

## ►► *Effects of Water Pressure and Chemical Treatment Combinations on Screen Reclaiming*

*Dawn Hohl,  
SPTF Technical  
Training & Resource  
Manager and Johnny  
Shell, SGIA Vice  
President of Technical  
Services*

### Executive Summary

**M**esh is essential to screen printing success. It's also one of the most costly materials used in the screen printing process — and that cost increases with the size of the screen. Therefore, reclaiming a screen is an important facet of a cost-effectiveness and quality. Too often, too few printers take the time and effort to determine the best way to protect this investment. SPTF conducted this study to evaluate the relative effectiveness of stencil reclamation with various combinations of cleaning/reclamation chemicals with each of three water pressures

(a common garden hose with a spray nozzle; 1,000 psi from a pressure washer and 3,000 psi, also from a pressure washer).

The tests featured nine screens and an image containing halftones, type, reverses and lines in a variety of patterns ganged in a 3 by 3 grid and exposed on a 305.34 (tpi) mesh.

Three ink systems were used in the screen, and three different chemical treatments were used for de-coating. All stencils and reclaiming operations on this set of three screens came from a specific line of chemicals and emulsions from a single manufacturer.

SPTF performed an additional test on a tenth screen to evaluate some chemical methods specific to a 3,000 psi pressure system.

From its investigation, SPTF concluded that improving pressure and procedures will result in cleaner screens and therefore reduce mesh costs as well as the expenses and downtime associated with remaking screens. It's essential that an operation evaluate its reclaiming procedures and equipment periodically to determine if new methods and procedures can improve results. Further, any costs involved in implementing a new procedure may be offset by increased profits.

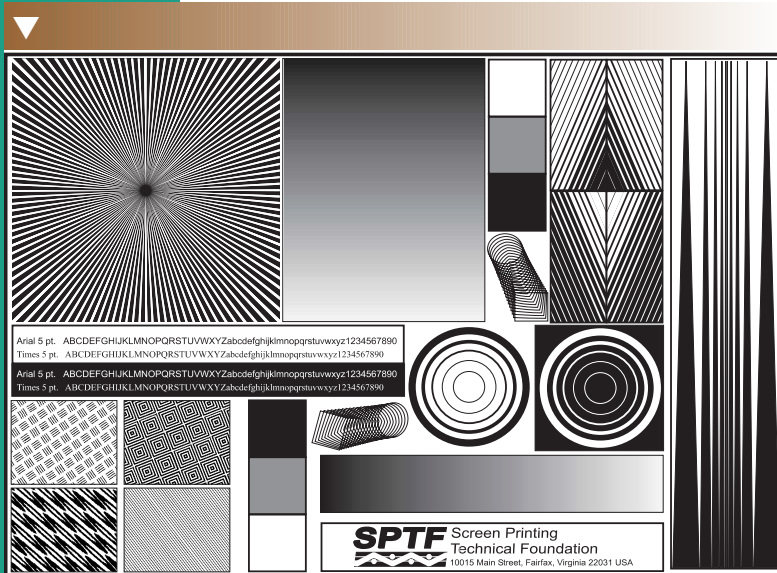
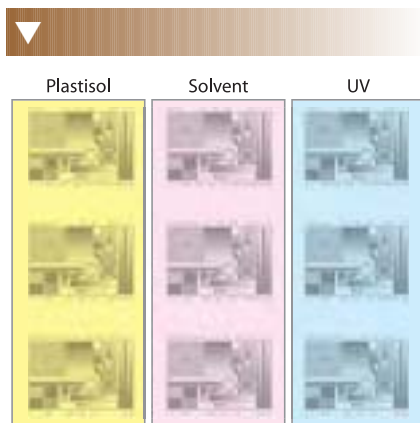


Figure 1: The test used a 3x3 layout of the graphic assembly above.

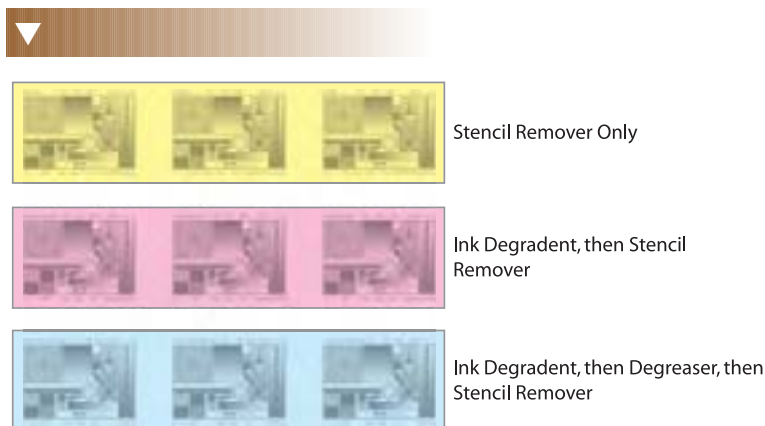
In light of this analysis, SPTF recommends the following steps. These steps are explained more fully at the end of the report:

- Use high-pressure washers (1,000 psi or higher) during reclaiming to improve the screen's cleanliness and reduce the use of haze removers.

- Test to determine an ink degradant/wash improves reclaiming results, and if it does, make it a permanent part of the reclaiming procedure. Be



**Figure 2:** Each column in the image was printed with a different ink system.



**Figure 3:** Each row in the image was treated with a different chemical combination.

**“ Ineffective methods, inefficient equipment and poor chemical choices can cause screen breakdowns, image flaws, and screen inventory shortages. ”**

certain the chemistry and the ink are compatible.

- Wipe the ink out of the screen immediately after it is removed from press using a press wash or ink wash (as a spray system or wipes) that's compatible with the ink. Reclaim the screen immediately after removing the ink.

- Compare ink washes and press washes to see which one produces the best results, then base your choice on the results, not solely the cost. A slightly more expensive chemical may extend mesh life and therefore reduce overall expenses.

### Introduction

Mesh is undeniably one of the most costly materials used in the screen printing process. The larger the screen the greater the investment it becomes, in terms of both labor and material. To top it off,

*everything* revolves around the mesh in screen printing: A screen problem can actually stop the whole printing process in its tracks. Mesh failure of one kind or another costs money on wasted substrate, press downtime, and screen remakes — and that's just for starters. It is, in fact, the heart of our process, essential to success.

