Screen Printing

introduction

All ingredients-art, stencil, mesh, print parameters, etc. -interrelate. It Is the entire recipe, not just one ingredient, that establishes high quality and production rates.

Without organisation between departments, the focus of each area will be on only one ingredient, not the entire recipe. The screen printing process can be distorted to accommodate practically any one ingredient, but this is the proverbial "tail wagging the dog" approach. It is much better to evaluate the entire process.

In general, the merchandising department, art department, screen printing, and warehouse groups need to have a good working knowledge of their contribution to the entire process. Education and cross-training is one way to help each department realise its contribution to the overall picture. By this method employees see first-hand how their work directly influences other departments and the quality of the finished product. The relationship between the screen mesh, stencil systems, screen exposure, tension, squeegee parameters, ink transfer to different materials, etc., is important to the quality of the finished product.

It is our hope that this manual will give you some insight into our products and assist you in seeing the "big picture" of the screen printing process.

Read the Wilflex User's Manual...
It's the smart thing to do!

Art work

Though there are many ways to create art, the artist needs to know some basic information for creating art for screen printing. Some of the questions the artist should ask include:

- What is the substrate? (color? type of garment? material content?)
- What type of print? (process? spot?)
- What size does the art need to be? (child? adult? left-chest?) What are the ink opacity requirements? (bright? muted? glossy? matte?)
- Is an underlay needed? (bright ink on darks? specialty inks?)
- What are the registration requirements? (butt? trap? overprint?)
- What are your production capabilities? (auto? manual? number of colors?)

Though most of this information can be standardised for each shop, some will be influenced greatly by the customer's vision of what he or she wants to achieve with the print.

Art Creation

The three most common forms of art created for screen printing are hand-drawn art, computer-generated art or art replicated from fine art paintings or photographs.

Hand-drawn Art

Hand-drawn art comes in many forms. An artist can create a key/me (an outline of the design) by drawing it on paper with an opaquing pen, shooting it on a camera or scanning it into a computer. Art can be created from a hand-drawn Ceylon provided the image is loaded into a scanning program like Streamline, converted into paths and then placed into an art program. With the image in a format that can be manipulated, the artist can clean it up, change its size and position, add text, and place colour in selected areas. Another option is to draw directly onto vellum or onto a coated screen. This method is not recommended, but it is effective for simple one-colour designs.

Computer-generated Art

Computer-generated art is conceived and designed on a computer through a variety of design programs. The most common programs in the screen printing industry are Photoshop, Illustrator, Freehand and Corel. Designs created on a computer are then separated with the computer's separation program.

Replications

Replications of fine art or photographs are most successful when they are shot with a digital camera or scanned into a computer. The artist can then utilise an advanced color separator program on the computer. The artist also can separate replications by hand through a series of hand-cut overlays.

Art Separations

Art can be created with any of the above methods, but eventually it must be converted into final separations. The goal of art separation is to create individual films, either acetate or vellum, in which the print areas block UV light rays and the negative areas allow UV light to pass through. The most frequently used methods involve separating by hand, camera and computer.

Hand Separations

An artist can achieve hand separations in several ways.
Hand-cut positives are created by cutting Photomasking film, or rubylith, into the shapes or letters needed. Then the artist peels away the negative unwanted portion, leaving rubylith in the areas to be printed.

Overlays are color separations created by the use of acetate or rubylith overlaid on a keyline, to create positives. By cutting, drawing, applying adhesive dot patterns, and using acetate or burnishing letters, the artist can build each color (as well as additional colors with dot pattern overlays).

Hand-drawn separations are created by tracing the design directly onto the acetate or vellum. Starting with a keyline of the design, the artist overlays each color one at a time and traces until all of the separations are completed.

Camera Separations

Camera separations are created by the use of a camera or other exposing equipment, such as a contact frame, to create acetate positives. An artist may use the camera to shoot separations from a laser jet printer or a hand-drawn keyline, as mentioned earlier. An acetate keyline from the camera then could be used as the basis for the hand-cut separation, utilising rubylith (as mentioned earlier), to achieve the trap method of printing. The trap method is simply when colors slightly overlap where they meet on a design. Using basically the same method, after cutting the rubylith, instead of peeling off the negative areas, the artist peels off the positive areas, leaving the print areas clear. The artist then takes this overlay (still attached to the Ceylon), and exposes it to reversal film on the contact frame. The end result is a perfect butt registration (or perfect dropout) of the separated colour.

An artist also can utilise the camera to create "user friendly" separations for the Production Department. Choking a colour describes a method in which the artist produces a slightly smaller colour separation, as if there is a hairline space between the separation and its adjacent colour. Choking allows easier registration of overlay colours (if the choked colour is a white underlay), and helps stop colours from bleeding into each other by creating a slight barrier of fabric. To choke a colour, simply place acetate sheets between the art and the film. The light will naturally expose inside the edges, creating a slightly smaller image on the film. To create a white underlay, an artist can register the film separations together on a contact frame and expose them onto dupe film. This method automatically chokes the plate This method is also useful in creating transfers because it is critical to butt-register all transfer colours.

Computer Separations

Computer separations usually are rendered from art created in a computer drawing program. Other art can be separated with the use of a computer, but first it must be scanned or converted digitally before it can be manipulated in a computer program. Although there are many separation programs and drawing programs with separation options, they all must reach a common end.

A piece of art created in a drawing program is separated easily because the colour usage is controlled during the creation of the art. The program will render separations per color and will print out exactly what the artist needs.

