

MURAKAMI SCREEN USA

Technical Newsletter - April 2014 - "Basic Screen Room Training"

MURAKAMI SCREEN U.S.A., INC. 745 Monterey Pass Rd. Monterey Park, CA 91754 Tel 323.980.0662

Basic Screen Room Training

This month's newsletter gets back to the basics of screen making. Spring is the start of the busy season in screen printing with new companies opening their doors and new employees that need to know how to make a screen. Not just any screen mind you, but a screen that will have few pinholes, produce sharp crisp art details, and avoid breakdown on press. So this month's article is an A to Z look at the products and process to create a durable screen.

Part One – Screen Preparation

1. Cleaning the screen prior to De-hazing – The first step in screen preparation is to analyze the mesh for ghosts of ink that show up from a previous print run. If the mesh is new you can skip to Step 2. But if your screen has a ghost image read on. Ghosts or fabric stains are caused by ink from the last print run. The ink can get caught in the 'creases' of the 'mesh knuckle' and is usually seen when dark inks are used. Ghosts can cause pinholes or show up in a solid print area on the next job since they can interfere with the ink transfer and leave a ghost in the print.



Use HR-700 or HR-701 to remove haze

(see details on page 2)

Preventing Screen Haze: The easiest way to minimize this issue is to clean the screens immediately after the print run. This includes plastisol as well as water base, discharge, or HSA inks. Cleaning screens while the inks are still wet will prevent ink from drying in the mesh knuckle creases. This is especially true of discharge, water base and HSA inks that can air dry. Once the ink has dried you will need a haze remover to clean mesh.

Murakami's SC-501, SC-505 and SC-507 are designed to clean the mesh well without chemically flashing the emulsion and making it hard to reclaim. Screen Openers, Acetone, MEK, and other hot solvent chemistries can lock in the emulsion and make reclaiming difficult. Murakami screen cleaners avoid locking in the emulsion which allows the reclaiming process to go easier.



SC-501

SC-505

SC-507

For water base and discharge inks a 5 gallon bucket of warm water works well, for plastisol or other inks the cleaners above work well, with **SC-507** designed for graphic and industrial inks as well as textile inks. When companies tell me they have no time to wash the screens after a job has finished on press I point out that screen reclaiming personnel will spend 2 to 3 times as much time cleaning the dried ink compared to a worker cleaning wet screens at the press. Typically all that needs to be done is to card out the inks and wash the image area. This practice makes ghost removal in the reclaiming area an occasional job rather than needing to do it on all screens which wastes chemistry and labor.

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2. Reclaiming the Screen: Dip tanks help save emulsion remover and soften the emulsion for reclaiming. **Murakami ER-605** or **ER-660** can be used in the dip tank. For hardened screens ER-605 can be mixed 15:1. Always reclaim the screens before the emulsion remover can dry on the screen. If you apply emulsion remover and allow it to dry, it may be impossible to reclaim since emulsion remover can lock in the emulsion once it has dried on the stencil.



3. De-hazing: The residual image left by the previous print job can be difficult to remove once the ink has dried in the screen. If left in the mesh it can affect the appearance of the next print run. Discharge prints may not show anything when the ink is wet, yet when cured this previous print image will appear within a solid area of the print when cured. Process and Simulated Process jobs can also be affected. Add to this an increased risk of pinholes and break down in the ghost area and it is clear the screen is better off with the ghost image removed.

HR-701 is a non-caustic haze remover, a safer haze remover if you will. It needs to be used as soon as possible after the job has been broken down and the screen reclaimed. It can be applied and left on the screen for 10-15 minutes, then rinsed, prior to using a pressure washer to remove the ghost image. It works better on softer ghost images where the ink has not completely dried.



HR-700 is a caustic haze remover, and requires careful handling. Employees must wear eye goggles, long industrial gloves capable of resisting acid. Avoid typical latex gloves used to mix ink or press work, they aren't capable of resisting this chemical. A large rubber apron and over shoe rubber boots are also recommended.



Why? This haze remover is extremely acidic and can cause serious burns, loss of skin, blindness, and well anything human it comes in contact with is going to be burnt badly with corrosive acid. How does cleaning the screen right after the job look now? A lot easier than dealing with this stuff for sure.



Recommended Personal Safety Equipment when using caustic haze removers.

