IV. ALTERNATIVES IN SCREEN PRINTING APPLICATION EQUIPMENT CLEANING

SCAQMD Rule 1171 regulates solvent cleaning activities and, as part of that, it establishes limits for cleaners that can be used to clean ink application equipment. The rule lists several different categories under "Cleaning of Ink Application Equipment." During this project, IRTA focused on cleaners used in two of the categories. Currently, the VOC limit for cleaners in the "Screen Printing" category is 750 grams per liter. Effective on July 1, 2005, the VOC limit for these cleaners declines to 100 grams per liter. Rule 1171 also specifies a VOC limit for the "Ultraviolet Ink/Electron Beam Ink Application Equipment (except Screen Printing)" category. The current limit is 800 grams per liter; effective July 1, 2005, this limit declines to 100 grams per liter. IRTA did not focus on this area because the District is conducting another project designed to address cleaning alternatives in lithographic printing. IRTA did test alternatives in the current study for UV screen printing. The rule also regulates the "Specialty Flexographic Printing" category. The current VOC limit for cleaners in this category is 600 grams per liter. Like the other two categories, this limit declines to 100 grams per liter in 2005. Originally, the project plan also covered UV light cleaning but there is now a consensus that cleaners for the lights will have no difficulty meeting the 100 gram per liter VOC level.

4.1. Preliminary Laboratory Testing

Table 1-4 showed the list of companies IRTA worked with during the project. IRTA obtained samples of inks from all of these companies in order to conduct preliminary screening tests. In a few cases, IRTA obtained samples for several ink types from certain companies. In other cases, where the company only used one type of ink, IRTA obtained a sample of only that ink. In addition, IRTA performed screening tests at two ink suppliers' facilities on several typical inks used in the screen printing industry so additional inks could be tested. Finally the Screen Printing and Graphic Imaging Association (SGIA) and 3M also provided a variety of inks for screening tests. Table 4-1 shows the list of companies and organizations that provided inks for the preliminary testing. Again, a few of the companies listed in the table participated in an EPA project that also involved testing alternative cleanup solvents.

The preliminary testing was designed to screen potential cleaners in a laboratory testing situation. IRTA was given two screens by one of the companies and these were used in the testing. In general, IRTA tested cleaners on the inks provided by the companies. In the screening testing, IRTA found that water-based cleaners and soy based materials worked well for cleaning the plastisol textile ink. For UV curable inks, the soy based cleaners seemed to work well in general. Acetone worked well for many inks including the difficult to remove solventborne inks.

Table 4-1
Companies Providing Inks for Preliminary Testing

Company/Organization	Type of Ink
Teledyne Electronics	Solventborne dielectric ink
Owens Illinois	UV curable ink for plastics
Southern California Screen Printing	UV curable ink for banners
Nelson Nameplate	Solventborne metal ink
	UV curable metal ink
City of Santa Monica Print Shop (EPA)	Solventborne paper/metal inks
Stith	Plastisol textile ink
Quickdraw (EPA)	Plastisol textile ink
Melmarc	Plastisol textile ink
Total Enterprises	Plastisol textile ink
Huhtamaki	Waterborne flexographic ink
Nazdar	Various
TW Graphics Group	Various
3M	UV curable inks
SGIA	Various

4.2 Field Testing

For each of the companies participating in the SCAQMD or EPA project, IRTA developed a test plan for testing the alternative cleaning agents. In general, the test plans involved some initial testing at the site to determine if the findings from the preliminary laboratory testing would hold up in the field. If the tests were successful, IRTA asked the company to perform a scaled-up longer term test of the alternatives. In some cases, the companies decided to convert to the alternatives and, in other cases, they did not convert. A few companies indicated they might convert to an alternative in the future.

The description of the testing and the cost analysis of the alternatives for each of the facilities is described below. IRTA generally attempted to include all the costs a company would incur in the cost comparison of the alternatives with the cleaning system that is currently used. In instances where companies did convert to an alternative, stand alone case studies that describe the conversion are presented in Appendix B.

4.2.1 Teledyne Microelectronic Technologies

Teledyne is an aerospace subcontractor located in Marina del Rey, California. The company manufactures hybrid circuits and uses conductive and dielectric ink to screen print the circuits on ceramic substrates. The screens used by Teledyne are stainless steel metal mesh.