Fine art or photographs can be separated by computer provided the artist has access to a large format scanner, a drumscanner or a digital camera. (If the Art Department doesn't own one of these, a service bureau can be paid to scan these images.) For best results, the image should be scanned at about 300 DPI in an RGB mode and saved as a TIFF file. Once the piece of art is converted digitally, it can then be introduced into the design program (in this case, preferably a program that can manipulate full-color scanned images, like Photoshop). When a design is in this type of program, it can render process separations or areas of color can be selected to create individual channels for each color, producing spot plates. The artist can increase or decrease the coverage of the selected color by using the "color range" tool. Once the design is satisfactory, the separations can be improved with spot plates or touch plates to enhance color sharpness and/or brightness.

To calculate line counts for halftone screens, simply divide the mesh count by -four. The result will equal the highest line count that should be used. The artist must have an understanding of mesh counts and their effect on the -press. For instance, when a fade is needed in a design, the artist may be tempted to put it in a high mesh. However, if that same color also consists of large, open print areas, the printer will require a mesh in a lower count. In this instance, the artist should calculate the halftone line based on the lower mesh.

When the design is ready to be separated, split the channels in the program. the program creates individual files for each color, giving the artist the option to go back and change a color individually if the print performance is not satisfactory.

It is very important to label each color and to make sure that each piece of film is complete with registration marks. Most programs offer these options on the separation screen, but some programs require the artist to incorporate the color names and registration marks with his or her designs. the artist must type each color name in its own color and color the registration marks with the "registration" color option.

Image output refers to the method in which a computer prints art or separations. One way of printing separations is on a laser jet printer. An artist may choose to print out directly on vellum, which exposes well, or on paper, which is then shot by a camera to render the films. In addition to laser jet printers, an image setter may be used to output separations. This equipment enables the artist to print out his or her art directly onto film (and can totally replace a darkroom).

It is a good idea to have a color "mock -up" of the design to accompany the separations to production. This action ensures that everyone from the screen room through packing are on the same page.

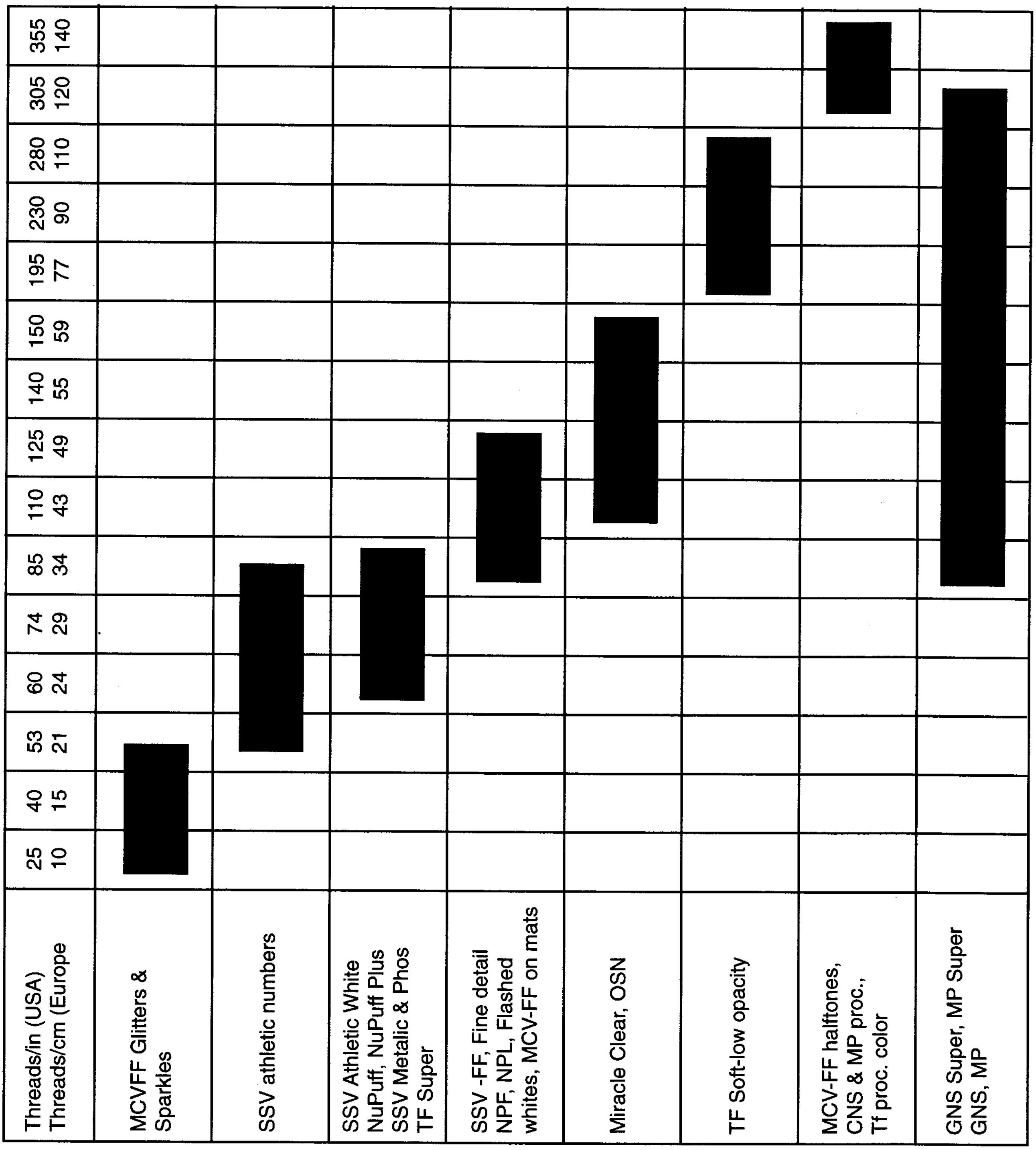
Artists need to understand the limits and advantages of screen printing. They must react to the needs of the customer as well as the production department. The bottom line is communication between the departments to ensure a predictable, repeatable product.