But at some point in all companies it must be used. Apply it with the personnel safety protection equipment listed above. Apply to the ghost area and let it sit for no more than 5 minutes. Any longer and the acid will also start dissolving the mesh. Each time this product is used the mesh is affected. After many applications the mesh may become weak and break due to threads that have become so thin they can't hold tension. After allowing the HR-700 to sit for 5 minutes rinse it off with a hose. Avoid using the pressure washer. It can cause the acid to bounce back onto the worker or nearby screens and work areas. A steady stream of water from a hose with the end cut off is the easiest way to avoid bounce back of the acid. Once the majority of the acid is rinsed off the pressure washer can be used to help clean the ghost from the mesh.

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4. Degreasing the Screen: On a recent trip I was amazed to find 2 of the companies I visited did not use any degreaser! Cost savings was the reason they didn't use it. Not needed they said. Yet they did put tape on every square inch of the screen except the image, used lots of labor to do it, and then spent more time taking inexpensive brown shipping tape off. This type of tape leaves adhesive residue on the frames, more cleaning, more labor, more money, when all they really need to do is degrease the screen well and use a quality emulsion like Murakami that they can trust won't pinhole or breakdown on press.

DGR-801 is one Murakami's screen degreasers, the other is **MS-Cleanser**. Both leave the mesh PH balanced and free of oils. Most commercial soaps have lanolin or other additives that leave an oily residue on the mesh. **DGR-801** leaves the mesh in perfect condition for coating. **MS-Cleanser** is an even better degreaser and is widely used for the making of high end screens for electronics and graphics. It does wonders on mesh. Water sheets off the mesh surface and perfectly prepares the mesh for coating.

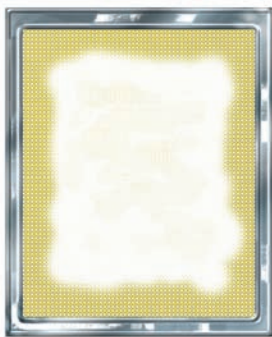
Some tips for degreasing:

For fine mesh use a sponge or soft brush that won't nick the threads. Make this a dedicated brush or sponge. It shouldn't be used for any other purpose. This is to avoid contamination with other chemistry, dirty screens, dirty sink, etc.

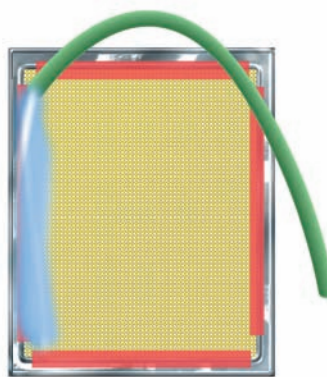
Keep it separated from all other processes to preserve the cleaning qualities. Wash both sides of the screen covering the entire area of the mesh. Rinse with a hose to avoid bouncing back contaminants from the sink, or have 2 sinks, one for reclaiming, one for degreasing to keep contaminants from bouncing onto the screen.

Rinse the inside creases where the frame meets the mesh first. Flood the creases with water on all four sides of the inside of the screen to remove any degreaser. Then rinse from the top of the screen down, letting the sheeting action of the stream of water wash off all degreaser on both sides of the screen.

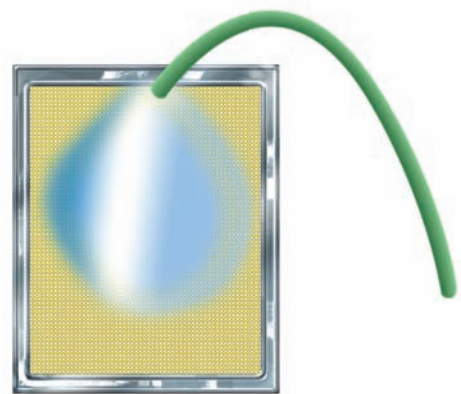
If you have a second sink dedicated for degreasing you can use a pressure washer to speed up the process. I still like a final rinse with the hose to remove any bounce back contaminants.