Teledyne used isopropyl alcohol (IPA) for cleaning the screens when IRTA began working with the company. The workers clean the screen during a printing run and after the printing run is finished. The screens are cleaned with a sponge. After the cleaning at

the end of a run, the worker checks the screens under a microscope to determine if the screen is clean.

IRTA obtained ink samples and a typical screen from Teledyne and conducted preliminary screening testing. The results indicated that both acetone and soy based cleaners effectively cleaned the ink. Testing at the facility was needed to see if there were other effects.

IRTA tested soy based cleaners, diluted soy based cleaners and acetone at Teledyne. The soy based cleaners did not completely clean the ink from the screens even when the soy was diluted. IRTA tested a blend of soy and acetone and, although the blend cleaned the screens, it left a residue that was unacceptable. The company tested acetone and it cleaned faster and more thoroughly than the IPA. The results indicated that acetone was the best option. The company believes that it did leave a slight residue, however.

Teledyne decided not to convert to acetone until the regulation requiring 100 grams per liter VOC content cleaners becomes effective. In the meantime, the company is using a blend of 63 percent IPA and 37 percent acetone that contains less than 500 grams per liter VOC.

Teledyne used about 100 gallons per year of IPA. Teledyne staff indicate that the company uses about the same amount of the IPA/acetone blend. If the company converted to plain acetone, use might increase because of the higher vapor pressure of acetone. For purposes of analysis, it was assumed that 10 percent more acetone would be required. Teledyne pays $6 per gallon for both IPA and acetone. The cost for purchasing IPA amounts to $600 per year. The cost for purchasing acetone would amount to $660 annually.

The workers indicated that the acetone was more effective and faster in cleaning the ink than IPA but had a stronger odor. Although labor costs might be reduced to some extent if Teledyne were to adopt acetone, the analysis assumed that the labor costs were the same.

Teledyne currently pays emission fees for the IPA used in cleanup. The company emits 100 gallons of IPA annually. Assuming a density for IPA of seven pounds per gallon, the company emits about 0.35 tons of IPA per year. SCAQMD charges $345 per ton so the annual emissions fee paid by Teledyne for the IPA amounts to $121. Since acetone is exempt from VOC regulations, use of the chemical would not lead to emission fees.

Table 4-2 shows the cost comparison for the IPA and the acetone. Even though more acetone would be required, the cost of using acetone is about nine percent lower than the cost of using IPA.

Table 4-2
Annual Cost Comparison for Teledyne for Screen Printing

	IPA	Acetone
Cleaner Cost	$600	$660
Emission Fees	$121	-
Total Cost	$721	$660

4.2.2 Owens Illinois

Owens Illinois is located in La Mirada, California. The company manufactures plastic cosmetic bottles and prints on them. The screen printing process is automated and it uses a UV curable ink. A picture of the process is shown in Figure 4-1.

