



Shirts printed with Aquarius Soft Base CMYK, showing the ability to capture a wide spectrum of color with just four screens plus a white highlight screen. (Courtesy of Jenny Ortolani.)

Variables in Printing Water-Based Inks

Review these tips before starting your first water-based print job.

The fashion world has been decorating fabric with water-based inks and dyes for decades, and now finished-garment decorators are taking up water-based printing as well. Today's water-based ink systems offer a full range of products for textile screen printers that can be used across a wide scope of fabrics including cotton, polyester, 50/50 and tri-blends.

In some ways, it can be easier to teach water-based screen printing to someone new to the process than it is to train a person who has only printed with plastisol, because old habits are hard to break! For example, plastisol printers are accustomed to leaving the inks in the screens overnight or waiting a few hours to clean up after a production run, but screens used with water-based ink need to be cleaned immediately after printing to prevent the ink from drying in them. Another difference is that plastisol printers are not in the habit of flooding the screen with ink when walking away from the press, but this is also necessary when printing

with water-based inks. Flooding the image area prevents it from drying in the screen prematurely.

Water-based printing is easy, but it's wise to review the main variables in the process before printing your first job.

Art

Creating artwork for water-based ink printing is not much different from designing for plastisol. Add a little thickness to fine lines and detail until you get familiar with printing water-based inks and select a 55-line dot pattern for simulated process jobs or halftone shading in the design.

Screen Emulsions

The screen emulsion needs to be water resistant to keep the stencil from breaking down during the print run. Screen emulsion chemistry has improved significantly in recent years and it is no longer necessary to use hardeners for water-based inks, even on long runs. Dual

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By James Ortolani, Sales Account Manager, PolyOne Corporation





Black 100% cotton T-shirt printed with Aquarius High Solid water base ink by PolyOne Corporation. (Courtesy of Jenny Ortolani.)

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cure emulsions work extremely well with water-based inks and the mesh can still be reclaimed after use. Alan Howe from SAATI Chemical explained, "Proper complete drying of the stencil is especially true in dual cure and diazo products where water molecules prevent cross-linking, as these will be the soft spots that start breaking down on the screen."

Squeegee Selection

Water-based printing is similar to traditional screen printing when it comes to squeegee selection: A softer squeegee will lay the ink on the surface of the garment and a harder durometer blade will drive the ink deeper into the fabric. A 60-durometer squeegee with a sharp edge is a good standard squeegee for manual or automatic water-based printing. Some printers have upgraded to a triple durometer squeegee, like a 60/90/60, where the soft 60-durometer edge lays the ink on the surface of the garment and the 90-durometer core keeps the squeegee from deflecting.

Mesh

Coarse screen meshes have historically

been a common choice for printing water-based inks, but today's systems now use much finer screen meshes. A 110 mesh is still a good choice when printing a water-based dye migration stopper or when printing high solid water base on dark garments, but many of today's water-based inks can be printed all the way up to 305 mesh! Or, try printing with the "S" screen mesh. The thread diameter is smaller and allows for a larger percentage of open area in your screen, resulting in a noticeable difference in print opacity when compared to standard mesh.

According to Ray Smith, Field Tech Services Manager, PolyOne, "With water-based inks, the goal with mesh is to achieve the most open area possible while maintaining a clean image edge. Mesh counts between 110 and 230 are recommended for vector designs to provide good ink deposit. Higher mesh, such as 230 to 305, could be used in halftone printing if needed."

On-Press Considerations

When printing water base with an automatic printer, Smith recommended setting up the flood bar with at least 1/32-

inch space off the screen to create a heavy flood over the image. "Add a generous amount of ink in the screen to allow a good flood over the image area," he added. "To improve the screen life, a wing flood bar keeps the ink in the middle of the screen, aiding the flood deposit."

Smith also noted, "To prevent over-flashing, heat up the shirt platens to 120 degrees F, and set the quartz flash to 80% power with a 3 - 4 second dwell time to attain an ink surface temperature of approximately 200 degrees F. Add a cool-down station to allow the garment to drop in temperature between 140 and 150 F before printing the next color."

Note: The comments above are only applicable to high solids (HS). Soft base and discharge should be printed wet on wet.