1. Apply degreaser to both sides of the screen



2. Rinse the red areas well with water to remove contaminants



3. Next rinse mesh from the top of the screen

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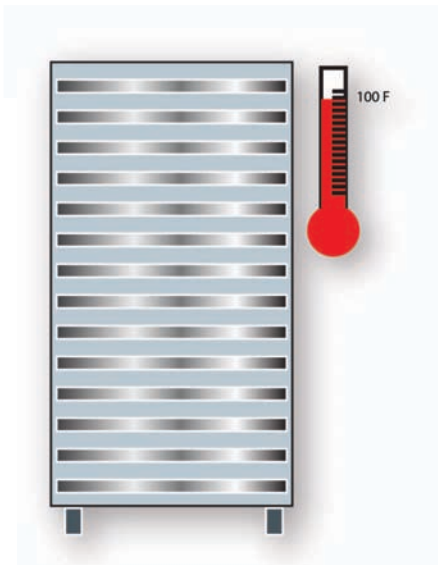
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Drying the screen: To avoid fish eyes or ribbons it helps to dry the screen horizontally off the floor in a dust free area. If you prefer to dry them vertically in groups in front of a fan just make sure to rinse screens completely. Drying the screens in racks off of the floor helps to prevent dust from being blown onto the mesh which later can become pinholes. Drying on the floor needs to be done in a clean area, not in a heavy traffic area where dust and shop dirt can be tracked in and blown onto the screens by a drying fan.

Using dedicated drying closets with 90-100F temperature along with good air movement accelerates the drying process and prevents dust contamination. (Note: if you use the drying cabinet to dry emulsion as well, lower temperature to 80F. See notes on drying emulsion below.)



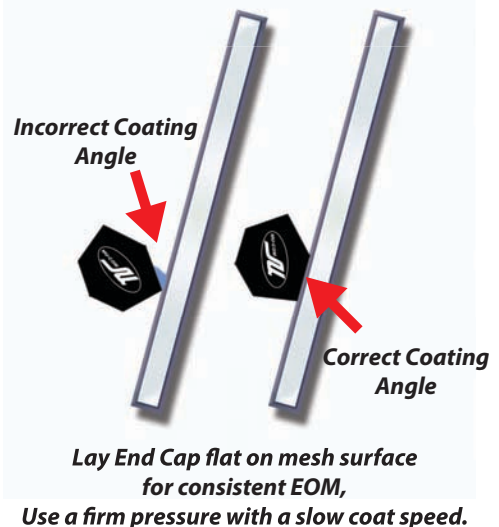
The screen drying area should be maintained with regular mopping and cleaning to prevent the build up of dust and contaminants. On a recent trip I ran into an older shop that had 2-3 inches of dried emulsion, ink, glitter and dirt on the floor. Almost impossible to fix now, but good cleaning practices could have prevented this disaster.

Part 2 Coating the Screen

Mixing in the diazo: If the emulsion needs diazo, or if it is being added to increase water resistancy then the first step is to prepare the diazo for mixing into the emulsion. Fill the diazo bottle halfway with water, seal the lid and shake the bottle gently to melt all diazo contents. Add to the emulsion and stir with a wooden spatula or stir stick. Avoid high speed drills as they will shear the emulsion and create excess air bubbles.



Allow emulsion to sit for 1-2 hours after mixing in the diazo to allow time for the air bubbles to escape. Also avoid using a metal spatula as the diazo can be attracted to the metal instead of staying suspended in the emulsion. Load the scoop coater to 2/3 of it's volume. Coating screens with very little emulsion in the scoop coater can create thin uneven emulsion coatings.



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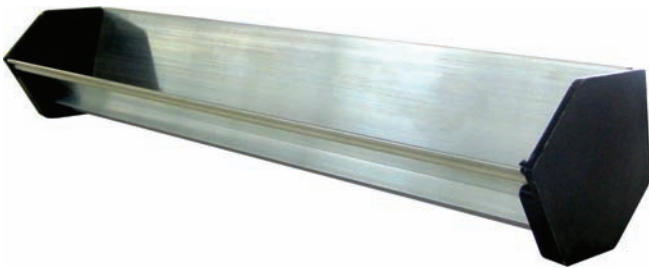
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Hand Coating: The technique used to coat screens by hand varies tremendously. Some workers want to coat the screens as fast as humanly possible, while others prefer a slow speed with firm pressure. Coating emulsion too fast introduces air bubbles into the emulsion. Quite often slowing down the coating speed eliminates recurring pin hole issues on press since no bubbles can be formed with a slow firm coating technique. Placing the end cap flat against the screen insures consistent emulsion thicknesses, especially if different workers coat screens.