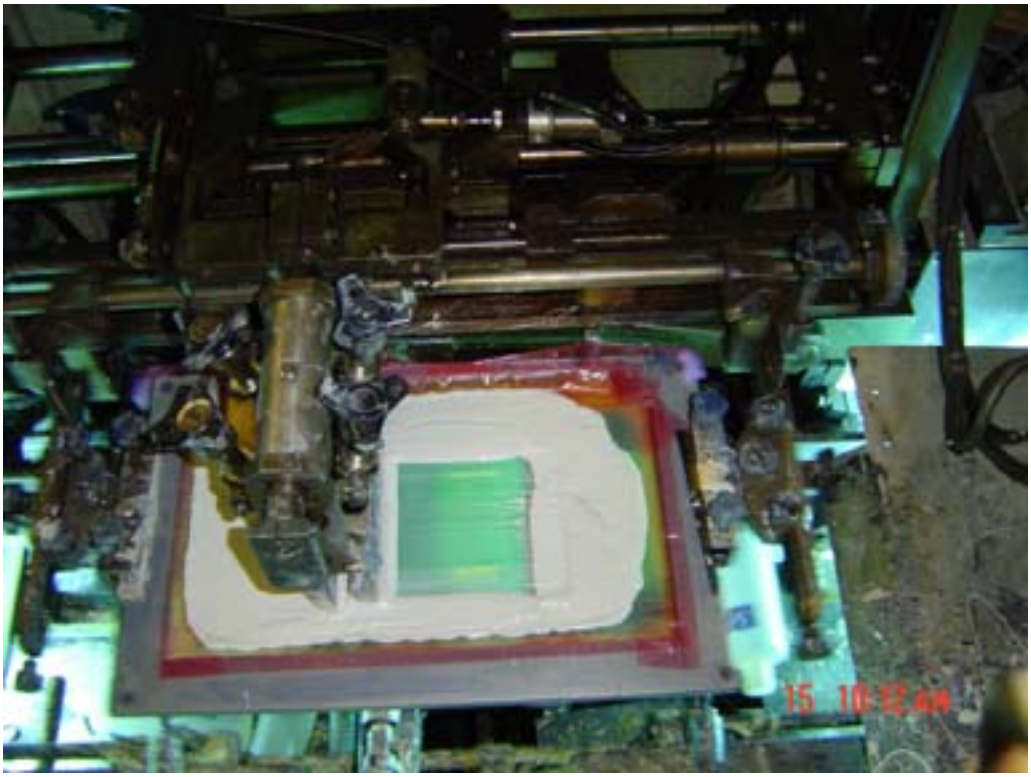

Figure 4-1. Screen Printing Operation at Owens Illinois.

Owens Illinois uses a VOC solvent for cleaning currently. Ink is cleaned from the screens with rags containing the VOC solvent at the end of a printing run. The cleaning solvent is also used to clean the bottom of the screens periodically during the printing run.

IRTA's screening testing indicated that soy based cleaners were effective in cleaning the company's ink. IRTA performed preliminary testing on some of the screens and on the in-process cleaning with soy based materials. Two of these high soy content materials, Soy Gold 2000 and Seibert Autowash #3, worked very well on the ink. IRTA selected

one of the soy products, Soy Gold 2000, which is water rinseable, for the scaled-up testing. IRTA provided five gallons of the cleaner to the facility and they used it for their cleaning. The results indicated that the cleaner performed very well for the in-process cleaning and at the end of the process. Some of the workers indicated that they liked it better than the current cleaner.

The only cost element that changed during the scaled-up testing was the cost of the cleaning agent. Owens Illinois currently uses 15 gallons per week of solvent and the cost of the current solvent is $13 per gallon. The annual cost for solvent purchases amounts to $10,140. The company would use the same amount of the soy cleaner but its cost is lower, at $6 per gallon. The annual cost for soy purchases would amount to $4,680.

Table 4-3 shows the cost comparison for Owens Illinois. The cost of using the soy based material is less than half the cost of using the current solvent.

Table 4-3
Annual Cost Comparison for Owens Illinois for Screen Printing

	Current VOC Cleaner	Soy Cleaner
Cleaner Cost	$10,140	$4,680
Total Cost	$10,140	$4,680

4.2.3 Southern California Screen Printing

Southern California Screen Printing (SCSP) is located in Fontana, California. The company performs screen printing services for the movie and advertising industries. SCSP uses UV curable ink for all of their operations. The screens used by the company are very large, perhaps 15 feet long and seven feet high. A picture of one of the screens is shown in Figure 4-2.

At the end of the screen printing process, SCSP must remove the ink from the screens. Currently the company has a bay where the ink removal occurs. The VOC cleaner is applied using a pump with a brush on the end for scrubbing the screens. The cleaner is applied to only one side of the screen except in the case of black ink. When black ink is used, both sides of the screen must be cleaned of ink. After the ink is cleaned, the stencil on the screen is removed and rinsed. The ghost image on the screen is then removed, the screen is rinsed again and, finally, is vacuum dried.

IRTA conducted screening laboratory testing on SCSP's ink and found several alternatives that might be suitable. IRTA did preliminary testing by hand cleaning screens at SCSP. The results of this testing indicated that only one cleaner, Seibert Autowash #3, was effective in cleaning the ink. This cleaner is a blend of soy methyl esters and a surfactant. An MSDS for the cleaner is provided in Appendix C.

Figure 4-2. Screen and Cleaning System at Southern California Screen Printing.

IRTA arranged for scaled-up testing at SCSP. Ten gallons were tested in the operation. The cleaner performed fairly well but more labor was required. All ink colors required the screens to be cleaned on both sides.

