

Water-Based Inks: An Eco-friendly Solution for Special-Effects Garment Printing

The search for sustainability pushes many screen printers to rethink their production methods and consumables choices. Read on to learn why water-based inks are a viable solution and discover how you can use the latest formulations to produce unique effects on garments.

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Most garment screen printers look to water-based inks when asked to suggest environmentally friendly alternatives for apparel decoration. The common wisdom is that if the ink is water soluble, and no mineral spirits or harsh chemicals are used in clean up, then it can't be harmful. Some will say there are limits to what you can do with water-based inks—you can only use low mesh counts, and you can't print on dark shirts. The fear sets in almost as soon as the words are spoken. You'll hear that the water-based inks will dry in your screens. Then comes the nightmarish image of a 100° summer afternoon, where the inside of the shop feels like a

baker's oven, nerves are frayed, screens are caulking up, and the dreaded deadline is looming. Few will admit they enjoy working with water-based ink systems, but you should reserve judgment until you've had a chance to learn about and experience the benefits and drawbacks of water-based inks in the variety of textile applications for which they're suited.

A few facts about water-based inks

Most traditional water-based systems contain 60%-70% water, which gives the impression that they're safe and leads to the assumption that the remaining 30%-40% solids content is not subject to local and/or federal rules concerning disposal and safe handling. It is, in fact, required that water-based

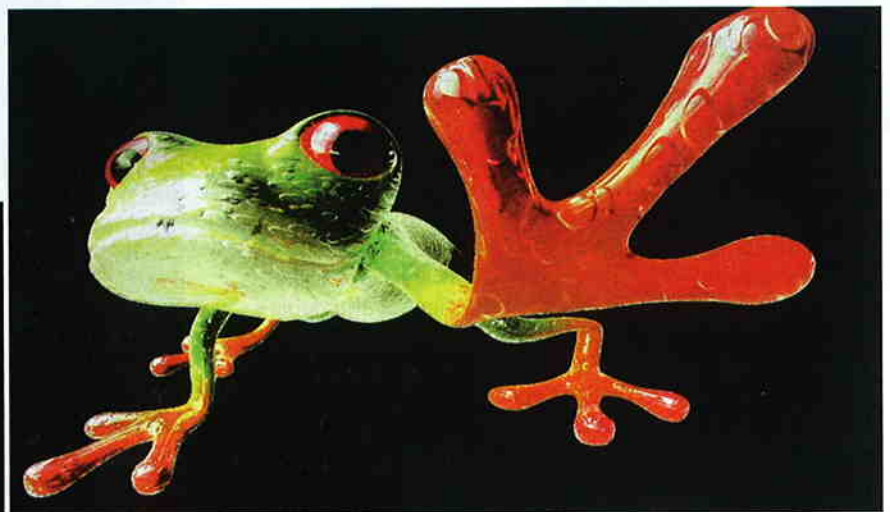


figure 1

HALFTONES

This decoration was created by printing a high-pigment white base through 160-thread/in. mesh, along with custom-mixed yellow, orange, red, light green, medium green, dark green, black, and white—all through 230-thread/in. mesh. The print was then cured at 375°F for one minute.