Which side of the coater to use? Modern hand scoop coaters have a dull and a sharp edge. Typically the dull edge is used to coat coarser mesh where more emulsion is needed. The sharper edge is typically used for higher mesh counts to control the amount of emulsion being coated.

Dull Edge: Mesh below 200 – Coat 1:1 for a 10% EOM
Sharp Edge: Mesh above 200 – Coat 1:2



Some workers like a 2/3 sharp with the last coating a clean coat. The number of coats or which edge is used can be a personnel choice. As long as the resulting coating achieves a 10%-15% EOM for textiles and a 6% for graphics and no air bubbles, the edge and number of coats can vary depending on the user. The goal is to achieve Emulsion Over Mesh percentages that creates excellent resolution and durability.

What size of coater should be used? The distance from the inside of the screen frame to the end of the coater should be 1-1.5 inches. The reason for this gap is to insure that the face of the coater is in equal contact with the mesh. If the coater is too wide and is within 1/4-1/2" of the inside of the screen frame it cannot make even contact with the mesh. This results in an emulsion coating that is far thicker in the center than along the edges. It is difficult to achieve a consistent exposure with an emulsion that varies in thickness.

Generally the center will be under exposed and lose details. Murakami makes custom size coaters to fit your needs. One trick is to buy a 2-3" coater and use it to fill in the gap on the outside edge with emulsion after the initial coating is done which can be done while the screen is still wet. Water base and discharge jobs benefit from having the entire mesh coated to prevent leaks underneath the tape job.



Maintain 1 to 1.5 inch gap between scoop coater and inside of the frame edge.

If you want the emulsion to cover as much mesh as possible use a small scoop coater to fill in gap after main coating.

Next Auto-coating Equipment

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Automatic Coating Machines:

Compared to hand coating methods, auto coaters have a very consistent slow coating speed with perfect angle as well as coating both sides at once. For large volume shops an auto coater creates consistently durable screens with excellent EOM properties for excellent resolution. For textile screen printing most auto coaters can coat 2 screens at once to maximize screen capacity throughput.



How long should coated screens dry?

This depends on the humidity, temperature, and air movement. Wet humid areas near a wash out sink or spray booth will prevent screens from drying completely. In dry desert like climates screens can dry in 15-20 minutes while the same screen could take an hour in a rainy, humid climate.



A moisture meter is the easiest way to know for certain when the screen is ready to shoot. Discharge, HSA, and water base inks need dry screens prior to exposure. Any moisture in the center of the screen will inhibit exposure and the stencil strength will be weaker.

Drying cabinets are an excellent tool in today's screen print shop. With more and more companies using water base, discharge and HSA inks the need to accelerate the drying process increases. Well dried screens = stronger exposures and stencil durability. For diazo emulsions or for emulsions containing diazo as an additive for water resistance the maximum temperature of the cabinet is 80 degrees since diazo can 'dark harden' when stored above 80 degrees for extended periods. However, adding a dehumidifier and increasing air flow will still be better than drying in the ambient temperatures and humidity of the shop where it can be cool in the morning, humid due to rain or fog, or warm in the afternoon.

Drying times are unpredictable in a shop where the temperatures and humidity vary. A drying cabinet helps to create predictable screens that are dry and they consistently expose to create durable stencils. If you use pure photopolymers without diazo and print only plastisol the drying cabinet can be heated to 100F for accelerated drying. With a dehumidifier and a fan placed off the floor the screens can dry very quickly. Again, if diazo is added to the emulsion keep the temperature of the drying cabinet at 80F.



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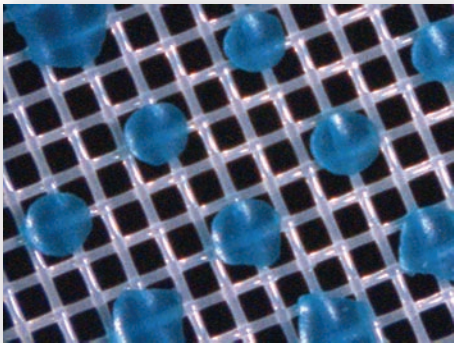
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Exposing the Screen

How opaque is your film image? The opacity of the image on your film determines how much time you can expose for. I read discussion boards where there seems to be a misconception on emulsion exposure. It isn't how fast you expose, it's how well you expose the emulsion that matters. I can expose a pure photopolymer emulsion like Photocure BLU for 10 seconds and get a great image, but I have also created a weak screen in the process. For durable stencils the goal is to give it as much light as possible and not lose details.