IRTA analyzed the costs of the alternative and compared them to the costs of the current cleaner. SCSP has one worker who spends seven hours per day cleaning screens. The worker's labor rate is $20 per hour. Assuming there are 260 working days per year, the annual labor cost for the cleaning process amounts to $36,400.

SCSP provided estimates of the labor breakdown for the cleaning process. The worker spends 20 percent of his time on ink removal, 20 percent of his time on stencil removal and rinsing, 20 percent of his time on ghost image removal, 13 percent of his time on final rinsing and seven percent of his time on the vacuum dry operation. For the cost analysis, it was assumed that the worker would spend twice the time when the alternative cleaner was used on the ink removal part of his job. On this basis, use of the alternative would add 1.4 hours of work per day to the cleaning process. The annual labor cost would amount to $43,680.

SCSP uses 110 gallons per month of solvent and the cost of the solvent is $11.53 per gallon. The annual solvent usage is 1,320 gallons and the annual cost of solvent purchases is $15,220. The cost of the alternative is estimated by the supplier at $7 per gallon. Assuming the volume of the cleaner would not change, the annual cleaner purchases for the alternative would amount to $9,240.

SCSP emits 1,320 gallons of VOC per year in the cleaning process. Assuming a density of seven pounds per gallon for the current cleaner, the company emits 4.62 tons of VOC per year. The SCAQMD fee for VOC emissions is $345 per ton. On this basis, SCSP's current annual emission fee is $1,594. The Seibert Autowash has minimal VOC content so it is assumed that emission fees will be negligible.

Table 4-4 shows the cost comparison for the current cleaner used by SCSP and the Autowash alternative. The figures show that the cost of using the alternative low-VOC cleaner and the current VOC cleaner are comparable. Although the labor cost is higher for the alternative, it is lower in overall cost than the current cleaner.

Table 4-4
Annual Cost Comparison for Southern California Screen Printing

	Current VOC Cleaner	Autowash #3
Labor Cost	$36,400	$43,680
Cleaner Cost	$15,220	$9,240
Emission Fees	$1,594	-
Total Cost	$53,214	$52,920

At the time of this writing, SCSP is investigating an alternative cleaner that they plan to adopt shortly. It is an acidic cleaner and the vendor indicates that it has a VOC content of 30 grams per liter. Because the testing is not yet complete, more information on and analysis of this alternative cleaner is not available at this time.

4.2.4 Nelson Nameplate

Nelson Nameplate is a company with about 270 employees located in Los Angeles. The company manufactures nameplates and part of the operation includes screen printing for the nameplates. Nelson uses a very durable solventborne ink which is difficult to clean. An MSDS for this ink is shown in Appendix A. Figure 4-3 shows a picture of Nelson's screen printing operation.

Nelson uses a blend of acetone and a VOC solvent for their in-process cleaning of the screens. The formulation is about half acetone. IRTA performed preliminary testing with Nelson's inks and found that acetone was an effective cleaner. At Nelson, IRTA and Nelson performed initial testing and found that acetone alone was not a suitable cleaner. The problem was that acetone, because of its high vapor pressure, evaporated very quickly "freezing" the ink on the screens. IRTA blended a new formulation containing 92 per cent acetone and eight percent of a propylene glycol ether which slowed down the evaporation of the acetone enough to prevent the "freezing." This formulation cleaned the ink effectively. An MSDS for the glycol ether in the blend is shown in Appendix C.

The high acetone content cleaner removed the emulsion from Nelson's screens. IRTA identified another emulsion that did not have this problem. Testing at Nelson verified

that the alternative emulsion could be used with the high acetone content alternative cleaner.

Both plain water and the acetone blend cleaned Nelson's UV curable ink. The company wanted one cleaner for the UV curable and solventborne inks.

Figure 4-3. Screen Printing at Nelson Nameplate.

Nelson currently uses 110 gallons per month of their press wash. The cost of the current cleaner is $10.60 per gallon. On this basis, the annual cost of purchasing the cleaning solvent is $13,992. The Nelson workers indicated they would use about twice as much of the alternative cleaner based on 92 percent acetone and eight percent glycol ether because it evaporates more quickly. The price of the alternative cleaner based on purchases of drum quantities is $4.40 per gallon. Assuming Nelson would require 220 gallons per month of the new cleaner, the annual cost of purchasing the new cleaner would amount to $11,616.