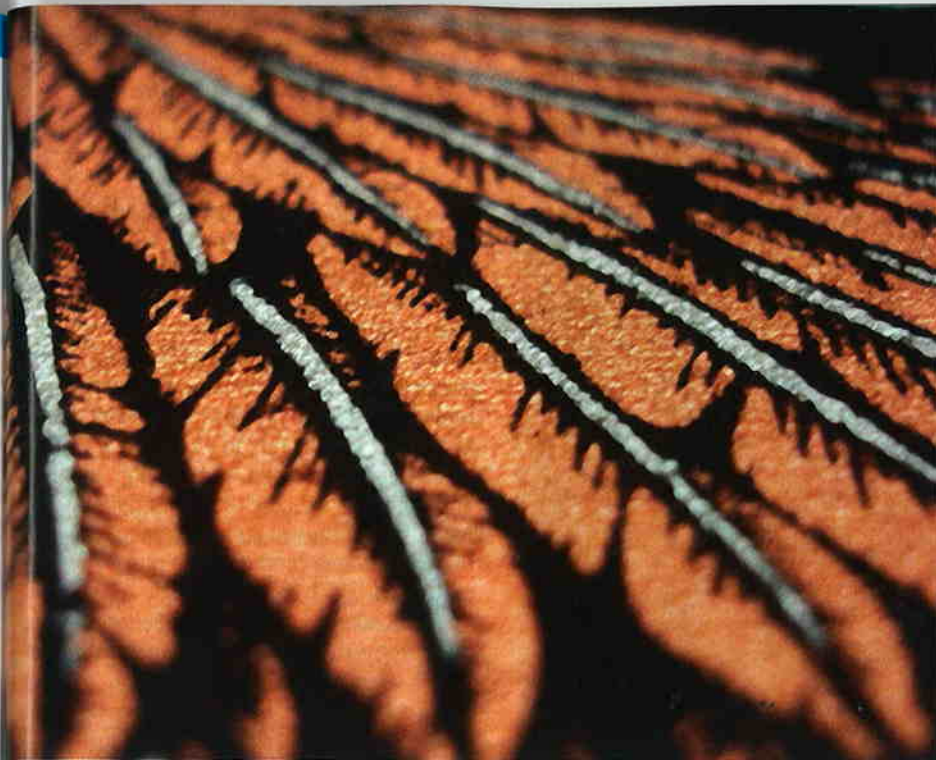


figure 2

THE METALLIC EFFECT

Here, copper metallic ink was printed through 86-thread/in. mesh (print-flash-print method), followed by a silver metallic ink printed through 86-thread/in. mesh, and then cured at 350°F for two minutes.

and imagination, the inks could be used effectively on colored garments—but darks are often ruled out. Add to this the fact that the inks themselves dry up in screens very rapidly, which makes long production runs either very frustrating or almost impossible. The addition of retarders sometimes helps, but the rapid drying on the screens remains a problem.

One way to offset the problem of printing on darks is using a discharge underbase; however, you can rule out its use as an environmentally friendly product due to a high formaldehyde content. The extremely unpleasant odor of discharge underbase also makes it very difficult to use. Many printers simply refuse to get involved with it.

inks be handled in much the same manner as plastisol inks in this regard. Material Safety Data Sheets (MSDS) must accompany all shipments and be available to any printer who uses the product. Water-based inks do release VOCs, so proper ventilation is required.

Water-based inks have been used for garment printing since the late 1950s. While the arrival of plastisols revolutionized the mass-production capacity for T-shirt printing and, over the years, has taken a larger slice of market share—particularly as the technology has advanced—water-based inks still have retained a niche and have remained a core tool for many printers.

One reason why some turn to water-based inks is because the inks are cheaper than plastisol and are a great cost-saving device, especially when printing longer runs on light garments. They also are easy to manufacture in house. Printers can purchase the raw materials separately and easily mix them in an ink room. Manufacturing in house is another good money-saving solution, as the mixed ink does have a much shorter life than plastisol ink. The hand also is very soft, and the inks can be reduced easily with water, giving an even softer hand—although this is only possible on white shirts, where color fastness or opacity is not a critical issue.

low solids content (sometimes as low as 30%) prevents successful use on colored garments, never mind black or navy. Moisture evaporates during curing, leaving a very thin ink film that's extremely transparent. As mentioned already, this is often not an issue for white shirts, and with some creativity



figure 3 PUFF INKS ADD DIMENSION

Using puff additives allows printers to produce thick ink films with original textures by using a thicker stencil. This decoration was produced with a red ink and 15% puff additive, printed through 110-thread/in. mesh (triple hit) and cured at 330°F for one minute.