Murakami emulsion is engineered to accept complete exposure and still develop extremely fine details. If your emulsion cannot hold details at full exposure then that is a competitor's product issue. Under exposing to get details will not yield a durable screen. This is a main difference found in Murakami emulsions. Expose them completely, no under exposure needed for details.



The reason I mention complete exposure vs. under exposure here is due to this: The opacity of the black image on your film determines how much exposure time you can apply to the emulsion. Dark, black, opaque imagery can be exposed completely. Transparent images on film need under exposure. Too much light on a transparent film image and the art work can't be washed out since the light has burnt through the image. Sharp line work, crisp halftones, and strong screens come with proper exposure and strong, opaque film. Murakami emulsions create the most durable screens available in the industry today with the best resolution possible for any mesh count.

Lining up the Art:

There are many techniques to place the art on the screen. Line up grids showing the print area for an automatic press is common. First step is to tape down the key positive to the grid. Place the next positive in register on the registration marks. Apply tape to this film, sticky side face up, or carefully mark the register marks on the inside of the screen to line up the positive's registration marks to be used in exposure. For the tape pick up method place coated screen over the grid against a line up board to center the screen frame on the image and lower gently to avoid moving the positive. Rub on the inside of screen to secure tape to bottom of screen. Gently lift screen and flip over to complete taping the positive onto the screen. Place the screen with the captured positive on the line up grid once more to make sure the film image is still in registration with the key positive taped to the grid. Repeat for all other colors, then mark the key positive with center points and level line# so it can be repositioned on the grid and attached to a screen.

Or you if the registration marks are always in the same spot, typical when an Illustrator template is used, you can mark the cross hairs on the inside of the screen. Then flip the screen over and line up registration marks on the film to the marks on the screen. This method I have found is not as accurate, but can be faster when faced with many images to shoot.



Use registration marks to line-up artwork

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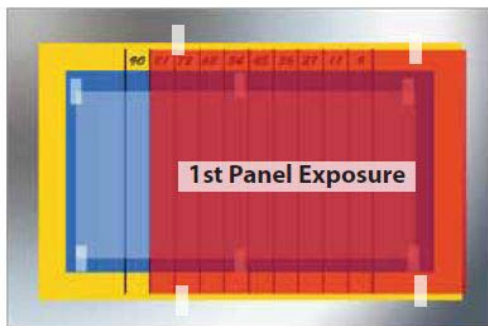
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Pin registration is usually manufacturer specific. M&R has Tri-Loc, MHM has a pin line up table, Newman has a pre register system as well as other tools to aide in pin register. In most cases a pre-punched header strip is attached to the individual films so that a pin registration bar can be used. This method is quite fast. Place the header strip on the pins, click a frame into the tri-loc or pinning table system and shoot the screens.

The advantage of this method is very little registration work will be needed on press. In my experience this can cut set up time on press by half or more and can be done by a non-skilled worker. In some cases no registration changes are needed. For Simulated Process printing this is a significant time saver and provides better accuracy than registering by eye alone.

Exposure Times: Every shop needs to perform an exposure calculator test or step test on every mesh they carry. Comparing times with another shop that has the same exposure unit can often be misleading. The reason? Similar exposure units may have lamps that differ in output due to age or the manufacturer chosen for the replacement lamp. Humidity and moisture in the emulsion also affect exposure time. A printer in Phoenix AZ exposing Photocure BLU on a NuArc Tri Light may have much faster exposure times than a similar company exposing along the coast in California using the same equipment. Perform a step test to determine your exposure times



Step Test Method to Determine Exposure

Link to Step Test:

<http://murakamiscreeen.com/wp-content/uploads/2012/07/Step-Test-Instructions.pdf>

Humidity affects exposure times. It is very dry in AZ with humidity readings in the single digits while the coast of California can be as high as 60-80% in the spring fog. Same holds true when going from Summer to Winter. Exposure times need to be calibrated, not guessed at. A step test is advised since it uses your film, with your exposure unit, in your environment.