With screens carrying this much importance in the printing process, it makes sense to take the time to protect that investment with proper maintenance and cleaning. But screen reclaiming is frequently overlooked. Too often, little time and effort is spent determining the most efficient, safe and successful way of accomplishing it.

In today's changing market, the successful company must optimize its reclaiming practices to remain competitive. Ineffective methods, inefficient equipment and poor chemical choices can cause screen breakdowns, image flaws, and screen inventory shortages. Giving attention to this forgotten area has the potential of lowering costs, improving quality and ultimately increasing profits.

To help printers improve their reclaiming operations, the Screen Printing Technical Foundation investigated some common variables in the reclaiming process. The objective of the study was to evaluate the relative effectiveness

of stencil reclamation when using various combinations of cleaning /reclamation chemicals and three water pressure settings. The following report includes an overview of the experimental method, a description of the conclusions drawn from the results, and a list of recommendations to improve reclaiming practices based on those results.

### Experimental Method

The project was engineered to create more than 1,044 combinations of test conditions. The results supply qualified information on the differences in using three water pressures for reclaiming as well as three reclaiming chemical methods. The following is a brief overview of the experiment.

The test image contained halftones, type, reverses and lines in a variety of patterns (Figure 1). The same image was ganged in a 3x3 grid and exposed on a 305.34 tpi mesh.

Three ink systems were used in the screen (Figure 2) and three different chemical treatments were used for the de-coating procedure (Figure 3).

Three screens were created with this setup, each one being reclaimed with a different water pressure throughout the experiment: a standard garden hose with a typical spray nozzle, 1,000 psi pressure washer and 3,000 psi pressure washer. (Note: The high-pressure unit actually registered 3,500 psi.) Water temperature remained constant at 80 degrees Fahrenheit (26.7 degrees Celsius).

A specific chemical/emulsion line from one manufacturer was used for all the stencils and reclaiming operations on this set of 3 screens. The chemical selections included a degreaser, direct emulsion, stencil remover, ink degradant/wash and press wash. The ink degradant/wash and press wash were compatible with all three ink systems.

All three screens were printed, reclaimed, and then measured three times to show a cumulative effect of repeated print runs. The screens were also de-hazed and measured after the second print run.

Two more sets of three screens were then produced, and the test was repeated using two other manufacturers' chemical lines and emulsions. This brought statistical significance to the comparison of the methods and pressures actually being tested.



Figure 4: The three areas in the image were referenced for the spectrodensitometer measurements using a film template with the areas of interest cut out.

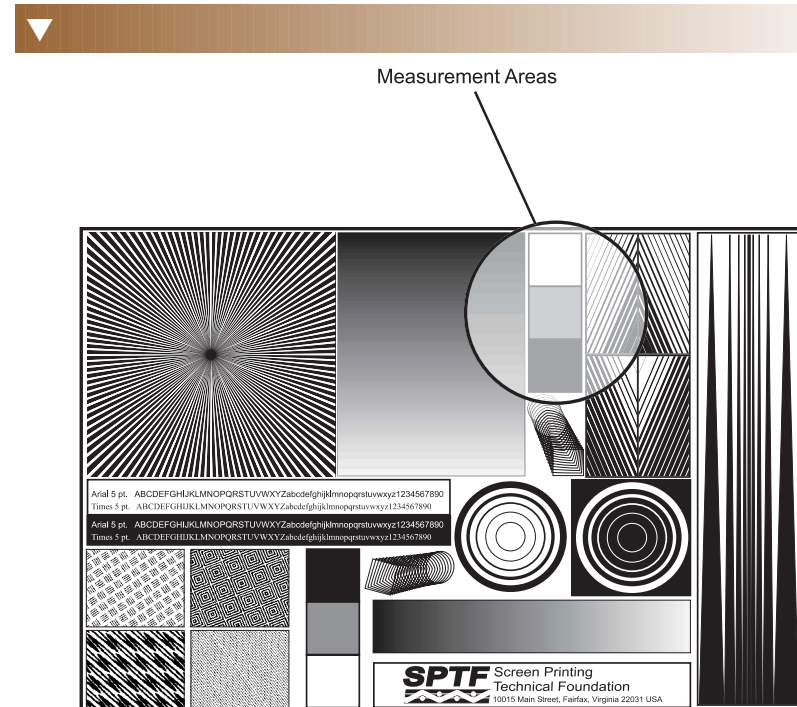
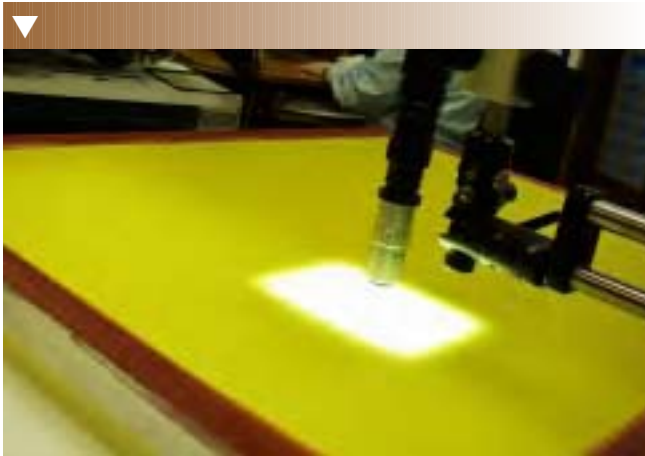


Figure 5: The three areas measured included a mesh only area, a 50 percent halftone tonal area, and an area where the stencil was solid.



**Figure 6:** Positioning SPTF's high-resolution video camera over specific areas of each screen captured magnified images.



**Figure 7:** The magnified images showed residue or the absence of residue for each combination.



**Figure 8:** Square squeegee strips were glued on the screen as dividers to keep the inks separate.

## Measurement/ Observation Methods

SPTF evaluated and measured each screen after each reclaiming. Methods included:

- Taking a digital photograph of each screen after reclaiming.
- Measuring the color of the reclaimed mesh using a hand held spectrodensitometer — Measurements were taken in the open mesh, 50 percent tonal area and solid stencil area of the image.
- Capturing a close up of the mesh using SPTF's image analysis system at a magnification of 125 times. The 50 percent area in the reclaim only chemical method of all three ink systems was selected for this evaluation point.
- Evaluating resulting prints after each print run for the presence of ghost images.
- Recording personal observations during the reclaiming process for each screen.