Screen Meshes

Note:

Proper screen tension and stencil emulsion
are critical for achieving optimum ink performance and quality prints.

"New high tension" or "low elongation" mesh fabrics are now available through several mesh manufacturers. These new meshes allow the Screen printer to achieve higher screen tension. High tension mesh in combination with high tension frames are excellent for use with Wilflex White inks as well as Wilflex Process colors.



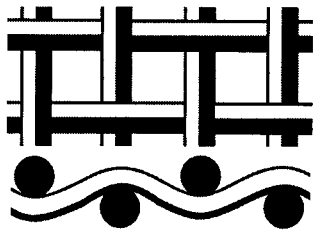
Mesh Thread Diameter

Mesh Thread Diameter In certain mesh counts there is a selection of thread diameters:S-O T-O HD-O

For the best results consider these thread diameters:

S-thinnest diameter-permits higher squeegee speeds-requires quality stencils.

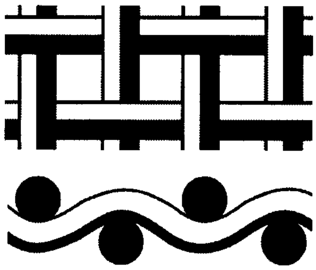
Mesh for Glitters:	25-53 threads/in 10-21 threads/cm
Mesh for Metallic:	60-86 threads/in 24-34 threads/cm



Light grade "S" with comparatively thin diameter threads and a large open area.

T-medium diameter-soft hand printing as well as wet on wet on darks

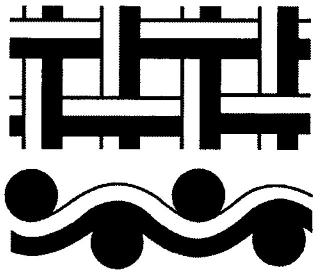
Mesh for Soft-hand:	140-305 threads/in 55-120 threads/cm
Mesh for Underbase:	110-160 threads/in 43-62 threads/cm
Mesh for Wet-on-Wet on Darks:	110-200 threads/in 43-81 threads/cm
Mesh for Halftones:	305-355 threads/in 120-140 threads/cm



Medium heavy grade "T"

HD-thickest diameter-requires a slower speed, thicker stencil and a dull edged squeegee

Mesh for Athletic Numbering & Flocking:	51-95 threads/in 20-38 threads/cm
Mesh for Opacity Hot-split Transfers:	51-86 threads/in 20-34 threads/cm
Mesh for maximum Puff Height:	74-125Threads/in 29-49 threads/cm



Heavy grade "HD" (Heavy Duty) thick diameter thread and a small open area.

Screen Frames

The purpose of the screen frame is to hold the screen mesh at proper tension for print production. Therefore, the screen frame must have the stability and strength to withstand the desired screen tension.

Screen frames are made from wood or metal. Metal frames are either fixed or moveable and retensionable. Screen frames must be resistant to the chemicals and inks used during printing and cleaning-up. The surface of the frame where the screen fabric is to be attached must be flat and free of foreign substances.

Screen Tension

Experience has proven that proper screen tension will improve screen performance, which means it will provide high resistance, firm adhesion of the stencil, suitable elasticity for off-contact printing and proper ink flow. It is important to have proper screen tension, but it is just as important to have consistent tension levels throughout a job. Screen tension is one of the most critical factors in producing screens mainly because screen tension directly influences printing results.

Printing parameters improved by proper screen tension include:

- registration accuracy
- line sharpness or acutance due to improved performance of stencil system
- "snap-off" and low off-contact distances
- ink deposit-uniform and consistent
- ink color consistency
- less ink penetration resulting in higher opacity on dark substrates
- less ink build-up on backs of screens
- run of squeegee-less squeegee pressure required; no crimping of mesh, which causes smudged prints
- screen life-stencil life and mesh life
- ink flow-due to shear from screen mesh
- print quality and consistency throughout production run

As these print parameters are improved, overall productivity is improved. Specific areas of improvement include faster set-up time for multicolour work, faster printing speeds and higher number of quality prints.

With this evidence indicating the importance of proper screen tension, screen stretching or tensioning methods need to be considered.

Stretching Tension Methods

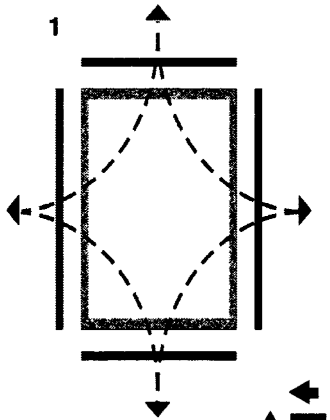
To begin the stretch or tension process, screen mesh must be positioned carefully. Eighty percent of screen accuracy is due to mesh position. In most cases, correct mesh position aligns fibres at right angles.

Devices used to apply tension to screen mesh are basically either mechanical or pneumatic.

1) Mechanical devices operate with tensioning gear and crank or wheel.Measurement of tension may be recorded as degree of mesh expansion or through use of a tension meter. Once mesh reaches desired tension, mesh is attached to frame with every effort to maintain tension. Disadvantages of this method include limited ability to reduce mesh tension in corners limited ability to adapt to various frame sizes, and loss of tension when mesh is attached to frame.

2) Pneumatic devices use a number of relatively small clamps operated with air pressure. The small clamps allow even tension over mesh area and controlled tension in corners to prevent mesh distortion. In most pneumatic systems, clamps are calibrated to provide equalised tension on mesh. The small clamps move laterally to minimise mesh distortion. Again measurement of tension may be recorded as a degree of mesh expansion or through use of a tension meter.