Traditional issues with water-based inks

Opacity has always been a downside to using water-based inks. Their typically

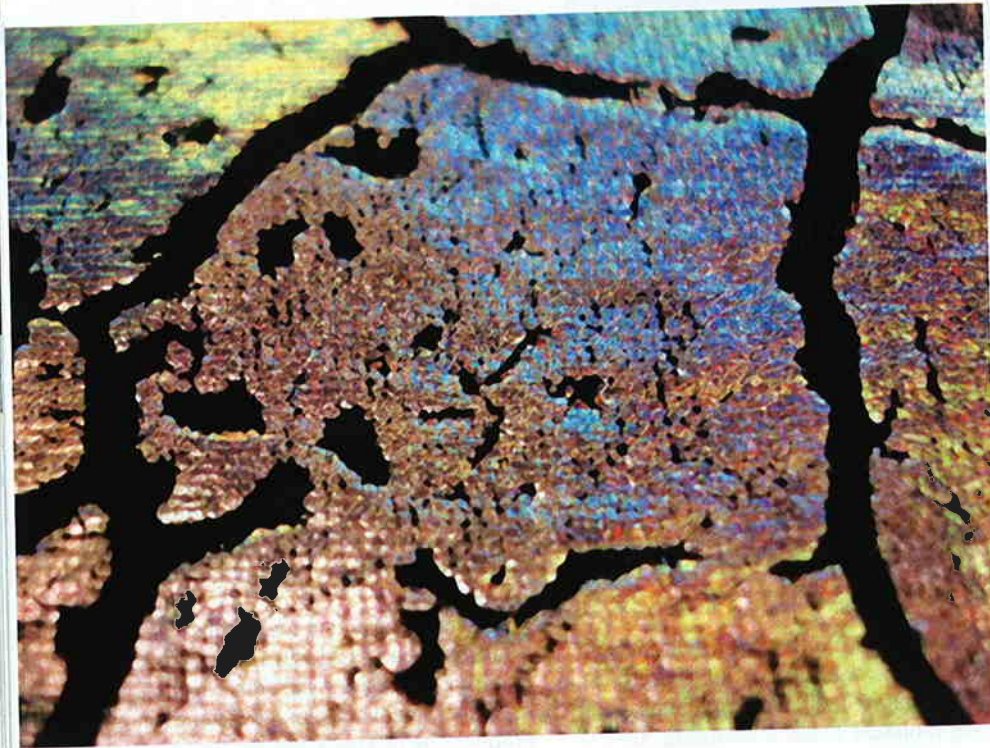


figure 4 FOILS FOR A VINTAGE EFFECT

The use of foil adhesives can create vintage-style prints. Here, the printer used a black ink with 15% puff additive, printed the ink through 40-thread/in. mesh, and cured it at 330°F for one minute. Foil was applied with a heat-transfer press at 350°F, 60 psi, for 16 seconds.