The spectrophotometric readings proved to be the most interesting and useful in our comparison. The changing color of the mesh from the stain (compared to the new mesh) made it easy to impartially track the effectiveness of the reclaiming variable combination.

Using a template that contained the areas of interest and a portable, hand-held spectrodensitometer (Figure 4), staff measured three areas in the image: an area where no stencil was present, a 50 percent halftone tonal area, and an area where the stencil was solid (Figure 5). Then, they compared the L a b measurements of the reclaimed screen to the L a b measurements of the new mesh to produce a Delta E value of color difference( DE). This DE value was used to accurately represent the degree of stain that occurred as compared to the new mesh.

SPTF's high-resolution digital video camera was positioned over the specified areas on each screen, again using a template (Figure 6), capturing an image that showed particles of residue or the absence of residue for each combination (Figure 7).

Additional measurements on the mesh and stencil were also taken. Mesh count, fabric thickness, EOM and Rz were measured on screen and stencil at appropriate points. Tension was also measured before and after all the printing and reclaiming stages.

*“The spectrophotometric readings proved to be the most interesting and useful in our comparison.”*

The results obtained using these methods will be presented later in the result section of this report. A document containing the specific measurements is available in the research area of SPTF’s Web site ([www.sgia.org/sptf](http://www.sgia.org/sptf)).

### Basic Procedure

What follows summarizes the basic experimental procedure, carried out over four days, for each set of three screens. Refer to the research area of the SPTF Web site for detailed, step-by-step procedures and variables used.

#### Day 1

A set of three 33.5 inches x 39.5 inches (85.1 centimeters by 100.3 centimeters) screens were stretched to the target tension and glued. All screens were made with the same mesh count (305 threads per inch (762.5 threads per centimeter), 34 micron thread diameter). The screens were tensioned identically using a pneumatic tensioning device and a rapid tensioning procedure. Target tension was 22 N/cm, the manufacturers’ midrange tension recommendation. The screens were then allowed to relax for approximately 24 hours at room temperature.

#### Day 2

All three screens were degreased, coated and exposed with the 3x3 image grid. Coating trough radius, speed and coats per side were adjusted for each emulsion to generate approximately the same stencil Emulsion Over Mesh (EOM). Exposure times were predetermined for each stencil system to ensure full exposure. The stencil EOM and Rz were measured before the screen was blocked out.

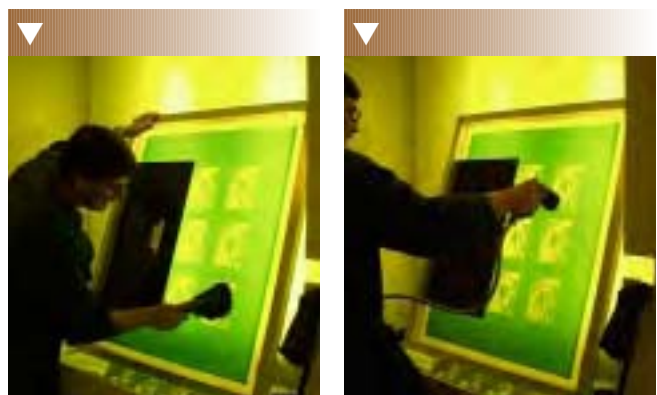
SPTF staff printed each column in the image on an uncoated card stock substrate using a different ink system. Square squeegee strips were adhered to the screen



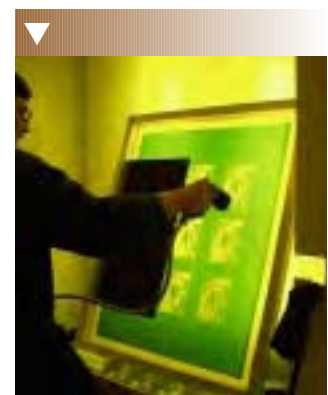
**Figure 9:** A sectionalized squeegee and floodbar were used to print all three inks at once.



**Figure 10:** Magnetic sheeting on both sides of the screen was used as the first mask to cover one row.



**Figure 11:** The appropriate chemical was sprayed on both sides of the remaining area of the screen that the mask did not cover, and the chemical was brushed on both sides.



**Figure 12:** The screen was then rinsed using the established water pressure for that particular screen.

to keep the ink separate (Figure 8). Then a sectionalized squeegee and floodbar were used to print all three inks at once (Figure 9).

After 100 impressions, the screen was removed from the press and the excess ink carded out. Staff wiped the ink out of the screen with press wash (based on chemical group) and disposable wipes, taking care to wipe each of the three ink areas separately so the ink would not mingle. After the squeegee dividers were removed they set the screen aside for a period of three hours at room temperature.

The screen was then reclaimed, each row of the image receiving a different chemical treatment. Magnetic sheeting on both sides of the screen served as a mask. The first mask covered one row (Figure 10), and an ink degradant/wash was sprayed, then brushed, on both sides of the remaining area of the screen (Figure 11). Staff then rinsed the ink degradant/wash using the established water pressure for that particular screen (Figure 12).



**Figure 14:** Example of how the screen looked after it was reclaimed in the experiment.



**Figure 13:** The second mask covered two rows, including the row the first mask protected.

**“A sectionalized squeegee and floodbar were used to print all three inks at once.”**

The second mask covered a second row in addition to the first (Figure 13). A degreaser was sprayed and brushed on both sides of the exposed row, then rinsed at the established water pressure.

The procedure required that, in the final reclaiming stage, all masks be removed and the entire screen be sprayed with stencil remover on both sides. The screen was brushed and allowed to sit for two minutes. The final rinse took place on the squeegee side at the established water pressure.

Each screen underwent this process, one using a garden hose, one with a 1,000 psi pressure washer and one with a 3,000 psi pres-

sure washer. After the screens were dried, they were measured and evaluated with the methods outlined earlier. Figure 14 shows a photo of one of the screens after reclaiming.

#### **Day 3**

Staff re-imaged the screens in the same manner, placing the image 180 degrees to the first run and printing 100 impressions. They evaluated print quality, then cleaned each screen with press wash, allowed to set for three hours and reclaimed with the chemical combinations as before. The screens were then measured and evaluated.

After evaluating the screens, staff applied a haze remover to the entire image area, following manufacturer



Figure 15: The 3,000 psi pressure washer used in the testing.

instructions. They left the haze remover on the screens for roughly the median recommended time. Screens were again measured and evaluated.