1



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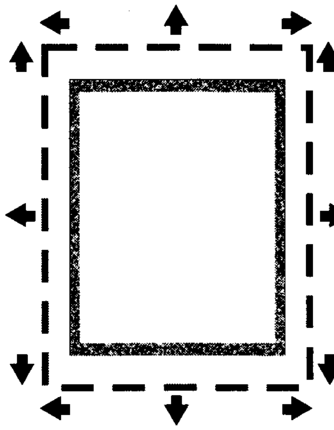
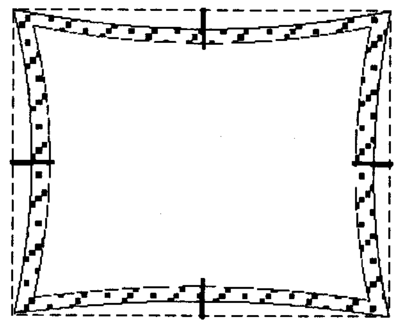
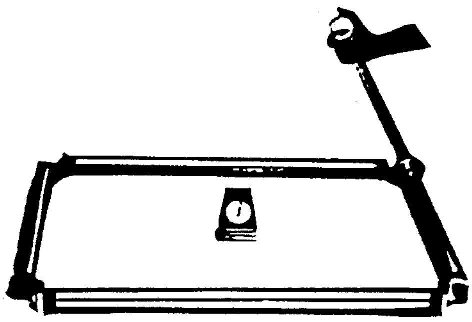


With mechanical and pneumatic stretch devices final screen tension may be enhanced by use of a frame with sides slightly bent in the concave direction. Once mesh is attached to this type of frame, the mesh tension and the frame oppose each other. Although this method enhances tension, it is difficult to control.



3) Re-tensionable frames provide an accurate stretch device as well as a frame. Screen mesh is attached to screen frame prior to stretching. The screen frame is then rotated and locked into position to provide tension. These frames provide even, continuous fabric tension and minimise mesh distortion allowing precision printing and registration within one thousandth of an inch. Retensionable frames address the hardening characteristic of polyester mesh.Polyester fibres of screen mesh brought under tension harden or re-align fibre molecules by breaking and reforming hydrogen and Van der Waals bonds. Retensionable frames may be used to bring fabric to ideal tension before, during and after printing. These frames allow the use of extremely high screen tension (when compared to other types of frames and tensioning devices). These frames can provide constant tension and reduce off-contact requirements while maintaining screen snap-off behind squeegee enhancing print quality. Measurement of tension should be recorded with a tension meter.



Recent developments in mesh technology have produced special polyester filaments that will withstand increased tension and may change the thread diameter recommendations. High tension meshes are particularly desirable when printing process colors and are helpful when printing white inks. For further information please consult your mesh supplier.
In all cases, high screen tension enhances the printability of Wilflex inks.

Mesh tension on a screen should never be left to chance.
The whole process should be kept under constant control.

Mesh tension is measured in Newtons/Centimetre. A Newton is a unit of force referring to the amount of mesh deformation (1 N=102g/cm^2). The need for quality and consistency in the printing process requires the printer to use measurement devices to record and control screen tension.
Although Wilflex inks are designed to perform well on screens with various levels of tension, proper high tension will help to optimise ink performance.

**For further information, please consult your mesh and frame representatives and other reference materials on the screen printing process.*

Stencil Systems

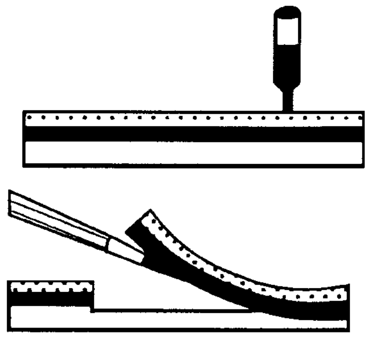
The purpose of the stencil system is to provide a method for accurate transfer of artwork to substrate. Artwork should be designed within the parameters of the ink, substrate and stencil system used.

Prior to preparing stencil system, screen mesh is normally roughened on the stencil side of the screen. The purpose of roughening is to provide more surface area for stencil adhesion. Several preparations are available, consult your stencil supplier for further information.

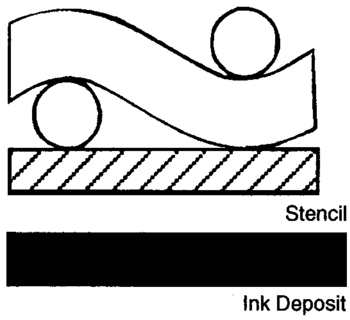
Screen mesh should also be degreased. Degreasing refers to removing any contaminates or dust from mesh. Degreasing chemicals should be handled carefully, using proper industrial hygiene.

There are basically five different types of stencil systems.

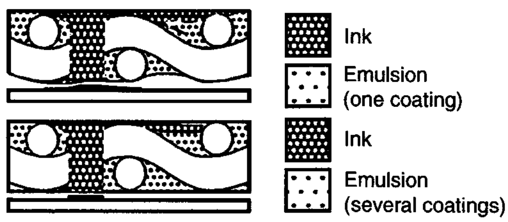
1. Hand-cut Stencils-Hand cut stencils are produced by cutting the design into an emulsion film which is backed by a support film. This stencil method is usually used only with simple designs, as cutting away emulsion requires patience and skill. Once the cut area (area to be printed) has been removed, the film is mounted on the screen mesh. The stencil film is wet with suitable adherent, blotted and allowed to dry. Once the hand-cut stencil has dried thoroughly the support film may be peeled away.