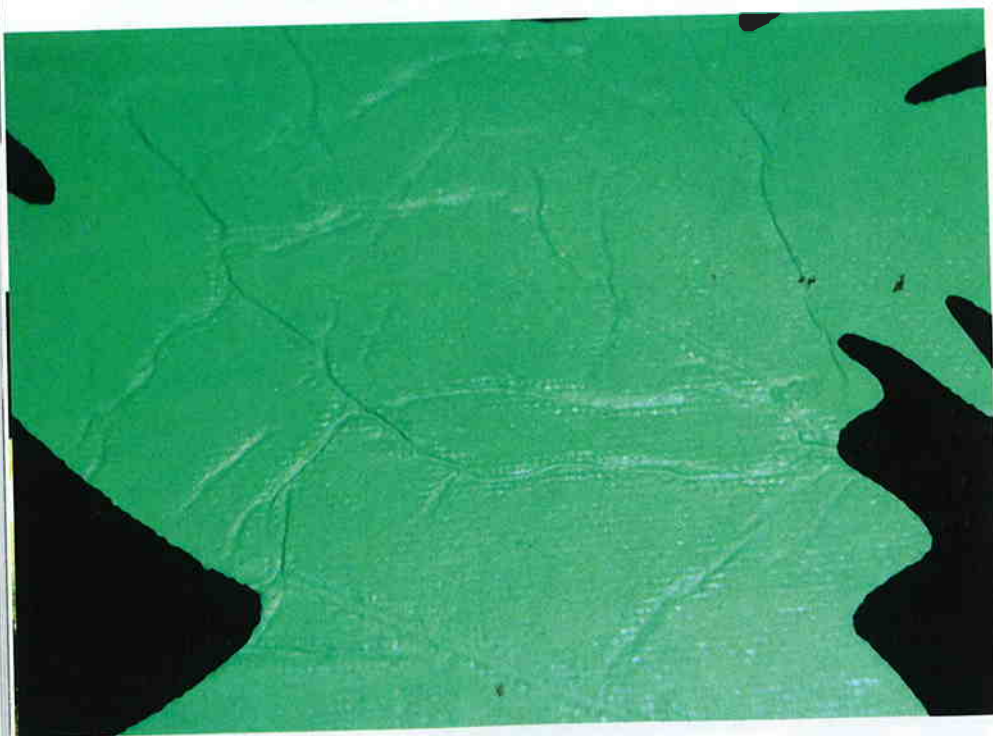


figure 5 CREATING CRINKLES

To achieve the crinkled look, the printer used a custom green ink, printed it through 40-thread/in. mesh, and cured it at 330°F for two minutes. He then applied crinkled transfer paper with a heat-transfer press at 350°F, 60 psi, for 16 seconds.

However, great strides have been made in recent years in the development of discharge inks. The formaldehyde levels have been lowered, and the odor has been greatly diminished. In some newer products, the primary discharge agent, zinc formaldehyde sulphate, has been replaced by a sodium-based equivalent, but the jury is still out on its effectiveness. It is an important step though, and the hope is that with further development and the encouraging trend towards greener products, the momentum will keep going.

Ink manufacturers have recently taken steps to increase the solids content in water-based inks in hopes of making them friendlier for use on dark shirts. This trend is especially evident over the past 10 to 15 years. The initial results gave excellent opacity and color fastness, but did not increase retention times in the screen. Some of these inks were even harder to manage and dried up even faster. The trade-off was still a tough one: cheaper inks, somewhat more environmentally friendly, great color and opacity on darks, easy to reduce for use on lights (which also saves on cost), but difficult to maintain on long production runs. Again, the use of retarders could help, but the problem still remained, and water-based inks continued to be seen as the demon of the print shop—although a somewhat necessary demon.

Demands for development

The push in recent years towards sustainability and the increasing awareness among end users and consumers concerning the environmental impact of products and lifestyles has driven the development of greener inks in screen printing. Along with PVC-free plastisols, the spotlight is again on water-based inks. Most of the major manufacturers now promote a version of each type of ink.

Huge leaps have been made in recent years in water-based-ink technology. With the introduction of newer wetting agents and emulsifiers, the old scourge of ink drying in the screen has been greatly diminished. Some of these newer inks now can be left in the screen four to five times longer without clogging or drying. Inks that lose moisture from evaporation due to the heat from dryers and extreme climate can be re-emulsified and re-used. Shelf life has been



figure 6 THE DISTRESSED LOOK

To create this look, the printer placed a crinkled piece of pellow material on the print area of the platen. He then gently pulled some platen peel across the creased pellow material, and then adhered the material to the sides of the platen. Next, he placed the garment on the platen and printed scarlet water-based ink through 40-thread/in. mesh and cured it at 350°F for two minutes.

greatly increased, with some products now lasting up to two years if stored under the correct conditions.

Application ranges for some of these inks have opened up to rival those of plastisols. Opaque whites that allow solid underbase printing on dark shirts, coupled with the ability to print through high mesh counts—a practice that was unheard of for traditional water-based printing—has given rise to possibilities both new and exciting. One example is printing halftones onto dark shirts using the same line weight and mesh as plastisols (**Figure 1**). Printers also can use newly developed modifiers and emulsifying agents to very effectively manage drying time in the screen.