Developing the image: Dip tanks filled with water act like another worker in the screen room to help soften the image area. Submerging an exposed screen for 2-3 minutes helps soften the image area and makes washout of fine details easier. If you do not have a dip tank just soak the screens on both sides, continue to lightly rinse to help develop or do another chore while the emulsion is softening. Develop with a pressure washer on fan spray. Murakami emulsions can withstand a pressure washer on fan spray to develop. This helps develop fine halftones and details. Develop screens from the print side of the screen. Wash inside gently at an angle to remove excess emulsion in the image area only when necessary. Most of the development process should take place spraying the bottom side of the screen.



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While the screen is wet in the developing process check the inside of the screen. If there is slime or soft emulsion that comes off when the screen is wiped on the inside then the exposure was not long enough. This is wasted emulsion that is being washed down the drain. The inside of the screen needs to be exposed completely for the stencil to have adequate strength for long runs or use on automatic presses.

Post Exposure: The sun is a great tool for post exposing screens. Placing the screen with the squeegee side towards the sun helps pure photopolymer emulsions to completely expose, which helps to prevent chemical flashing by hot solvent cleaners. Post exposure in the sun also helps create a stronger screen. For dual cures and diazo emulsions it accelerates drying time. If the sun is not available the drying cabinet can be used to accelerate drying. For water base, discharge, and HSA inks post exposing the stencil for twice as long as the original time on the exposure unit also helps create stronger screens when the sun cannot be used.

Hardening: For long water base, discharge and HSA print runs it is recommended to harden the emulsion for increased water resistance. Murakami MS Hardener can be applied to both sides with a wet cloth, or paint roller and then allowed to dry in the sun, or in a hot box or in front of a fan. Heat helps the hardener do it's job and improves the results. Murakami A&B Hardener must be mixed with equal parts of A and B together and used within 24 hrs. A&B will create a semi permanent screen with optimum durability.



Murakami
MS Hardener



Murakami
Hardeners A&B

Do not assume that you can underexpose the emulsion, use a weak light source and then harden with these products and expect to achieve the most durable screen. One thousand watts, LED exposure systems, fluo tubes can make good screens, however the strongest screens come from a strong multi spectral light source which typically are 5k, 6k, 8k Metal Halide lamps with fresh bulbs that have been calibrated via a step test to expose the emulsion on each mesh count completely. A well exposed screen with strong multi spectral light and then hardened makes printing discharge, water base and HSA ink far easier with no stencil breakdown.



Taping the screen: Apparently a lot of companies have little confidence in their screen making capability since many use half a roll of tape to cover every square inch of the screen. This is very costly in terms of the cost of the tape, the labor to remove, and the labor to clean up adhesive that is now stuck to the mesh and frame. Murakami emulsions are pin hole and fish eye resistant, and very, very tough. It is possible to use only tape on the inside of the screen, block out on the bottom and decrease tape and labor costs dramatically.

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Blocking out the screen: Use a Murakami BL-901 (Blue) or BL-905 (Red) blockout for plastisol. The Murakami emulsion you use does not need excessive amounts of tape if you have followed the tips above. A well degreased mesh with Murakami emulsion applied slowly and exposed completely can avoid massive amounts of tape use. For water base, discharge and HSA inks it is recommended to use the water resistant Murakami emulsion you coated the screen with.



Carding the block out or the emulsion around the image area is sufficient on well exposed Murakami emulsions. Discharge print runs are better off without a ton of tape that just traps the moisture in the emulsion and causes the stencil to soften faster. With the bottom of the screen exposed to the air it avoids the greenhouse effect of excessive amounts of tape and the emulsion image can stay dry to prevent emulsion delamination from the mesh on long print runs.



Rounded Squeegee Edges
are gentle on the emulsion
compared to a sharp corner.

Murakami emulsions have excellent image resolution and stencil strength that is recognized by the world's largest print shops as well as the start ups that begin in a garage. My old company was a classic example of the right product at the right time. We had grown from a local small hand printer to an automatic shop overnight due to the demand for screen printing by the large Los Angeles fashion houses. We pioneered the discharge foil look that is still popular to this day. Aquasol TS eliminated our stencil issues. Because of the great quality of this product our prints were the best they could be, and we were able to print non-stop using discharge ink and focus on timely service, print quality and cutting edge designs rather than fussing with screens breaking down or not printing the art as good as it needs to be to stay competitive.

Expose the Quality

Questions? Give us a call, we're here to help.

Murakami Support: (323) 980-0662 or (800) 562-3534

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