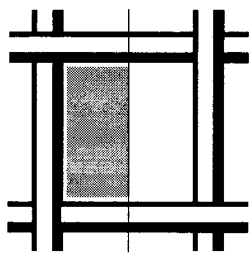
2. Indirect Photostencil. The indirect photo stencil consists of a stable film coated with a presensitized emulsion, gelatin or synthetic polymer. Processing the stencil is done prior to adhering the stencil to the screen mesh, hence the name "indirect." The emulsion film is exposed with the art positive, then chemically hardened. The unexposed emulsion is rinsed away with water. The emulsion film is mounted on mesh and allowed to dry. After emulsion is dry, the support film may be peeled away. Indirect Systems give high definition prints for medium print runs.



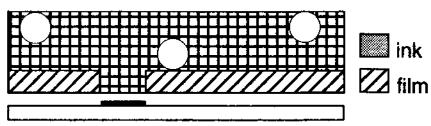
3. Direct Photostencil-Direct photo stencil systems are processed with the stencil system on the screen mesh. The emulsion is a photo-sensitive liquid that is applied to mesh to embed mesh with emulsion. Several coats of emulsion will help produce a higher resolution print. After the mesh is coated and allowed to dry, the emulsion is exposed with the art positive in contact with the emulsion. After proper exposure the unexposed emulsion is washed out. Direct stencils are durable but can allow some ink spread due to poor edge definition.



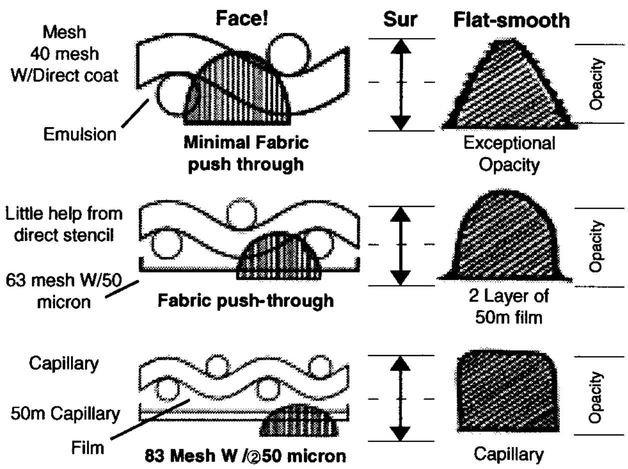
4. Direct/Indirect Photostencil-The direct/indirect photostencil combines methods and advantages associated with direct and indirect systems. A film consistency of an unsensitised emulsion on a support film is placed in contact with dry screen mesh. A sensitised liquid emulsion is then squeegeed on inside of screen mesh to adhere emulsion film and sensitise it. The emulsion is dried and the support film is peeled away. The emulsion is exposed with the art positive in contact with the emulsion. After washing away unexposed emulsion, the screen is allowed to dry. The direct/indirect stencil system provides high resolution prints and durability to withstand long production runs.



Mesh Crossing of an Indirect Screen

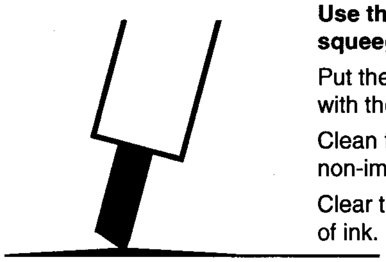


5. Capillary Stencils-Capillary stencils are made of a presensitized emulsion coated on a support film. The emulsion film is adhered to screen mesh with water. Excess water is removed and emulsion is dried, then the support film is removed. The emulsion/screen is exposed with art positive held in contact



Squeegees

Squeegees are designed to help the ink flow through the screen mesh. The squeegee should have an edge to correspond to the screen mesh used. The squeegee pressure should be kept to a minimum to allow the ink to be applied to the surface of the substrate.



Use the least amount of squeegee pressure to:

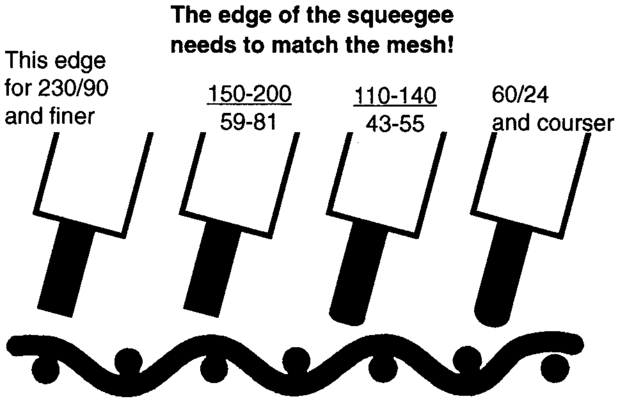
Put the mesh into contact with the substrate.

Clean the ink from the non-image areas.

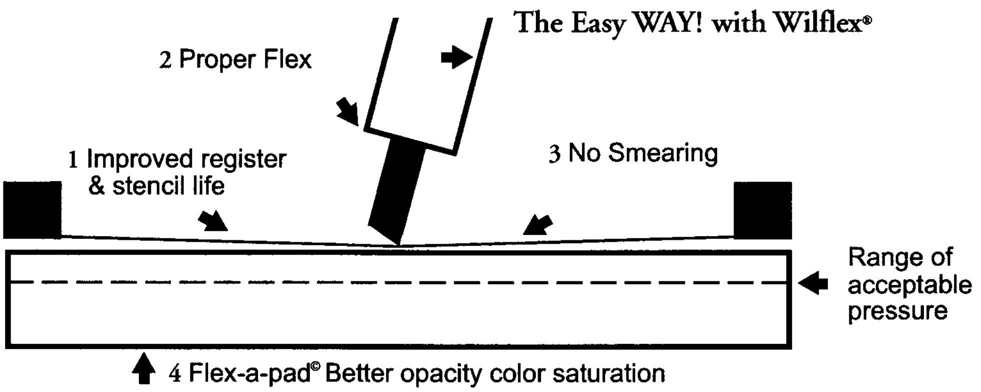
Clear the open stencil areas of ink.