Plastisol vs. Water Base

When printing white plastisol on dark garments, a common technique is to print with a 110 mesh, flash and print a second highlight white screen with a 230 mesh to increase brightness. To achieve this same effect with water-based inks, that process is reversed. First, print HS white through a 230 mesh and flash (to seal the surface of the garment). Then print a second HS white ink through a 110 mesh to achieve a bright white.

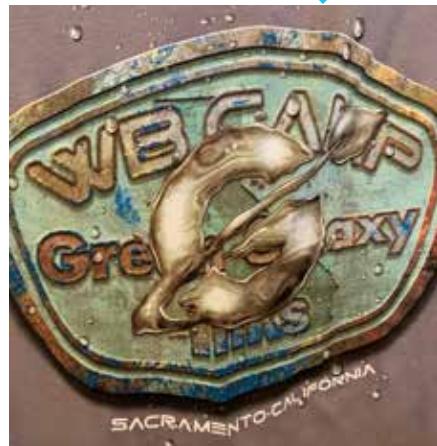
Mixing Water-based Inks

When mixing custom colors, it is important to have a digital gram scale for accuracy in mixing ink formulations. With water-based inks there are three main systems — soft base, HS and discharge — and they are all mixed with water-based pigment concentrates to achieve pantone colors. The pigments are typically universal, meaning they can be used across all water-based types.

The soft base (for printing light-colored garments) is great for printers starting out, because these inks are easy to print using a wide variety of mesh counts (all the way up to 305), and they print nicely on cotton, tri-blends or polyester. Printing with HS water-based inks on dark garments takes a few more steps and a good understanding of the variables associated with printing on dark garments, including EOM, squeegee durometer, screen tension, mesh count, squeegee angle, squeegee speed, squeegee pressure, flood bar settings, off-contact settings and flash cure temperatures.

Discharge Water-based Inks

Discharge water-based inks are a great way to achieve bright colors with a very soft hand, but it's important to only use garments that are dyed with a reactive dye that is suitable to work with the discharge printing process. Printing with discharge inks requires a discharge additive to be



WB/Camp: An In-Depth Look at Water-Based Inks

In September, SGIA hosted WB/Camp, a first-of-its-kind water-based ink summit in Sacramento. The event included expert-led education as well as on-site demonstrations at Motion Textile's facility.

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Three-color psychedelic design printed with Aquarius Bright Discharge Base ZF. All discharge colors are printed with 200 mesh and one squeegee pass for each color. (Courtesy of Jenny Ortolani.)

Special effect water-based inks include suede, metallic, reflective and pearlescent, and can be mixed with pigment concentrates to achieve custom colors.

mixed into the ink just prior to printing. (Gently remix the ink prior to adding to the screen.) The additive deactivates the dye in the garment with a bleaching effect and removes the color of the garment in the printed areas when run through a hot-air convection oven. The end result is a bright and soft hand water-based print! Discharge water-based inks are available containing formaldehyde (ZF) and non-formaldehyde (NF). Best results are proven to come from one squeegee stroke with discharge inks; multiple strokes will lay down more ink that can slow down the discharging process in the oven.

Special Effects

Special effect water-based inks include suede, metallic, reflective and pearlescent, and can be mixed with pigment concentrates to achieve custom colors. Plastisol and water-based printing require similar mesh counts for printing special effect inks, such as glitter through a 30 mesh, pearl base through an 80 mesh, and suede inks through a 200 mesh.

Additives for water base inks include retarders to keep the inks flowing in extra hot and dry shop conditions. Most water-based inks offered today are made to print straight from the bucket, so use additives sparingly and only as necessary.

Curing Water-based Inks

Three categories of heat are used in curing textile inks: conduction, radiant and convection. An example of conduction curing is the use of a heat press to cure a screen-printed image, and an example of radiant heat is the use of an electric infrared oven, such as what's used to cure plastisol inks. Convection heat is the optimum choice for curing water-based inks, because the hot forced air accelerates the evaporation of the water from the ink and allows the ink to cross-link and cure.

Most graphic supply houses sell water-based startup kits and this is a great way to get started with water-based printing. By following the guidelines in this article and reaching out to your ink supplier, you will be on your way to adding water-based printing to your print shop's services!

James Ortolani has been active in the Imprinted Sportswear Industry for 35 years specializing in the screen print process for garment decoration and was inducted into the ASDPT Academy of Screen printing in 2011 for his contributions to the screen printing industry.

James is currently employed by the PolyOne Corporation as a Regional Account Manager.