#### Day 4

For the third re-imaging, the image was rotated 180 degrees from the second run, and the screens were used to print just 25 impressions. The print was evaluated for quality. Staff cleaned each screen with press wash, allowed it to set for three hours and then reclaimed it with the chemical combinations described. A final measurement and evaluation was made on each screen, and the mesh was ripped out and saved.

This four-day procedure was repeated three times, once for each manufacturer chemical set, creating a total of 9 screens.

### Additional Test

An additional test was performed on a 10th screen to evaluate some

chemical methods specific to a 3,000 psi pressure system. A screen was stretched, stenciled and printed according to the above procedure, with the following changes:

1. A fourth chemical/emulsion set was used.
2. During the reclaiming process, the ink was carded from the screen, and just half of the image area was wiped with press wash. (This left one half with significant ink residue.) The screen was then allowed to sit for 3 hours as before.
3. Half of the screen was reclaimed with the 3,000 psi pressure washer (Figure 15) without applying reclaim solution (Figure 16). Using the masks as before, the screen side where the press wipe was used was reclaimed with the 3,000 psi washer after applying and brushing in a reclaim solution.

The six areas created were measured and evaluated in all points as

the previous nine screens.

The haze remover was applied to the entire screen and rinsed with 3,000 psi pressure after the second reclaiming, as before. All other points of the test remained the same.

### Results

While this experiment is simple in concept, the data created a maze of combinations that can be presented a number of ways. Because of the extensive data and graphs used to evaluate the information, only some are included in this report.

This analysis focuses on the impact of water pressure on reclaiming efficiency and the benefits of the cleaning/chemical combinations and methods commonly used in industry.

### Screen Data

Staff measured the screens for actual mesh count at tension, fabric thickness at tension, stencil EOM and Rz. The results (Chart 1) were consistent, confirming the validity of the comparisons between the emulsions used in the test and the experimental procedure.

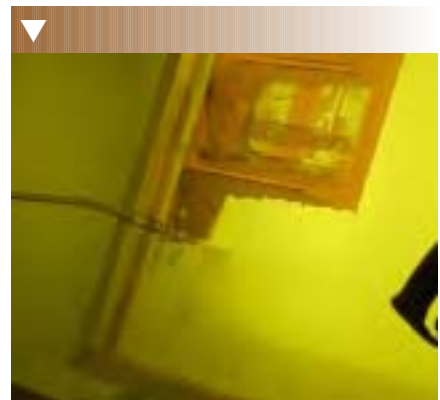


Figure 16: The additional test called for reclaiming the screen using the 3,000 psi water pressure without wiping the ink out or applying stencil remover.

Chart 1

Average Fabric Thickness	42.88
Average Emulsion/Mesh Thickness	50.44
Minimum Emulsion/Fabric Thickness	49.12
Maximum Emulsion/Mesh Thickness	51.06
Maximum Difference	1.94
Average EOM	7.56

Average Rz	13.8
Minimum Rz	12.49
Maximum Rz	15.15
Maximum Difference	2.66

The measured mesh count on all 10 screens varied by only a thread or two in both directions. Fabric thickness on the stretched screen was within a micron. All of the mesh used in the study was taken off the same bolt of fabric, and this data reflects that consistency.

Average EOM values from all the stencil coatings throughout the project (30 total) were within 2 microns of each other, despite the fact that four different emulsions were used. The Rz values of all the stencils were within 3 microns of each other. The average emulsion thickness was 7.56 microns, and the average Rz value was 13.8.

### Comparison of Water Pressure

To focus the comparison on the method and pressure effects, SPTF averaged the results from all three manufacturer's chemical sets to determine an overall trend in the data. In most cases these will be the graphs presented for discussion.

#### Stencil Residual vs. Ink Residual

In the solid stencil area of the image, the stencil residue was minimal in most cases, even on the garden hose screens. However, in looking at the 50 percent areas, stencil residue was visible, especially on the garden hose pressure. Figures 17, 18 and 19 are from one chemical set with solvent ink after the second run in the reclaim-only chemical method. The three figures show results from the three pressures tested. The garden hose result in Figure 17 shows bluish bits of emulsion left in the screen, as well tinges of black ink. There is significantly less stencil and ink residual left on the 1,000 psi image (Figure 18), and even less on the 3,000 psi image (Figure 19), but some bluish particles are still visible. In looking at all the images, the garden hose did have trouble removing the stencil residual in this 50 percent area. High water pressures improved this problem greatly.

All the stencils in the study were properly exposed, and as noted, the stencil-only area did not have much measurable stencil stain. But in the 50 percent area, the stencil particles are significant for the reclaim-only method. One possible explanation is that the presence of ink in this 50 percent area hindered the stencil reclaiming process, while in the case of the stencil-only area very little ink was present to interfere with

Chart 2

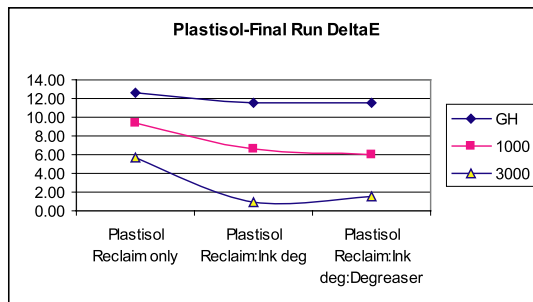


Chart 3

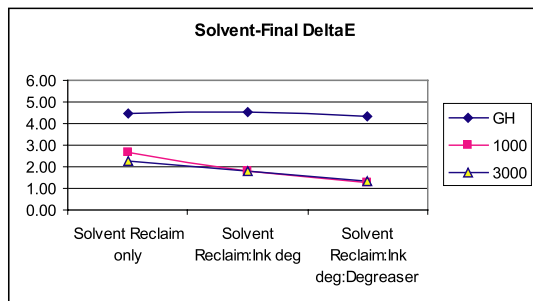
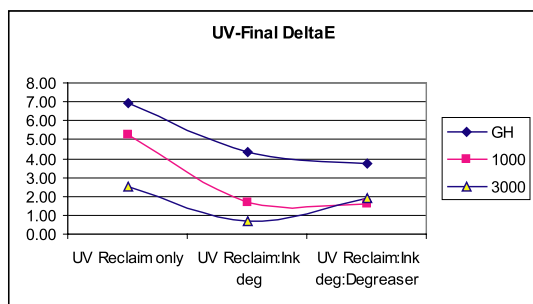


Chart 4



the chemistry. Images were not taken in the other two chemical methods areas, so it is unknown if the other two chemical methods would reduce the stencil particles remaining in this 50 percent area.