The squeegee durometer or hardness may be changed to suit ink and print. However, a 70 durometer squeegee may be used for most printing. Composite squeegees or squeegees with multiple durometer rubber allow for more control.

Composite squeegee rubber utilises the strength of high durometer rubber to maintain proper stiffness and durability while using lower durometer rubber for the edge which contacts the screen and ink.



Less radius = less ink deposit
More radius = more/heavier ink deposit



Substrates

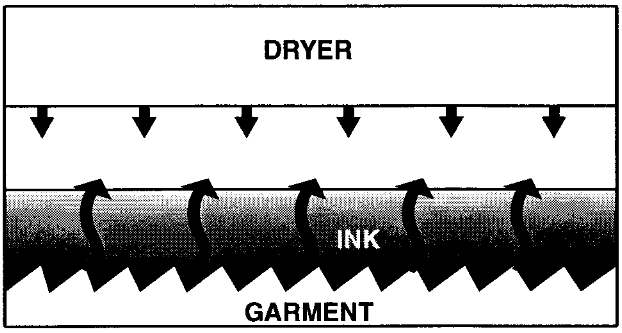
Substrates for plastisol inks vary dramatically, floor mats, tote bags, to T-shirts. In each case, a Wilflex ink may be used to produce a quality print. Certain characteristics of each substrate should be considered: 1) fabric content, 2) color, 3) fabric mass, 4) heat stability, and 5) end use. Consult data sheets on Wilflex inks for choosing ink for each substrate.

FABRIC CONSTRUCTION OF YOUR GARMENT AFFECTS THE PRINTING PROCESS	
PERCENT FABRIC MASS	REMEMBER YOU CAN'T PRINT ON AIR!
90% Woven Goods 80% High End Fleece 70% Low End Fleece	60% High End Heavy Weight Tees 50% Low End Heavy Weight Tees 40% 50/50 Regular Weight Tees

For low fabric masses, we suggest

- finer detailed artwork
- avoid color on color printing
- higher screen tension
- small radius, short height, low durometer squeegee
- slower squeegee speed
- reduced squeegee pressure
- capillary film, piggybacked or adhered with compatible emulsion
- mist-type spray adhesive like Duo-Tak.

The higher the fabric mass the easier it is to print.



Always preprint and test new substrates. For assistance, see "Evaluating Plastisol Inks" in the User's Manual

Curing

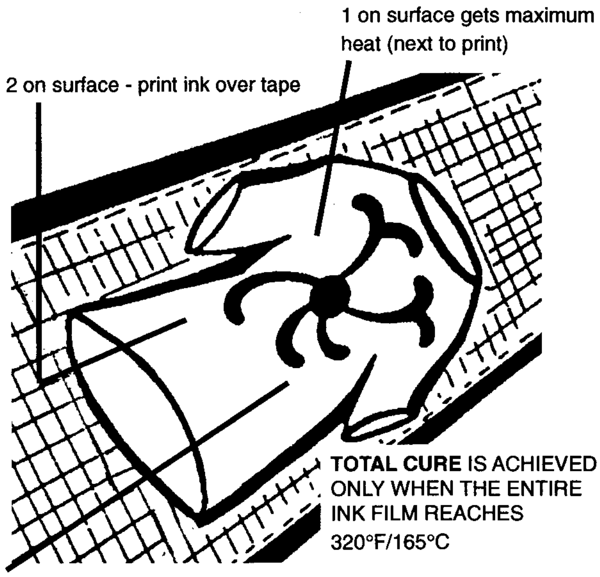
1. GET THE ENTIRE INK FILM TO 320F/ 1 60C
2. MONITOR THE HEAT
3. USE THE WASH TEST TO EVALUATE CURE.

To cure plastisol inks the ink film must reach appropriate cure temperature. A heat history includes time and temperature used to reach total fusion or cure in ink. This cure or fusion is instantaneous once the entire ink film hits the cure temperature (320°F/160°C, except FF inks 270°F/132°C).

Use Thermo-probe to monitor temperatures
Always test for cure with wash tests.

TAPE METHOD - TO CHECK CURE

USE 3 TEMPERATURE TAPES TO TEST FOR PROPER DRYER SETTINGS.



3 under shirt and image will give lowest reading. Varies with both garment and ink film thickness.

FASTER FUSION INKS REQUIRE 270°F/132°C FOR FUSION.

Hot Wash/Cold Rinse
Normal /Reg. @ 10 minutes
90ml of concentrated detergent
4. After washing is complete, place sample and towels into the dryer.
5. Dryer Settings: Cotton / High (1 05°F/40°C) / Timed Dry 30 minutes
6. Perform two to five complete wash and dry cycles.
7. Compare washed half of sample with unwashed portion.

Evaluation and Classification

Failure

The ink film is not cured when:
1. Severe cracking of the ink is noted.
2. Partial or total loss of the ink film from the garment.

Pass

The ink is cured if none of the above is seen. Slight loss of color intensity (AATCC Gray Scale for evaluating change in color 4-5), and slight nap show through are normal for cured ink films after washing.

Solvent Cure Test

Solvent testing is only the second most reliable method for testing plastisol Cure. The most reliable method is wash testing. If solvent testing is chosen to evaluate cure, follow these steps:

Method #1:
1. Apply two or three drops of 99 percent ethyl acetate to the surface of the ink layer being tested. Warning! Ethyl acetate is poisonous and flammable. Always wear butyl or nitrile (not latex) rubber gloves and goggles when handling this chemical. Do not pour directly from the container onto the fabric. Use a glass eyedropper.
2. Fold the T-shirt so that the area of the ink film that has been treated with the solvent is pressed against an unprinted area of the T-shirt.
3. Firmly press the two layers of fabric together with a small C-clamp or similar clamping device for two minutes. If any ink transfers from the printed area to the unprinted area, it is an indication that the ink film is not completely cured.

