MURAKAMI

January 2013

Technical Newsletter

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

Print Engineering

Screen Printing is unique among printing methods. It can vary from a printed medical circuit, to a 14 color simulated process masterpiece on a t-shirt, to a 100 screen fine art serigraph. While the print process is very similar, squeegee, mesh, ink, and substrate, it's the art that we use to make the screen that is unique to the product being printed.

Textile printing of all the print techniques encompasses many different types of art. From solid spot color, to 4/C process, to simulated process printing. The choices of mesh, emulsions, squeegee, press print sequence and press adjustments can be overwhelming. Even if a shop manages to find it's own 'recipe' of mesh counts, emulsions and press controls, the way the print is engineered in the art department determines how well production will run and how well the design sells. Too often the hand off of art to production is not managed well. If the art department doesn't know what works in production then profits will suffer. If print production doesn't know how to communicate in art and RIP terminology to the artist and separator the prints may not achieve the quality of the original art.

No matter how good the art department or production manager skills are, print engineering begins the moment artwork is received. Almost any t-shirt printer or ad specialty printer has been handed a business card or is sent the logo from an email signature when the customer is asked for artwork.

Rule #1: Business Cards and Web Logos are not acceptable forms of artwork for T-shirt separation.

Recreating art is very expensive and time consuming, yet too many times an art file is provided that won't work.

For today's apparel printing we need digital vector art, or a bitmap version that is twice the size of what is needed for the final print at a resolution of 150 dpi minimally. Or 300 DPI if it is to final size, especially if halftones are to be used in the print process where tonal transitions need to be smooth and dramatic in the final print. The more data in the art, the easier it is to use filters and separation techniques that yield good positives for your screens.

Vector Art (OK) | 300 DPI Art (OK) | 72 DPI Web Art (Art must be recreated)

So let's say the customer has provided art, at a decent resolution. To the customer this can be a photograph of the subject with a very busy background and they want to add their boat name. Is this really art work you can use? Well yes, but you will spend a ton of time in Photoshop trimming out the subject matter from the background as well as formatting it with type and playing with the layout. This is another area where the customer may think they have provided art when he really has just provided a component to make the final art. Customers like this can be shocked when they are told how much it will cost to create their concept before separations begin. Ignoring the amount of art labor to produce the job can eat up all the profits you might have been able to make.

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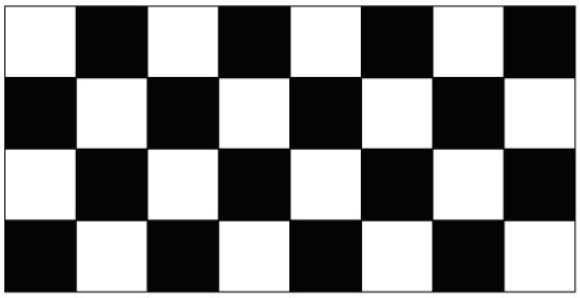
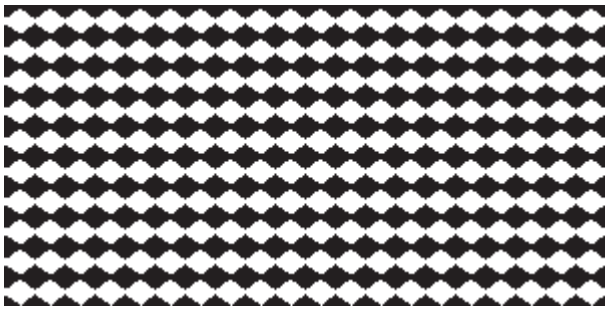
So onto **Rule #2; Does the design have air in it?** I have found that a checkerboard is an easy way to visualize this. You have black and white in a 50/50 balance. 50% of the design can be viewed as air, the other 50% as ink.



A checkerboard represents a balance between ink and shirt fabric to promote a softer print, commonly referred to as the 'hand' of the print.



Halftones in Simulated Process printing provides a similar effect and helps plastisol prints achieve a softer hand.

Simulated Process Plastisol Printing on the other hand needs air. A solid base plate with solid color overprints within the base plate are extremely hard to print without a lot of flashes. Wet onto wet colors will migrate into their neighbor and blur, edge quality will suffer, and ink colors in the solid area may orange peel or have different shades. By using dark inks without a base plate, and incorporating shirt color as part of the design the print will be softer and breath well for a better customer experience. Minimize the use of a solid base plate as much as possible, or break up a the base with 60-80% tonal values to incorporate air in the solid print areas instead of 100% solid ink.