The ink residue can be compared in the image area where no stencil was present or in an open mesh area. Most of the comparisons here will focus on the mesh area or the area where the ink residual is the greatest. Charts 2, 3 and 4 show the average DE in that mesh area for the three pressures and three inks tested after the final reclaim in the experiment. The garden hose results for all three ink systems clearly showed greater residue than the 1,000 psi and 3,000 psi results. In the case of the plastisol and UV ink, progressive improvements from 1,000 psi to 3,000 psi are also evident. In some cases as much improvement was seen from moving from 1,000 to 3,000 as moving from a garden hose to 1,000 pressure.

The plastisol results show the most visible improvement from pressure with all the chemical methods tested. (The UV and solvent results do show this, but to a lesser degree.) Therefore, increases in pressure improve results regardless of the changes in chemical method used. So it is not logical to expect the same improvement from changing the chemical treatment as increasing the water pressure.

The solvent-based ink generated the least residue, and the plastisol the most on all nine screens tested. The UV ink had some staining, but in most cases it was not extreme. Clearly, the resulting ink residue is related to the ink type used.

Not only did the pressure help remove the ink during a regular reclaiming process, but in most cases it also improved the results obtained with the haze removers. Chart 5, 6, and 7 isolate the average DE after a haze remover was applied for each ink and chemical method. As before, the plastisol showed the most dramatic results, primarily because there was more ink residual (Chart 5). The solvent ink had the least stain, so there was not much to haze. But it still shows a slight improvement from the garden hose to the 1,000 and 3,000 pressures (Chart 6). The UV ink seems to have mixed results, but generally pressure did improve results overall (Chart 7).

Chart 5

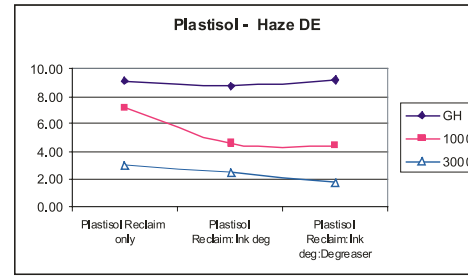


Chart 6

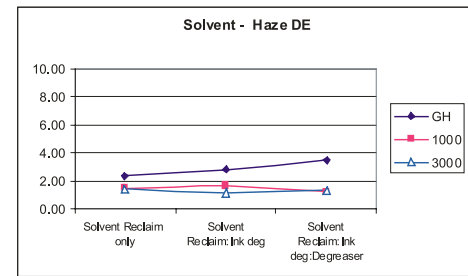


Chart 7

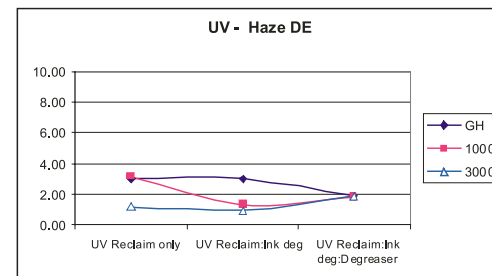
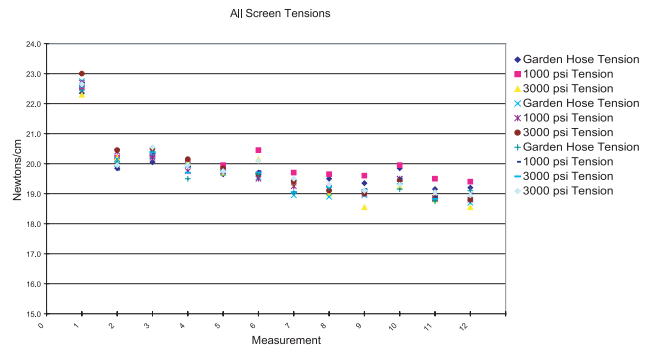


Chart 8



The distinct conclusion from all these observations is that higher water pressures clearly remove more ink residue than lower pressures, with or without the use of additional chemistry.

**Effect of Various Pressures on Screen Tension**

As mentioned, SPTF staff measured screen tension at 12 points throughout the experiment; they were able to directly compare the tension for all 10 test screens because the mesh count, tension, frame size and stretching procedure was the same for all screens.

The composite graph in Chart 8 shows very little difference in tension throughout the entire four-day test between all screens. There is a slight drop in tension (less than one N/cm) on one of the 3,000 psi screens, but the other three screens subjected to the 3,000 psi pressure do not show this drop, so it cannot be attributed to the water pressure. Additionally, all the screens were within one N/cm at the cut away tension, and remain roughly one N/cm of each other all the way through the test.