Table 4-5 shows the cost comparison for the current and new cleaner. The yearly cost of using the alternative cleaner is 17 percent lower even though more would be used.

Table 4-5
Annual Cost Comparisons for Nelson for Screen Printing

	Current Cleaner	Acetone/Glycol Ether Blend
Cleaner Cost	$13,992	$11,616
Total Cost	$13,992	$11,616

4.2.5 City of Santa Monica Paint Shop

The City of Santa Monica Paint Shop provides painting and screen printing services for the City of Santa Monica. The shop prints on paper, cardboard, plastics and metals. The City uses an enamel air dry ink on metal signs. For some of the traffic signs, the City uses several other inks including a translucent reflective traffic sign ink.

IRTA began work with the City of Santa Monica on a project sponsored by EPA. The City uses a commercial cleaning agent for removing the inks and sometimes follows with MEK. The cleaner is applied to the screens by hand. IRTA performed preliminary laboratory testing and found that one water-based cleaner called Mirachem Pressroom Cleaner, a soy based cleaner called Soy Gold 2000, acetone and a blend of 92 percent acetone and eight percent glycol ether removed the enamel ink but that only acetone based cleaners removed the other inks. IRTA performed scaled-up testing with the company and found the same results.

Over the last several months, the City has been using plain acetone for cleaning the non-enamel inks. One problem with the acetone is that it tends to remove the stencil the shop uses for these types of inks. If the acetone is removed immediately, however, the stencil is not damaged.

The City has not had any enamel ink applications over the last few months but has a choice of acetone or soy based products for removing these inks.

IRTA analyzed the costs to the City for using the current cleaner and acetone on the non-enamel ink. The City purchases eight gallons per year of cleaning solvent at a cost of $14 per gallon. The total annual cost of the cleaner amounts to $112. The use of acetone is estimated to be the same. Assuming a cost of acetone of $7 per gallon, the annual cost of using the acetone cleaner would be $56.

Table 4-6 shows the cost comparison for the City. The cost of using acetone for removing the inks is half the cost of using the current cleaner.

Table 4-6
Annual Cost Comparison for City of Santa Monica for Screen Printing

	Current Cleaner	Acetone
Cleaner Cost	$112	$56
Total Cost	$112	$56

4.2.6 Stith

Stith is a small textile screen printing company located in Santa Fe Springs. The company applies an emulsion to the screen which is exposed to form a stencil, prints primarily on T-shirts and then cleans the ink from the screens using a parts cleaner containing mineral spirits. The screens are then rinsed and the stencil is removed in some cases. In other cases, the stencil is saved for future printing for the same customer.

IRTA performed laboratory screening testing of several alternatives on Stith's ink. The company uses traditional plastisol textile printing ink. Acetone, one water-based cleaner and various soy products worked well. IRTA took these alternatives to Stith and performed preliminary testing by using rags with the alternatives to hand clean the screens. All of the alternatives worked well.

IRTA provided Stith with a parts cleaner containing a water-based cleaner called Mirachem Pressroom Cleaner at about a one-third concentration. An MSDS for this cleaner is provided in Appendix C. Stith tested the cleaner but it removed their stencil and blockout. Although there are emulsions that are both solvent and water resistant, Stith did not want to change their emulsion for the testing. At that stage, IRTA provided a parts cleaner containing a soy based cleaner called Soy Gold 2000 to Stith. An MSDS for this soy based material is provided in Appendix C.

Stith found that the soy based material cleaned the ink but, because the cleaner has a lower vapor pressure than their current cleaner, they would have to have an extra rinse step. Stith also found that use of the soy cleaner led to pinhole damage in the stencils and they had to be repaired.

Stith already has a parts cleaner and could use the soy product in that unit. Thus, no capital investment in equipment would be required to convert to the soy alternative.

Stith has one employee who spends four to six hours per day cleaning screens. The labor rate for this worker is $10 per hour. The annual labor cost for cleaning, assuming the worker spends five hours a day cleaning for 260 days per year is $13,000. If the company converted to the soy cleaner, the worker would have to spend an extra two hours per day rinsing the screens. In addition, the worker would need to spend about two minutes more to repair the damage from pinholes for each screen. Stith cleans about 30 screens per day so use of the soy would increase the cleaning time to seven to nine hours per day. The annual labor cost for cleaning the screens would amount to $20,800.