One of the last hurdles for water-based inks to cross was their use for special-effects printing. The wide range of applicability of plastisols in special-effects printing is well known to some and not surprising to those less experienced. High-density, gel, suede, metallics, and thermosetting bases are some of the more prominent products, and they can be used to achieve all

manners and types of texture, loft, or shine.

Many types of curable and non-curable reducers also can give a soft hand, rivaling the softness of water-based inks. But all of these reducers contain PVC and phthalates, heavy metals, as well as some of the lesser known culprits, which render them not environmentally friendly.

Many of the PVC- and phthalate-free plastisols currently on the market do not have the specialty bases with which to achieve the same looks as their PVC-containing cousins. However, some of the newer high-solids, water-based inks available do have some supporting additives and a widened application range as a result.


While clear gel currently is unattainable in a water-based format, you can use metallics, thickening agents, and puff additives to create considerable loft, as well as a suede look and feel (**Figures 2 and 3**). The higher solids content allows the printer to produce a thicker ink film and build on that film by using a thicker stencil to create very

original textures. Foil adhesives and glitter bases are available, and foil can be applied to the ink itself to create textured, vintage look (**Figure 4**). Simply adding water to reduce the opacity of the ink can produce a washed-out effect. Add distressed artwork and an enzyme wash to enhance this concept (**Figures 5 and 6**).

Bear in mind that some of the additives are PVC- and phthalate-free, and they contain no heavy metals, pesticides, AZO, PCP, or biphenyls. This makes them very environmentally friendly, according to current standards.

Keep watching water-based inks

The addition of longer shelf life and the ability to rescue inks that have lost moisture by using emulsifiers also lessens waste and adds to their sustainability. All in all, the future looks bright for water-based inks. The trend toward protection of the environment is evident in all sectors of the economy and looks set to intensify. We'll eventually reach a point where screen-printing inks will be entirely eco-friendly and the toxins that were once a strong part of their formulations will become relics of the past.

Water-based inks, by their very nature, are uniquely poised to make quite a contribution to this movement within the screen-printing industry. While plastisols will not go away any time soon, you could argue that as ink manufacturers spend more time in R&D of water-based, eco-friendly ink products—especially with respect to specialty printing—they can easily capture as large a share of the market. 

Have a comment about this article? E-mail it to the editors at screen@stmediagroup.com.

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3P's Value products are 100% recyclable and engineered without harmful substances. Products include Value Premium Flag FR, Value Display FR, Value Satin FR, and Value Gloss FR.

EskoArtwork Concludes Merger

EskoArtwork, Gent, Belgium, announced that the board of directors of EskoArtwork is arriving at the conclusion of a comprehensive integration process, which began one year ago with the merger of Esko and Artwork Systems. Operations, staff, and distribution channels from the former companies reportedly have been aligned and combined. The company says in turning its focus towards the next steps in the company's development, EskoArtwork's board of directors has decided to make some changes at the executive management and board level.

Guido Van der Schueren, currently executive management board member and chief commercial officer, has been appointed non-executive vice chairman of the board, reporting to EskoArtwork's chairman, Jean-Claude Deschamps. Van der Schueren will focus on strategic projects and related board matters. Carsten Knudsen, president and CEO, remains executive board member and assumes the leadership of EskoArtwork's management team. For more information about the company, visit www.esko.com.

International Coatings to Replace Phthalate-Based Inks

International Coatings, Cerritos, CA, announced plans to replace by the end of the year any plasticizers in its ink that may not comply with the new wave of legislation and regulations concerning phthalates in children's articles. The federal government and several states have enacted legislation that will restrict the use of six phthalate plasticizers in children's toys and child-care articles. International Coatings says it is not clear whether and how these laws apply to children's clothing printed with plastisol textile inks that contain phthalates.