Chart 9

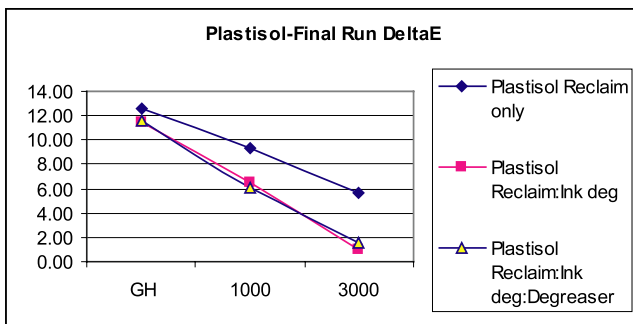


Chart 12

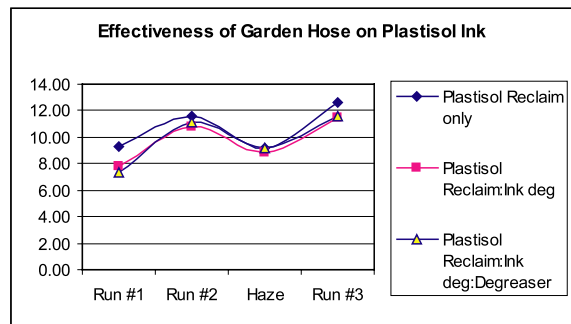


Chart 10

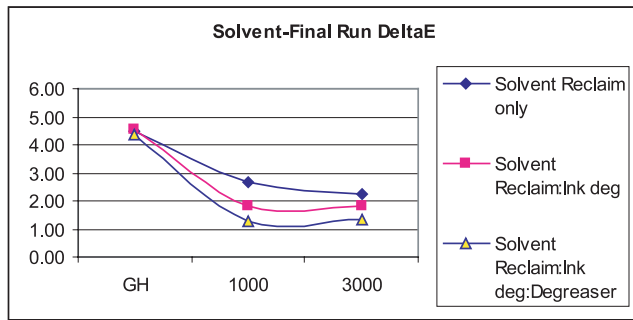


Chart 13

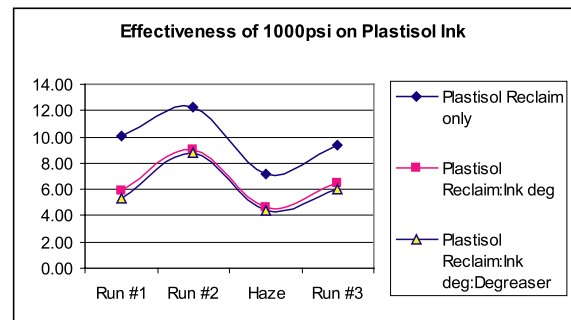


Chart 11

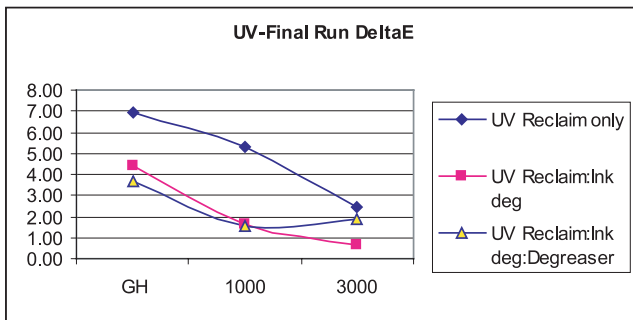
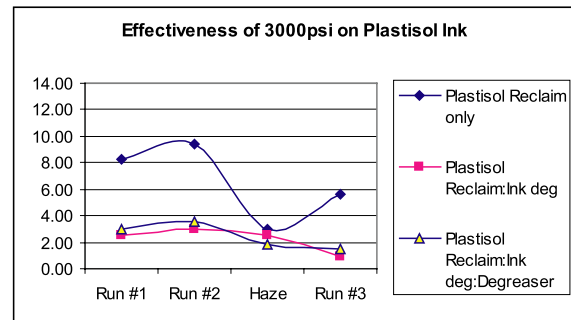


Chart 14



***“The benefits of adding an ink degradant/wash step in the reclaiming process are really only realized when high-pressure water is used.”***

It must be noted that one test screen did break during the last reclaiming using the 3,000 psi pressure washer. Whether the break was a direct result of the high pressure or another factor is not known. The 3,000 psi unit does have some operating requirements that must be observed for personal and screen safety.

### **Comparison of Chemical Combinations**

The graphs in Charts 9, 10 and 11 separate the chemical method differences for each ink and water pressure. First, the second and third chemical combinations show little to no change to each other on all three ink systems — the difference between them is the addition of a degreaser after the ink degradant step. It is obvious that, with the inks tested, this additional step produced little benefit and was not worth the time or money to perform.

When comparing the reclaim-only area to the other two chemical combinations that include an ink degradant, there is definitely an improvement. The plastisol shows the greatest change, which seems to intensify with higher pressures (Chart 9). The UV ink also shows improvements, especially with the lower pressures (Chart 10). The solvent ink showed so little staining

that the effects of these chemical combinations are not pronounced (Chart 11). It appears that adding an ink degradant step to the reclaiming process definitely reduces the ink residual.

When we compare the same ink with all three pressures and all the evaluation points, in Charts 12, 13 and 14, we see an interaction with pressure and method. The results from the garden hose do not display differences between the three chemical methods (Chart 12), but the 1,000 and 3,000 pressures revealed improvements from adding the ink degradant/wash (Chart 13). Similar outcomes can be seen in the solvent and UV inks. (Graphs are available on the SPTF's Web site, [www.sgia.org/sptf](http://www.sgia.org/sptf).) The benefits of adding an ink degradant/wash step in the reclaiming process are really only realized when high-pressure water (1,000 psi and above) is used.

#### **3,000 psi Test Results**

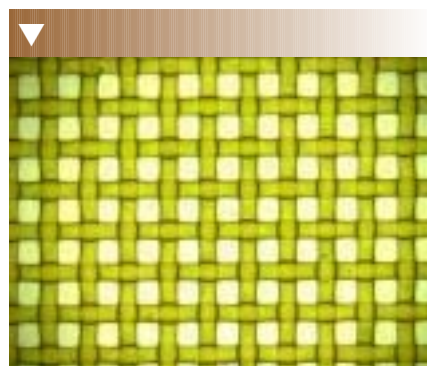
The 3,000 psi additional test screen answers the question of whether using a press wash and reclaim solution is important at super-high water pressures with a clear “yes”. The graphs shown in Charts 15, 16 and 17 illustrate the results for all three ink systems. The images where no chemical was used show an excessive stain for all inks after all three runs. In fact, in some



**Figure 17:** Image taken in the 50 percent area of Chemical 2, solvent ink, reclaim only method using a garden hose after the second print run reclaiming.

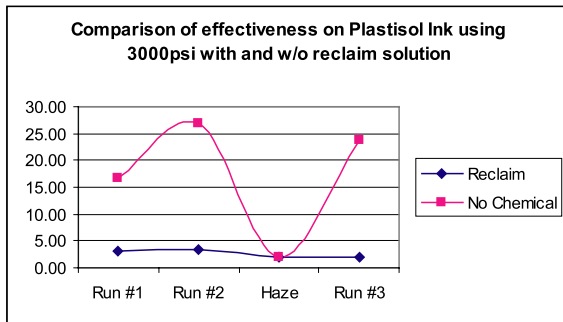


**Figure 18:** Image taken in the 50 percent area of Chemical 2, solvent ink, reclaim only method using 1,000 psi after the second print run reclaiming.

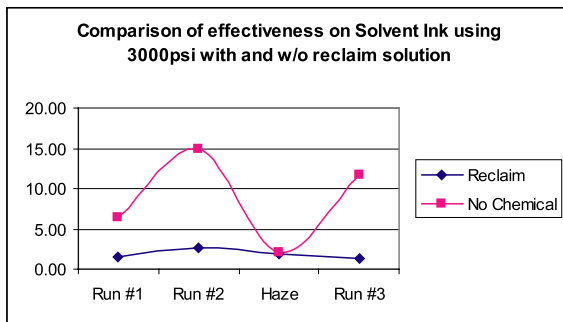


**Figure 19:** Image taken in the 50 percent area of Chemical 2, solvent ink, reclaim only method using 3,000 psi after the second print run reclaiming.