Method #1 may give false positive results (the test indicates that the ink is completely cured but it is not) if the ink layer is extremely thick. If the ink layer is thick, use Method #2 when testing with solvent.

Method #2: Use for Thick Ink Film

1. Apply two or three drops of solvent to the fabric on the inside of the T-shirt, behind a printed area.
2. Fold the shirt so that you can press the ink layer that has been treated with the solvent against an unprinted area of the shirt.
3. Firmly press the two layers of fabric together with a small C-clamp or similar clamping device for two minutes. If any ink transfers from the printed area to the unprinted area, the ink film may not be completely cured.

The ethyl acetate test is described in more detail in "The Solvent lest For Cure" in the April 1995 issue of Screenplay. This article is available as a reprint through ST Publications Inc.

Bleed Test

Since dye lot variation is very common, it is imperative to test a garment's propensity for dye migration. Historically, fabrics containing polyester are more likely to bleed than any other fabrics whereas nylon and cotton much less likely to bleed. However, it is suggested that all dark fabrics that will be printed with white or light coloured inks should be evaluated for bleeding.

The bleeding phenomena occurs due to a reaction between the ink and the dyes of the fabric. Two tests for fabric only are described in "Troubleshooting Dye Migration on Polyester Fabrics," which appeared in Screenplay, March 1995.

The following is a test method evaluating the bleed potential of ink printed on a given fabric:

1. Bleed resistance (or the resistance of an ink to accept the dyes from polyester fabric) is determined by the chemistry of the ink, complete ink cure and by the ink deposit. Choose the screen mesh that duplicates the planned use of the white ink as well as two other possible combinations.
2. Print just the white ink on appropriate fabric swatches and hold for three weeks. After three weeks, visually evaluate the prints for whiteness. (You may choose to try accelerating this evaluation by holding the prints at 105 F/ 40 C for 2 to 5 days.)

"Troubleshooting Dye Migration On Polyester Fabrics" is available as a reprint through ST Publications Inc.; 513-421-2050. Additional information on synthetic polyester dye migration and sublimation is detailed in the Screen printing and Graphic Imaging Association (SGIA) Technical Guidebook.

Fabric Discolouration Test

It is extremely important to pre-test on light coloured or stone washed garments. Avoid stacking hot, because such colors are more prone to color distortion due to the dye stuffs inherent in the garment. Fabric and dye characteristics can exhibit variance between manufacturers and from dye lot to lot. The following test will determine if the fabric dyestuffs are prone to discolour:

1. Print ink onto suspect fabric and fuse.
2. Cover the print area with a piece of the suspect fabric (sandwiching the print) and set in a heat press.
3. Set the heat press to 200 F and 5 PSI.
4. Close the transfer press and let sit for four hours before visual evaluation.

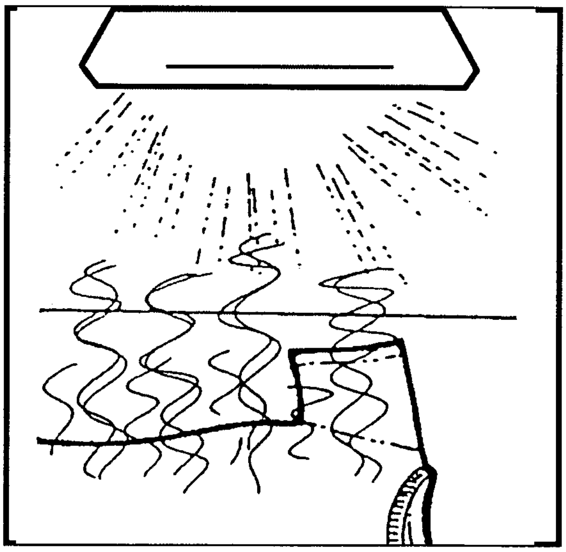
If material is prone to discolouration, you will see a "ghost" image of your printed image on the material that was covering the printed area.

Transfer Release Test

It is important to conduct accelerated age tests in your plant, which will indicate how a transfer will release from the transfer paper after six months to one year "on the shelf." Accelerated aging tests can be performed by placing the printed transfer in a hot box or hot room, at 100 hours at a temperature 120°F. This will simulate one year of shelf life. Tests conducted in your plant will help keep your transfer/garment reject risk to a minimum.

Flash Curing

Plastisol inks gel or reach an intermediate point between liquid and total fusion. This gelled state is tack-free and allows another layer of plastisol to be printed over gelled ink without distortion of print. When flash curing, it is important to monitor temperature with a Thermo-probe, heat tapes or crayons. Due to differences in power, height above ink film, and efficiency of the flash unit, a specific dwell time cannot be given. Incorporating the use of finer mesh counts for your flash plate will decrease the dwell time needed to gel the ink, resulting in faster production speeds. Be certain to set flash dwell times on heated pallets to simulate production. Adjust your settings so that the ink is just dry to the touch. Avoid excessive overflashing, as it can result in poor inter-coat adhesion of overprint colors.



WHEN TO FLASH?

ARTWORK
- Large solid of coverage
- Colour on colour
- More than 1 predominant colour
- More than 1 "problem" colour

INK
- Colour not high opacity
- Colour not bleed-resistant
- High chroma colours
- Soft hand inks on darks

STENCIL
- Meshes too fine
- Stencil too thin

SUBSTRATE
- Order including lights & darks
- Dark garments/bad bleeders

Consult data sheets on Wilflex inks for recommended gel or flash temperatures.