Stith currently changes out their parts cleaner, which has a fluid capacity of 25 gallons, once per year and adds five gallons of makeup solvent per month to the parts cleaner. Thus, the company purchases 85 gallons of mineral spirits per year. At a cost of $2.40 per gallon, the total annual cost is $204. The soy would require changeout once a year but less makeup solvent would be required because of the lower vapor pressure of the soy. Assuming that the makeup would be five gallons per quarter, the total soy usage

would amount to 45 gallons per year. At a cost of $6 per gallon, the cost of purchasing soy would be $270 annually.

Stith currently disposes of the mineral spirits at a cost of $375. The cost of disposing of the soy cleaner would be the same.

Table 4-7 shows the cost comparison of the current cleaner used by Stith and the alternative soy cleaner. The figures show that conversion to the soy cleaner would increase Stith's cleaning costs by about 58 percent.

Table 4-7
Annual Cost Comparison for Stith for Screen Printing

	Mineral Spirits	Soy Cleaner
Labor Cost	$13,000	$20,800
Cleaner Cost	$204	$270
Disposal Cost	$375	$375
Total Cost	$13,579	$21,445

4.2.7 Quickdraw

Quickdraw is located in West Los Angeles, California. The company is a textile printer and most of their work involves printing on T-shirts. Quickdraw removes the ink from the screens after printing. The company uses a VOC solvent for cleaning the screens currently.

IRTA tested two alternative cleaners with Quickdraw. IRTA provided the company with a heated parts cleaner containing a water-based cleaner called Mirachem Pressroom Cleaner at about a one-third concentration. An MSDS for this cleaner is shown in Appendix C. The company used the Mirachem for several months and found it satisfactory. IRTA also tested a soy based cleaner called Soy Gold 2000 in a parts cleaner with Quickdraw. The MSDS for this cleaner is shown in Appendix C. Again the company found this alternative satisfactory.

To use the Mirachem alternative, Quickdraw would need to purchase a heated water-based parts cleaner. Assuming the parts cleaner would cost $1,500 and a ten year useful life for the equipment, the annualized equipment cost would be $150. The company has a cleaning system with a pump and a brush currently. The soy could be used in this equipment. Thus for a conversion to soy, the company would not have to make a capital investment.

Quickdraw currently spends about four hours per day cleaning screens. Assuming a labor rate of $10 per hour and 260 hours per year of operation, the annual labor cost is $10,400. Quickdraw estimates that the labor cost with use of the Mirachem cleaner would increase by 10 percent because it does not remove the ink as easily as the current solvent. Thus the labor cost with the Mirachem alternative would amount to $11,440. Quickdraw

estimates that an extra hour of labor would be required each day for the soy because the screens would require rinsing. Assuming five hours per day for cleaning, the labor cost for soy would be $13,000 annually.

Quickdraw currently uses seven gallons of solvent in six months. The cost of the cleaner is $11.40 per gallon and the annual cost of the cleaner is $160. The parts cleaner used with Mirachem would require changeout every six months. Assuming a parts cleaner capacity of 30 gallons, the use of the liquid would amount to 60 gallons. The Mirachem is used at a concentration of 30 percent which means that 20 gallons of Mirachem would be used each year. Assuming a cost of Mirachem of $10 per gallon, the annual cost of purchasing Mirachem would be $200. The soy cleaner is as efficient at removing the ink as the current solvent. Quickdraw would likely use the same amount of soy as the current cleaner. Assuming a cost of $6 per gallon for the soy, the annual cost of purchasing soy is $84.

The cleaning unit with the pump at Quickdraw has a one-fourth horsepower or 0.2 kW pump. The unit operates four hours per day with the current cleaner. Thus the electricity use is 0.8 kWh per day or 208 kWh per year. Assuming an electricity cost of 12 cents per kWh, the annual electricity cost with the current solvent is $25. The soy cleaner could be used in the same unit with the same annual electricity cost. The parts washer for the Mirachem cleaner is heated and the heater uses 1.5 kW; the pump uses 0.2 kW. Assuming the parts cleaner operates 4.4 hours per day (10 percent longer than the current cleaner) and that the electricity cost is 12 cents per kWh, the annual electricity use would amount to $233 with the Mirachem.