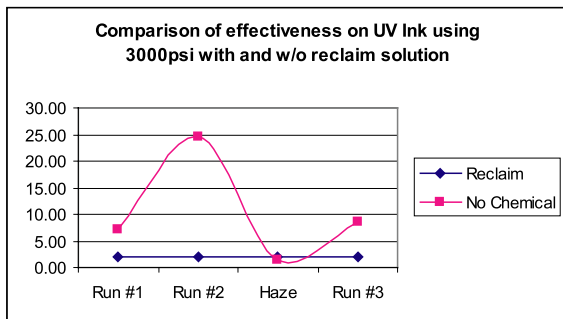
**Chart 15**



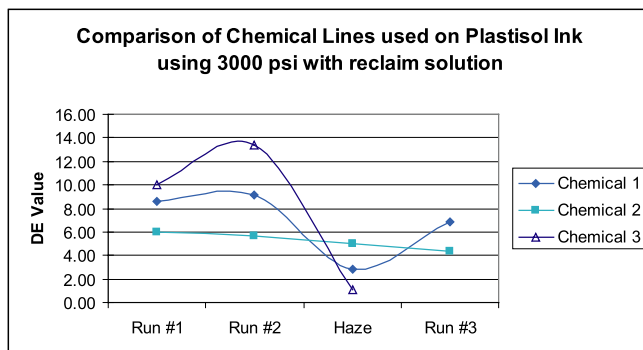
**Chart 16**



**Chart 17**



**Chart 18**



cases the reduction in stain was more than six times from just a press wash and reclaimer. The close-up images of the mesh in the 50 percent area exemplify the ink stain differences with and without chemistry on plastisol ink (Figure 20 and 21). When considering stencil residue in the comparison, there was no discernable difference between the chemical and no-chemical sides. Brute pressure does not take the place of using chemistry (press wash in this case) to break down the ink.

The high pressure is effective at removing the stencil without reclaiming solution (assuming the stencil is not underexposed), but using reclaiming solution does increase the time it takes to pressure wash the screen completely.

*“The close-up images of the mesh in the 50 percent area exemplify the ink stain differences with and without chemistry on plastisol ink.”*

Additionally, the area where the chemical was used did not require a haze remover with all three inks after the second print run under these conditions. In the comparable reclaim-only areas on the other 3,000 psi test screens, the plastisol ink showed the need for a haze remover for all three of the manufacturers’ chemicals tested (Chart 18). The other inks did not display this effect. This again points to the effectiveness of press wash.

Bottom line: Using press washes to remove the excess ink and reclaimers to dissolve the stencil significantly improves removing ink residual and reclaiming speed with a 3,000 psi pressure washer.

**Print Results**

During the second and third print runs, SPTF staff inspected the printed image for ghost images from the residual left in the screen. No ghost image was seen during any of the print runs, despite some significant residual in some of the test cases. The lack of a ghost print could be attributed to the absorbency of the substrate, but the precise reason is not known.

## Additional Observations

As described earlier, a press wash product was used to clean the ink out of the screen once it was removed from press. To focus on the press wash's relationship to the ink residual left throughout the test, look at the results after the first reclaiming in the area where only stencil reclaimer was used. The stencil reclaimer acts mainly on the stencil, whereas the other methods use an ink degradant/wash to further remove ink, making it possible to then infer the relative effectiveness of the press wash from this data.

We have already examined the results on the additional 3,000 psi screen test, which showed a dramatic difference between wiping and not wiping the ink out of the screen (Charts 15, 16 and 17). For the other nine screens in the test, the graphs in Charts 19, 20 and 21 compare the reclaim only, first-run data with the different chemical lines for all three pressures.

Clearly, the different press washes responded differently to the same ink, with all other variables and procedures being the same. It should be noted that the press washes used were multipurpose products that worked with all three ink systems. Using a press wash specifically designed for plastisol ink might have improved results seen with the plastisol ink used in the test.

The water pressure did not influence this effect much, even at 3,000 psi (Chart 21); this suggests that the chemistry and process of removing the ink from the screen directly after press cannot be replaced by sheer water pressure. Ink removal is

a step that should not be ignored or taken lightly.

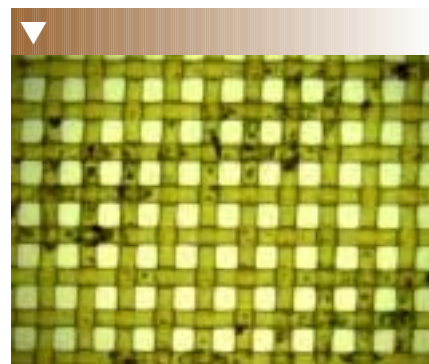
Ultimately, this demonstrates that the compatibility of press or ink wash chemistry with an ink line directly affects the amount of ink residual on the screen. It also shows that wiping or spraying the ink out of the screen directly after printing is critical to the whole reclaiming process. If indeed the press wash is a major factor in screen reclaiming, then changing to a more effective press wash could make a dramatic difference in reclaiming efficiency.

## Recommendations

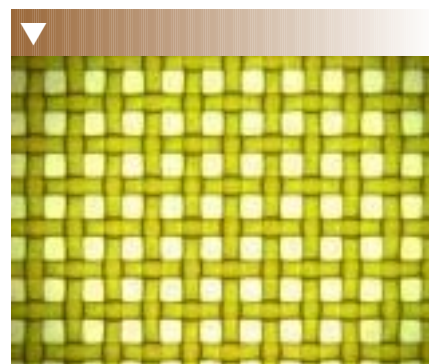
Based on these conclusions, the following general recommendations should provide practical information to shops wishing to make their reclaiming operations as effective and efficient as possible.

- Use high-pressure washers (1,000 psi or higher) during reclaiming. High-pressure water — in combination with press wash, ink degradant/wash and stencil removers — greatly improves the cleanliness of the screen. Pressure efficiency also can reduce the use of haze removers, which shorten the life of the expensive mesh. Reducing the need for haze removers also saves money by eliminating a step in reclaiming and chemical use and the associated costs of material, labor and environmental requirements.

