" currently requires the cleaners used for cleaning ink from screens to have a VOC content of 750 grams per liter; in July of 2006, the VOC limit for these cleaners is much lower, 100 grams per liter. The purpose of IRTA's project is to identify, test and implement alternative cleaners for the participating screen printers that meet the lower VOC content limit, are low in toxicity and do not cause problems for hazardous waste disposal and sewer discharge.

In initial laboratory testing, IRTA identified several different water-based cleaners that appeared to work well for cleaning Texollini's screens. Three of the water-based cleaners that worked best were tested in the company's spray operation. All three cleaners worked better than the solvent used currently even when they were diluted. IRTA provided larger quantities of the cleaner that worked the best to Texollini for scaled up testing. After three months of testing, Texollini was pleased with the cleaner, GD 1990, which is made by Brulin. The operators used the cleaner at 25 percent concentration for most applications. In some cases, where a more rigorous cleaning is necessary, the operators increased the concentration to 50 percent. The GD 1990 is certified by SCAQMD as a Clean Air Solvent. The VOC content of the cleaner concentrate is less than 5 grams per liter.

The company is able to use much less of the water cleaner than the solvent. In addition, the labor for cleaning the screens has declined from 30 minutes per screen to 10 minutes per screen. Because the screen cleaning takes less time, Texollini has also reduced their electricity cost. Converting to the alternative water-based cleaner has reduced the company's cleaning cost by 65 percent.

Lana Farfan, Project Engineer at Texollini, is happy with the new cleaner. "We are continuously searching for ways to reduce our VOC emissions throughout the plant, she says. "Conversion to the new water-based cleaner is better for the workers and the environment and the added benefit is that it also saves us money."

### **Annualized Cost Comparison for Texollini**

	VOC Solvent	Water-Based Cleaner
Cleaner Cost	\$117	\$58
Labor Cost	\$780	\$260
Electricity Cost	\$3	\$1
Total Cost	\$900	\$319

## SANTA ANA SCREEN PRINTER ADOPTS WATER-BASED CLEANER

Powerhouse is located in Santa Ana, California. The company, with four employees, provides services to the contract apparel industry. Most of the company's business is printing on T-shirts.

IRTA began work with Powerhouse as part of a project sponsored by the South Coast Air Quality Management District (SCAQMD). The aim of the project was to identify, test and demonstrate low-VOC, low toxicity alternatives for cleaning ink in textile printing. The SCAQMD regulation requires cleanup materials to have a VOC content of 100 grams per liter or less by July of 2006.

For several years, Powerhouse used a parts cleaner that contained mineral spirits for cleaning the screens. Nick Fortune, the owner of Powerhouse, has 23 years of experience in the industry. "We participated in the project because we wanted to see if there were better cleaners out there."

Powerhouse initially tested four alternative cleaners by hand. Three of the cleaners were water-based and one was a soy based material. "One of the water-based cleaners worked well and the soy cleaner cleaned the ink best," said Nick Fortune. IRTA provided Powerhouse with a plastic parts cleaner to perform longer-term testing of the best performing alternatives. The company first tested the soy based cleaner. According to Mr. Fortune, "the soy cleaned well but it dissolved the adhesive we used to make the screens." IRTA provided larger quantities for testing the water-based cleaner and the Powerhouse employees found that it worked very well. "The water-based cleaner worked so well, we decided to buy the parts cleaner," said Mr. Fortune.

Powerhouse converted to the low-VOC water-based cleaner several months ago and it has worked successfully since then. Using the water-based cleaner is less costly than using the mineral spirits. Says Mr. Fortune, "I got a new cleaner that's better for my employees and the environment, but I also saved money."

### Annualized Cost Comparison for Powerhouse

	Mineral Spirits	Water-Based Cleaner
Annualized Capital Cost	-	\$88
Servicing Cost	\$1,863	\$456
Cleaner Cost	-	\$435
Electricity Cost	\$21	\$83
Total Cost	\$1,884	\$1,062