There is no disposal required with the current solvent. Use of soy would similarly not require disposal. Use of Mirachem would require disposal of 60 gallons per year of waste. Assuming a cost for disposal of $1 per gallon, the annual cost of disposal would amount to $60.

Table 4-8 shows the cost comparison for the current solvent, the Mirachem and the soy. The figures show that the cost of using the Mirachem is 14 percent higher than the cost of using the current cleaner. The cost of using the soy is 24 percent higher than the cost of using the current cleaner.

Table 4-8
Annual Cost Comparison for Quickdraw for Screen Printing

	Current Cleaner	Mirachem	Soy Cleaner
Capital Cost	-	$150	-
Labor Cost	$10,400	$11,440	$13,000
Cleaner Cost	$160	$200	$84
Electricity Cost	$25	$233	$25
Total Cost	$10,585	$12,023	$13,109

4.2.8 Melmarc

Melmarc is a textile printing company with 180 employees located in Santa Ana. The company processes 60,000 to 80,000 garments per day and uses about 1,500 screens per day. They have 10 automated screen printing machines and four manual presses. After the screens are used for printing, they are cleaned in a conveyorized custom designed machine that uses solvent with brushes for cleaning the ink from the screens. The cleaning machine has several stages for rinsing the solvent from the screens and removing the stencils and the haze. The stencils are removed from more than 95 percent of the screens and the screens are then reused in the process.

IRTA conducted preliminary laboratory testing on the plastisol ink used by Melmarc. Several water-based cleaners and soy based products performed well. IRTA then conducted testing at the facility. IRTA staff removed the ink from the screens by hand to screen potential alternative cleaners in several different sessions. After the ink removal, the screens were put through the cleaning unit for rinsing. The manager said the screens were clean and indicated that the ink removal had been successful.

IRTA prepared for a scaled-up test. Two alternatives were to be tested. The first was one of the water-based cleaners, Daraclean 236, that performed well. The second was a soy based cleaner called Soy Gold 2000. The management of the company changed during the testing. The new screen and equipment manager refused to allow IRTA to conduct the scaled-up testing.

4.2.9 Total Enterprises

Total Enterprises is a textile printing company located in downtown Los Angeles that prints on 450,000 pieces each week. The company has eight automated machines and several additional manual machines. The company has a parts cleaner that is used to remove the ink; the parts cleaner is supplied by a service provider and it uses mineral spirits.

IRTA conducted preliminary laboratory testing with the plastisol ink used by Total Enterprises. The ink was successfully removed with Mirachem Pressroom Cleaner, a water-based cleaner, and with soy based products. In initial testing at the facility, the Mirachem removed the emulsion so facility personnel indicated that this would not be acceptable. In scaled-up testing, IRTA provided a parts cleaner containing a soy based product called Soy Gold 2000 to Total Enterprises. The soy cleaner cleaned the ink well.

Total Enterprises uses a blockout that is water soluble. After cleaning the ink with the soy cleaner, the screens require a rinse. Rinsing the screens would remove the blockout which the company did not want to do. IRTA identified a blockout that was water and solvent resistant but the company refused to try it. In addition, there was a change in management and IRTA could not continue testing at the company.

4.2.10 Huhtamaki

Huhtamaki prints ice cream cartons for a variety of customers. The company has both lithographic and flexographic printing operations. IRTA analyzed Huhtamaki's cleaning agents for the flexographic printing operation which is classified as a specialty flexographic printing operation. In this operation, Huhtamaki uses waterborne inks like many other companies that perform this type of printing.

Huhtamaki uses a water-based alkaline cleaner to clean the photopolymer printing plates and various metal parts from the press. The company has used this cleaner for many years. IRTA worked with Huhtamaki to test alternative water-based cleaners. Huhtamaki wanted a cleaner that had a lower pH than the cleaner they are currently using and they wanted an alternative cleaner that cleaned more effectively. IRTA and Huhtamaki found an alternative cleaner that met these criteria and the company is currently performing scaled-up testing. The cost of the current cleaner and the alternative are comparable. An MSDS for the alternative cleaner, called Mirachem Pressroom Cleaner, is provided in Appendix C.