

The water based alternative?

# They've Come a Long Way

BY ED BRANIGAN

The question of whether to use water-based inks usually elicits one of two responses, both negative, of varying degrees of conviction. The first is fear-based—the “you must be crazy” kind of fear—wherein the ink’s worst attributes are immediately pointed out. Almost everybody who has worked production using water-based inks has a war story about it drying in the screen, or the time they had to work from ten p.m. to dawn because it was only during the cool hours of night that water-based inks would cooperate. “Thanks,” comes the last word, “but we’ll stick with plastisol.” The second response is the quieter one, from the printer who acknowledges the use of water-based inks, but offers little encouragement. This experience and quiet confidence most likely results from years of suffering, battling the “demon” water-based ink.

But recent legislation regarding phthalates has put screen-printing inks fairly under the microscope, bringing water-based back into the discussion. The ink companies traditionally provide information in the form of MSD and tech sheets, as well as certification regarding local, state and

federal restrictions and guidelines. While none of this has changed it would seem that, taken under the broader sweep of the green movement in general, printers are asking more questions and demanding comprehensive answers. The components of the most commonly used inks are under scrutiny—plastisol, in particular—and, while the discussion rages, printers still need ink to put onto shirts. So we turn again to water-based ink and ask some valid questions with regard to its efficacy as a valid alternative.

## Water-based advances

Most textile water-based inks were, until recently, composed of 70-80 percent water. Advancements in technology have brought about water-based inks in recent years that are now 30-40 percent water. The remaining solid content of either one *can* be composed of pigments, binding agents, resins and extras such as formaldehyde, biphenyls and certain heavy metals. These inks are subject to the same local and federal safe-handling and disposal rules as are plastisols. Proper ventilation is required as VOCs are still emitted during the curing process.

About the author: With 25 years experience in the screen- and graphics-printing industries, in both Europe and the U.S., Ed Branigan served as director of R&D for several large screen-printing and merchandising companies including Winterland Productions and Giant Merchandising. He is currently print products applications manager for Calif.-based International Coatings, engaging in product development, marketing support and conducting workshops and seminars.



That said, great strides *have* been made, resulting in new water-based ink systems that are not only opaque, but much more user friendly for mass production, and containing less or none of the toxic elements mentioned above.

For now, the point to note is that, while water-based inks in general do contain substantial amounts of “just water,” this by itself does not necessarily make them more sustainable or environmentally friendly. So choose your brand carefully, study the technical information, and ask for certification. Deciding which ink to use will be influenced by several factors, including customer needs, cost and design specifications.

One of the major factors in water-based inks’ favor *used* to be its soft hand. Simply adding water could not only extend the ink and save money, but also render the hand impossible to feel. The downside was the lack of opacity—that only grew worse with the addition of water—which limited the printer to light-colored garments. For dark shirts that required full-color saturation, plastisol was the only way to go.

Likewise, the mesh range for textile printing with plastisol commonly



The version on the left is a regular plastisol print on a black shirt, while the other is printed with a high-solids water-based ink. What a photo in a magazine does *not* reveal is the difference in the two prints’ hand—it is significant.



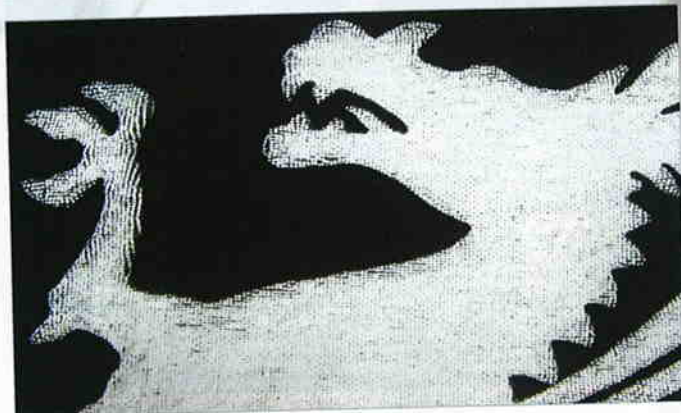
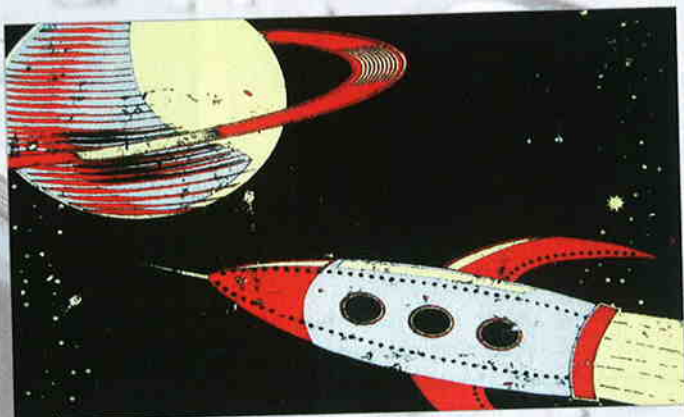
runs from as low as 25-tpi to as high as 355-tpi. The upper range for water-based ink *went* to about 156-tpi. Nobody would have dreamed of trying to print halftone dots through a 230 mesh with water-based ink, especially on a large production run. Nowadays there are inks on the market that will stay wet in the screen for hours, and even if moisture is lost they can be “brought back to life.” Given the right temperature and humidity, some of these inks can be left in the screen for extended periods, even over night.