- Test to determine if applying an ink degradant/wash before the stencil is removed will improve reclaiming results. Make sure the chemistry is designed for the ink used. If the ink degradant/



**Figure 20:** Image from the 50 percent area of additional 3,000 psi test using no chemistry with the plastisol ink after the second print run reclaiming.

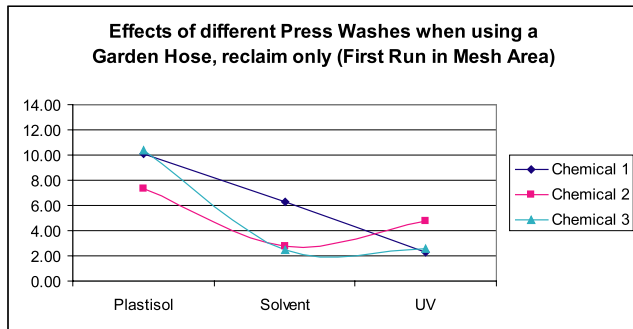


**Figure 21:** Image from the 50 percent area of additional 3,000 psi test using press wash and stencil remover with the plastisol ink after the second print run reclaiming.

wash does improve results, make it a permanent part of the reclaiming procedure.

- Wipe the ink out of the screen immediately after it is removed from press using a press wash or ink wash that's compatible with the ink. Use a spray system or wipes. The longer the ink sets in the screen after press the greater the stain will be. Reclaim the screen immediately after removing the ink.

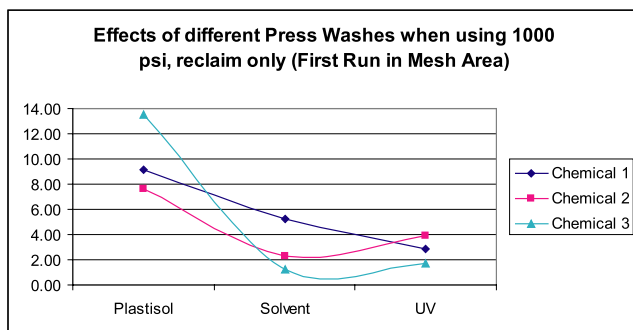
**Chart 19**



**“Screen printing shops can’t afford to neglect the reclaiming process.”**

■ Do some comparative testing with ink washes and press washes to see which one produces the best results with your ink systems. Don’t be afraid to spend a little extra money on a compatible clean-up chemical; it could be a simple improvement that can end up saving money. Some benefits that can be realized from this step include using less chemicals, shortening the reclaiming process, and reducing the use of haze removers and thereby extending mesh life.

**Chart 20**



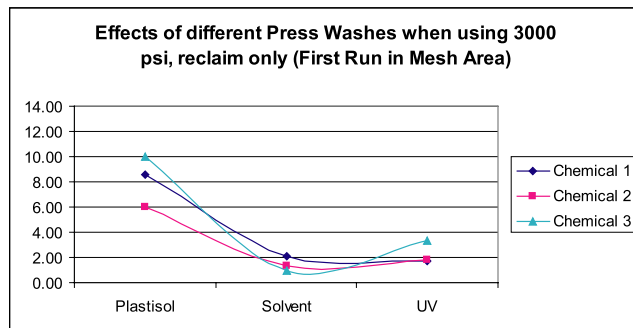
Following are additional ways to optimize reclamation efforts. A number of these were featured in the EPA’s Design for the Environment case studies, which SGIA and SPTF assisted in preparing in 1996.

■ Some ink staining can benefit from a second application of ink wash/degradant after the stencil is removed. This extra step could eliminate the need to use haze remover, extending mesh life.

■ If the screen is not immediately reclaimed after press, pre-treating it with an application of ink degradant/wash may help minimize ink residual.

■ If chemical recirculation systems (manual or automatic) are used, replace the chemistry at the appropriate intervals, so dirty chemistry doesn’t redeposit the ink on the screen.

**Chart 21**



■ Some chemicals (such as acetone and lacquer thinner) can actually make ink lock up in the threads, whether they are used on press or when removing ink from the screen. Likewise, some screen cleaning/opening chemicals can lock up your stencil, making the ink extremely difficult to remove. Rather than using these types of solvents, find a suitable replacement designed for screen printing inks.

■ If removing the stencil is difficult, it is most likely because your stencil is underexposed. Use an exposure calculator test to determine the correct stencil exposure for each mesh/tension/emulsion/coating technique com-

ination. Also, use an integrator to help compensate exposure as the lamp degrades over its life. Finally, make sure that the lamp distance is appropriate for the screen size so the entire stencil sees the proper amount of light.

- Using hot water instead of cold will improve reclaiming speed and results.

- Avoid using excessive squeegee pressure on press — high pressure drives the ink into the knuckles, where it gets trapped. Properly tensioned screens will make high off contact distances and excessive squeegee pressures unnecessary.

- Avoid abrading the mesh when possible. Abrasion is only necessary with indirect stencils and, in some cases, capillary films. (Refer to manufacturer's instructions.) If abrasion is necessary, use only rottenstone or a commercially-available screen printing abrasion product. Abrade the mesh on the substrate side only, and do not over-abrade by scrubbing hard or long. Abrasion should take place only once when the screen is brand-new. Repeated abrading will weaken the mesh and make reclaiming more difficult. It will also make the mesh more susceptible to damage from haze removers.

- Use a professional pressure washer rather than one of the low-cost ones available from home improvement stores. The higher-quality pressure washers have more horsepower, necessary for the continuous use required in a screen plant. Lower horsepower units will simply wear out quickly in this type of environment.

## Conclusion

This investigation and analysis illustrates that improving pressure and procedures will result in cleaner screens. Of course, this research and analysis is in no way a comprehensive test of all the possible chemical methods, inks mesh counts etc., but it certainly provides direction as to some critical points to evaluate.

Screen printing shops can't afford to neglect the reclaiming process. It's essential to examine a facility's reclaiming process, equipment and procedures and perform some simple testing under its unique conditions to determine if new methods and procedures can improve results.

Some changes may be simple, inexpensive and immediate, others more complex in expense and time. However, while overhauling your reclaiming department may incur extra costs upfront, it is likely these will be offset by improved productivity, fewer screen remakes (i.e., reduced labor and mesh costs) and increased screen throughput. The payoff could end up being significant to the bottom line.

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**Screen Printing  
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10015 Main Street  
Fairfax, Virginia, 22031-3489 USA  
Telephone: 703-385-1417  
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