2013 ISS Long Beach Show Shirt

The whole goal of print engineering is to understand how the art will print on press and how close we can get to non-stop production. Black t-shirts are the easiest to break up a design with air. I specifically built spaces between the elements and used the shirt as a shadowing effect in the above design which is very typical for black shirts. There are minimal solid areas, most of the colored art except for the highlights is a tonal value.

This base plate has just a few solid areas of art that will be used in the highlight white areas of the design. Base plate quality can be significantly increased by using S-Mesh from Murakami that allows for brighter, whiter base plates that can hold 45, 55, 65 line halftones.

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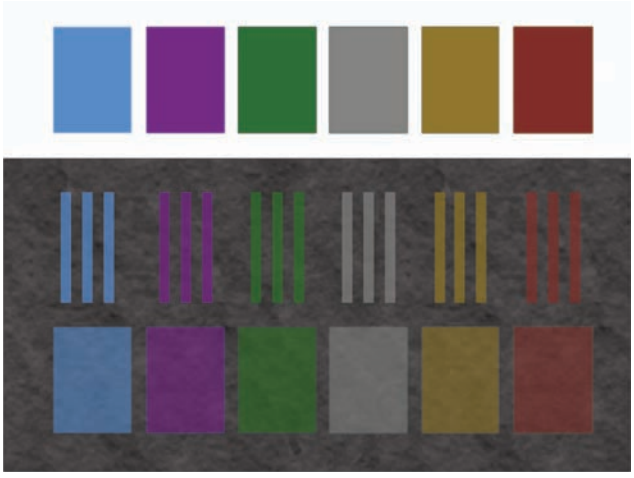
The 'air' in the design can also be dark ink colors within the design that don't need a baseplate and can be printed through higher mesh counts from 150-250 threads per inch on colored t-shirt fabric. On lighter fabric colors this is common practice, however on dark shirts the more you can print ink color right onto the shirt without a base plate the easier production can be. An example would be a medium blue. It may be too dark when printed straight onto the shirt as called out in a PMS number mix and when printed on a solid base plate the color may be too light with wet onto wet printing. There may be opaque bases that help increase opacity or modifying the ink by adding white or a tiny bit of blowing agent can increase opacity. The art can be designed with patterns or as line work that will appear more opaque than large solid areas that will show mottling of the ink. The eye will often miss slight color variations in thin art, but the eye will also pick up slight color variations in large solid areas. Other typical ink colors that don't need a base are medium to dark greys, earth like greens, deep maroons and purples.



In the graphic above the line work appears more solid with less mottling of the color which is seen in the solid areas. Sometimes a base isn't needed for line work or details or where the dark ink is dark enough to cover the shirt color in broader print areas. The graphic above of lines and solids are both set to 60% opacity over the simulated shirt pattern, the same holds true in print.

You can also use clear base to stain the shirt fabric to create tone on tone effects. Quite often these types of colors can be placed in the print sequence before a white base ink. A print sequence of a clear, then a dark purple and blue can be printed wet onto wet before the white base plate. This allows 2-3 ink colors to be flashed by the base plate flash and opens up more print heads on the press where flashing of a color over base plate is not needed. With the base plate printing right after inks that can be printed directly onto shirt fabric, the edge quality of the white is sharper than printing dark colors after the base where the print can smear along the white edge.

Rule #3. Cross Train Between Departments: Too often the production department and the art department do not meet often enough. Artists can assume that a 110-T will cover all base plates, while the production manager takes a look at the halftone in a base plate and switches it to 225-S. Both need to sit down and figure out the mesh call outs and sequence of every job before art is sent to the screen room where time is precious. I often required all incoming art to be color photocopied so I could write up the mesh counts I wanted. Art is rarely the same type of art or subject matter and each needs to be analyzed for the following areas to achieve success. *When the art goes to sampling the sampler needs to mimic a production press so that it prints flawlessly in production, more on this screen printing crime later.*

1. Is there enough air in the print?

2. What colors can be printed directly on the shirt?

3. What colors need a baseplate? What other colors do I need to use as a baseplate in addition to white? (It may be more than just white). Red for example looks better printed over a red base plate than white where it can lose strength.