An opaque water-based ink system has been attainable for some time. Previously, the simplest way to increase opacity was to put less water into the ink. But this only amplified the aggravation of the drying mentioned above. Now, though, with the addition of emulsifiers that retain and lock in moisture, not only is high-opaque water-based ink available, but it also resists drying in the screen to a great degree, thereby allowing printers and designers to print the elusive smaller dot using a higher mesh count, achieving much higher resolutions than were previously possible. Alongside this it is now also possible to plan and execute long production runs using water-based ink, with minimal interference.

### **Discharge progress**

The use of discharge ink has gained a strong foothold in retail fashion in particular, but also across a wide spectrum of T-shirt printing. The process of discharging textile dyes has been around since at least the late-19th century. Mention the word “discharge” to the average T-shirt printer, though, and it will elicit a similar response to the question asked earlier about water-based inks in general. The fear has been the formulation’s formaldehyde, and it used to be a very real fear. Discharge not only gassed off formaldehyde when curing—and thus was extremely foul smelling—but trace amounts were left in the shirts and recommendations

## Water-Based Inks



**Clockwise from top left:** Here's another example of a design printed with water-based ink. In this case, 60-dpi halftone dots were printed, and 230-tpi meshes were used on all colors; this is an example of a water-based discharge print, with a water-based pigment tint; this print, courtesy of Rick Roth, Mirror Image, shows the extreme detail now available through the use of water-based textile inks; SFX anyone? Here is an example of a water-based white ink printed on top of a plastisol specialty ink.

were often made for retail customers to wash the shirt once even before wearing. (Not likely!) But for those who chose to work with it, the effects were unbeatable, especially on the darkest garments.

With discharge, though, progress is also being made. The formaldehyde levels are lower now and are significantly less foul smelling, making it easier and more attractive to handle. Non-formaldehyde discharge is another emerging alternative. Discharge can be tinted using non-corrosive pigments, creating vibrant colors on dark garments with an almost undetectable hand. When trying to achieve a soft hand for plastisol on a dark shirt, many printers turn to discharge as an underbase, and the procedure is very effective. Taken a step further by reducing the plastisol with an extender or curable reducer, and an even softer hand is achievable. Discharge can also be used as an underbase for standard water-based inks.

Although there are plastisol discharge inks available, it is the water-based variety

with which most printers are familiar. It has remained stubbornly on the radar in spite of its reputation, and its popularity is rising simply because, when used correctly, the results can be stunning.

### Simply add water. . . .

Everybody knows that oil and water don't mix. Nobody is putting plastisol pigment into water-based mixing base, or vice versa. With the tools of sorts between the two systems is approaching. The mesh ranges are now close to the same, although it is still only the brave few who will step into the upper ranges of 280-305 with water-based ink.

With the use of dual-cure emulsions that resist both solvents and water-based products, either type can be swapped out if necessary. Water-based inks do still require a longer cure time, but some plastisol inks such as gels, thermosetting inks and certain blowing agents themselves require


higher cure temperatures, so these different products can all be incorporated into the same design. Even so, most water-based inks will still air-dry anyway.

Whereas plastisol ink can be printed on top of a water-based ink and not wash off, the same was not always true of the reverse. But now, using a high-solids water-based ink, these two media can stay together, which opens up some possibilities in the specialty-printing area. If this same high-solids water-based ink is used as a baseplate for a design with plastisol ink, it will reduce the hand. Want it even softer? Simply add water.

While we certainly cannot mix these two systems together in a bucket, there is nothing to stop us from putting them together on the print, either side by side or one on top of the other, if it suits our needs.

### Proper management still required

After all that's been said, there are still some limitations to be faced when printing with



water-based ink systems. Almost all of them depend on our the need for the ink to stay wet in the screen long enough to make it worth the trouble of putting it there in the first place. There is still a variance among the different systems on the market, with some behaving as water-based inks have historically done, and others performing better. Even among the newer inks, with their stronger moisture-retention capabilities, there's still water in there and—unlike plastisol—the ink *will* eventually dry if not managed properly, whether in the screen or elsewhere. This is especially true when printing the aforementioned halftone designs through high mesh counts.

The key difference that marks this newer breed is that their emulsification properties and newer wetting agents have advanced tremendously. Long production runs are now possible because we have water-based inks that not only stay wet in the screen for much longer on their own but can be kept wet even longer with a little help; and even when they lose most of their moisture we can rehydrate them again.

No water-based textile ink has the durability and longevity of plastisol, either in its wet or cured state. Nor do they have the versatility that plastisol enjoys where special-effects printing is concerned. What we do have are water-based inks that, when printed, feature the same coverage and opacity as plastisol on a dark shirt. These inks feel softer and have far greater resilience than their predecessors. They can and are being printed in production on automatic machines for long runs and with great effect.

They are not, nor will be, plastisol inks. But as has been shown, water-based inks can be used as a viable substitute on many occasions. While it is *still* the case that not every water-based ink product on the market offers complete environmental friendliness—and arguments about what constitutes sustainability aside—if reducing one's carbon footprint is something a printer is interested in pursuing, exploring water-based inks is a good place to start.