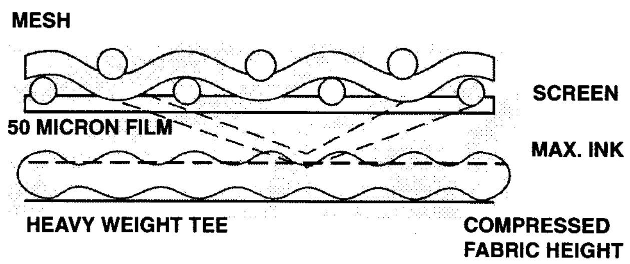
Products especially suited for flashing include:

Bright Tiger #1148OHT, Olympia White #11375HT, Athletic White #11OOOWHT, XL Flash #11360HT, Miracle Clear #101 6OSSV

Notes On Off-Contact

Definition:

Distance the screen is above the substrate before the print stroke.



Key Point:

The point of contact with print surface is limited to edge of squeegee and occurs only at time squeegee passes over surface of screen. Quality and resolution are greatly affected at the point of contact.

Advantages:

1. **Sharp Print.** The correct amount of off-contact can reduce impact of viscous, cohesive ink. Plastisol ink with its cohesive quality can cause slurring or loss of definition and sharpness. This occurs when the screen sticks to the printed garment, and during the shearing process, the print slides.
2. **Reduction of ink build-up.** Because the off-contact causes momentary contact with surface, the contact is quick enough to overcome the cohesive nature of ink.
3. **Increased printing speed.** Ink shears at contact point, therefore, stroke can be faster than printing on contact.

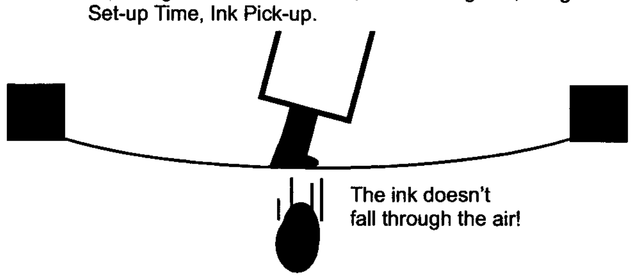
Considerations:

1. **Screen Tension** The higher the tension, the less off-contact distance is needed.
2. **Free Mesh Area** This is the distance between ends of squeegee and inside of screen frame. The smaller the free mesh area, the less off-contact is possible.

   Recommendation Free mesh area 2 1/2 inches at each end of squeegee and 4 inches for color well at top and bottom.
3. **Pallet Surface** The harder the surface, the less contact is needed.

Greater off-contact distance
Greater squeegee pressure

This leads to:
Pinholing, Stencil Breakdown, Loss of Register, Longer Set-up Time, Ink Pick-up.



Each screen should be low enough to allow minimum squeegee pressure to put the stencil into contact with the substrate, and high enough to keep the mesh from resting in the wet layers of ink.

Off-Contact Rule:

With properly tensioned screens (16 Newtons and above) and free mesh area of 2 1/2 inches on each end of squeegee, the off-contact distance should be no more than 1/16 inch, ideally 1/32 inch. With wooden frames, a suggested off-contact distance should be 1/16 to 1/8 inch.
General Rule: Off-contact distance should always be less than 1/8 inch.

Fibrillation or Washout?

Fibrillation is a condition that occurs when substrate fibres break loose from the ink film due to washing and drying. As the fibres break through the ink film, high contrast between loose fibre ends and the ink film cause a faded appearance. The apparent color loss is not the result of plastisol inks washing out.

What is the difference between fibrillation and washout?

Fibrillation

- Ink color looks washed out or faded in an even manner over the entire print
- Inks are cured
- Most often occurs with 100 percent cotton

Washout

- Ink color is faded in spotty, uneven patterns
- Occurs when inks are undercured
- Can occur on any substrate

How does fibrillation occur?

Washing and drying create a rubbing action against the print and raise the loose yarn fibres from the ink film. Additional wash and dry cycles cause more loss of ink film.

How can you predict any fibrillation effect?

Test, test, test and test some more. Test your normal printing conditions for each type of garment you offer. Then vary the mesh, stencil, ink and squeegee to find the best combination to hold down loose yarn fibres. Your final result should be an acceptable soft hand print before and after washing and drying.

Fibrillation Guide

	Yarn count	Fibre content	Stitch Density	Ink Options
Fibrillation less likely to occur	High count (fine yarn)	100% polyester (low fibre content)	Higher than 1000	Super-opaque or fast-fusion inks
		Polyester/cotton blends	all-purpose inks	Multi-purpose or
Fibrillation more likely to occur	Low count (course yarn)	100% cotton, acrylic, and acrylic blends (high fibre content)	1000 or less	Process inks

Ink System Concerns That Affect Fibrillation

Ink Type	Filler Level	Mat-Down Capability	Print Hand
Process	Little/None	Poor	Soft
All Purpose	Moderate	Fair	Fair
Fast Fusion	Little/None	Good	Fair
Super Opaque	High	Good	Harsh

How to improve your results:

1. **Apply a wet base of:**
   Finesse
   Blend of Finesse/MCV-FF Base
   Do NOT flash

2. **With varying mesh counts, apply a flashed base of:**
   MCV-FF Base
   Transflex Printable Adhesive

3. **Alter your ink deposits by combining:**
   Greater stencil thickness and higher mesh count
   Lower stencil thickness and lower mesh count
   Softer, slightly rounded-edge squeegees with less pressure

4. **Change your ink system to:**
   MCV-FF inks and Genesis/MP inks
   Transflex transfer inks
   A mixture of direct print inks and transfer power

Remember : Fibrillation relates to ink film strength and fabric characteristics