"Most of International Coatings' ink line has been 'phthalate-compliant' for some time," says Stephen Kahane, president of International Coatings. "But we've decided that the most prudent approach now is to remove any of the remaining proposed restricted phthalate plasticizers from our inks, whether their use falls under the new laws or not. That

way, any uncertainty regarding compliance and safety is removed. Printers can continue to use any International Coatings ink products without worry."

GroupeSTAHL CEO Hosts Blog on Heat Printing

GroupeSTAHL, St. Clair Shores, MI, announced that its CEO, Ted Stahl, launched a blog to provide information and tips on decorating T-shirts, CAD materials, digital transfers, vinyl cutters, heat-transfer presses, lettering, team numbering, and anything else related to garment decoration. Topics already posted on the blog include how to choose a heat press, how to print a T-shirt, and sales and marketing tips. New postings will appear once or twice a week at <http://blog.stahlsid.com/blog/heat-press-central>.

GSG Launches E-Commerce Site

GSG, Dallas, TX, formerly Graphic Solutions Group, Inc., a supplier to the screenprinting, sign, digital imaging, and embroidery industries, launched an e-commerce site at www.gogsg.com. The company says it developed the site to be the most comprehensive online products resource for the screen, sign, and embroidery industries.

The Website features products from CCI, KIWO, M&R, Nazdar, PolyOne/Wilflex, Sefar, Stretch Devices, Ulano, and other manufacturers. Digital products include inks and equipment from Brother, HP, Gerber, Mimaki, and Roland; digital print media from 3M, Oracal, Arlon, and Ultraflex; and software and color-management solutions from SAI, Wasatch, and X-Rite. Embroidery equipment and supplies also are offered from ZSK, Isacord, H&V, Groz-Beckert, and more.

Steve Anderson, GSG's vice president of marketing, says customers can shop online and pay by credit card or register to become a terms customer. He also says the site has been integrated with GSG's back-end inventory system, allowing customers to see which items are in stock and which items might be temporarily unavailable.

Access Display Group Receives Patent

Access Display Group, Inc., Freeport, NY, a designer and manufacturer of changeable signage-display frame solutions for visual merchandising, announced it received Patent No. 7,360,330 by the US Patent and Trademark office. The new utility

patent, titled "Multi-purpose display frame with gravity lock," is a continuation of the company's first US patent application approved in 1994.

The gravity locking system, which has been added to Access Display Group's line of display frames, secures a front frame that swings open and prevents it from opening without first sliding up the gravity lock rod. The lock and hinges are positioned behind the front frame, hidden from view. The display frame allows change of posters, signs, and dimensional items without removing the frame from the wall.

"The issuance of this patent expands and further enhances this display system, marketed and branded as 'Swingframe,' and reinforces Access Display Group's leadership in providing the simplest, most versatile and changeable poster display and signage systems in the display fixtures industry," says Charles Abrams, president of ADG.

The new patent applies to several Swingframe wall and floor-stand displays, built by ADG. The swing-open frame and display products include poster frames, sign holders, movie poster frames, shadow boxes, enclosed bulletin boards, letter board directories, menu cases, backlit posters displays, and slim edge-lit lightboxes. For more information, visit www.swingframe.com.

LexJet Offers Mutoh ValueJet Printers

LexJet, Sarasota, FL, is now an authorized re-seller of Mutoh's ValueJet line of low-solvent printers. "Over the past few years we've developed a solvent media line that has no equal in its quality and depth for various outdoor and indoor applications," says Dione Metnick, LexJet's product manager. "With the addition of Mutoh's ValueJet printers, we now have the capability to offer each piece in the solvent printing process, from RIPs and media to hardware, individually or as a bundled system."

LexJet's solvent media includes specialty films, backlit films, reverse-print polycarbonate, fine-art papers, décor media, photo papers, adhesive-back vinyl, banner materials, wallcoverings, canvas, and fabric. LexJet also offers FLEXcon's line of advertising graphic systems for train and bus wraps, advertising for walls, buildings, billboards, floors, sidewalks, carpets, and backlits. LexJet also offers a range of solvent solutions from 3M and Oracal. For more information, visit www.lexjet.com. ■