4. What mesh count does my base plate need? *(Murakami S-Mesh is leading the way in printing halftone base plates with brilliant white prints and a soft hand.)* 150-S threads per inch can hold a 45 and 55 line halftone very well, as can a 135-S with a 50 line halftone. (Continued on page 4)

5. What will be the sequence of the print? (***Beware:*** ***The sample department determines the ease of production. They need to mimic an automatic press. The sample dept can create samples with many more flashes and print strokes than the press has. The sequence they develop must be duplicated on the automatic press exactly and documented on a print spec sheet.)***

6. What ink system will be used? Mesh counts may be different for PVC and Pthalate free inks vs. Plastisol.

7. What are the reference colors in the print? ***(like Coca Cola Red for example or flesh tones.)***

8. Are the detailed tonal areas of the job better in a halftone or in stochastic dots? ***(The smaller the print area the better stochastic looks compared to halftones.)***

9. Are there enough print heads to have a cool down station after every flash when the job is set up on an automatic press?

10. If the press doesn't have enough heads for a cool down station, what color would print in the station after the flash? Typically a small print area combined with a slow flood speed and a fan can cool down the pallet enough to prevent hot tack issues.

11. Will the print sequence be able to run non stop?

12. What is the best mesh recipe for the print? (This is the domain of both the production and art departments. Too often printers receive screens with mesh called out by the art department that needs to be changed to mesh counts that will print better.)

Rule #4, Cross Train each other: Print Engineering involves the knowledge of the press operators and production manager merged with the Art Department's separation ability and RIP knowledge to separate the art into discreet colors that have been engineered to print well.

The art department and sampling department are capable of creating prints and sequences that are unachievable by production. Production needs to express what it needs to print production well, after all that is where most of the billable dollars are created.

I showed the same design to the production and art department at a recent visit and they arrived at two different mesh call outs. Combine their knowledge in a pre-production meeting to come to a consensus that will result in shorter production run times

Production	Art Dept
Base: 225/S	Base: 160/T
Blue 1: 350/T	Blue 1: 280/T
Blue 2: 300/T	Blue 2: 280/T
Grey 1: 350/T	Grey 1: 300/T
Grey 2: 200T	Grey 2: 250T
Black: 350/T	Black: 280/T
White: 280T	White: 280T

Production	Print Engineering	Art Dept
Base: 225/S		
Blue 1: 280/T		
Blue 2: 300/T		
Grey 1: 350/T		
Grey 2: 250T		
Black: 350/T		
White: 280T		

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The shape of the art also plays a role in quality. Rectangles, squares, simply don't reproduce well on a shirt. A shirt is flexible and once pulled off a sticky pallet these shapes never look correct. Print Engineering would solve this. Avoid straight horizontal solid shapes. Introduce some curve or type warp to the design to hide the distortion of familiar shapes. Circles fall into this category as well. Instead of nice circles you can wind up with football shapes or distorted blobs. The outer edge of the art should be broken up, never straight, as found in geometric shaped art.

Geometric Shapes often become distorted after the shirt is pulled from the pallet.

One company I have visited has a "Wall of Fame" and a "Wall of Shame" on the production floor to let the printers know what is working well, the same applies to art and production. Print Engineering is a collaborative effort of the entire company.

1. Know what art can be reproduced well and what can't. (Salesmen need to learn to just say no sometimes, Rule #1, or charge accordingly and not give away profits.)

2. Know what mesh counts and thread diameters produce better prints. (Art departments should be given sample prints with mesh callouts so they can analyze and compare incoming art to apply best practice solutions in the past)

3. The art department and sampling need to know print sequencing. The print sequence of a good print can be documented, again some excellent print samples in the art room can tell a story, provide mesh callouts and print sequence so the artist thinks like a printer. Also provide a recommended print sequence for the sample dept to speed up their efforts.

4. Know how halftones work, what angle? What frequency? For what mesh count? What can halftones do well? What areas would stochastic work better?. One of these areas would be small faces in a print, stochastic dots can hold more detail in a smaller area, halftones have finite rulings that can lose details in small reference print areas.

5. Know what ink colors can print without a baseplate. The less base plate the better.

6. Know your ink system to use for a given design, what works on plastisol may not work on new PVC and pthalate free inks, or water and discharge ink.

7. Know with a degree of predictability how the design will look when it is printed in production. I saved this for last because this is the money maker. Combining print knowledge and the art department skills can create jobs that set up faster and get approved quicker. If you don't hit what I call the downhill point in a print run by the 50th print your print engineering needs improvement. If you find that at print 200-300 after fussing with the design for hours that you need to change the sequence, art, or re-shoot a screen on another mesh count, then this is part of the learning curve. Refining the Print Engineering in Tear Down meetings, collaboration of Art and Production, and using screen products that can help you achieve better results are keys to more profitability.

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