



Screen and Inkjet Join Forces in Hybrid Systems

Manufacturers of hybrid screen and inkjet apparel printing solutions tout them as providing the best of both technological worlds. Is it true?

Anyone who has used analog printing methods to print four- or six-color process knows that it requires considerable time, effort and expense to make multiple plates or screens and register them with each other and maintain them in register for the entire print run.

Process color digital inkjet printers are designed to print job after job in register. Most inkjet printheads, however, typically deposit very thin layers of ink for process color printing and require low viscosity inks for jetting, which can lack opacity. Covering dark surfaces, such as dark garments, can prove beyond the process's capabilities, whereas screen printing can deposit thicker opaque inks that easily cover and print dark or colored garments. Additionally, many fabrics will require the deposit of a pretreatment before being able to accept and adhere inkjet inks. Thicker screen inks formulated for printing such fabrics, however, can adhere to these fabrics without pretreatment.

Combining screen and inkjet printing can enable garment printers to screen print an opaque underlayer on a wide range of colored fabrics and then inkjet print a full-color image on top of it. Inkjetting enables the print designer to personalize or customize each image. While designers can often adapt their changing designs to match the screen-printed underlayment print area, the multi-station garment screen printing systems can host screens with differing underlayment coverage.

Markets and customers have grown to expect the full-color graphic images that digital printing has provided in recent years. Full-color images can often capture viewer attention better than monochrome. Digital printing offers the customers of garment print providers the ability to stand out and project their own, even personalized, image and message.

Digital inkjet printing and screen printing can complement each other, with the capabilities of one compensating for

Combining the two in a hybrid device enables cost-effective customization, personalization and greater print image variety.

By Vince Cahill, Owner, VCE Solutions





Courtesy of The M&R Companies.



An M&R Digital Squeegee system shown at PRINTING United.

the limitations of the other. Analog print technologies offer the advantage of cost-effective high productivity because they can reproduce the same image repeatedly, and digital inkjet printing can produce different images from one print to the next. Combining the cost-effective long-run print production speeds of apparel screen printing with inkjet's high-resolution variable imaging capabilities and minimal setup requirements creates a system that increases applications and expands business opportunities.

That is why equipment manufacturers are devising hybrid print systems. Combining inkjet and screen enables cost-effective customization, personalization and greater print image variety. Below is a sample of what manufacturers have available today.

The M&R Companies

M&R, which primarily manufactures and supplies screen printing equipment and accessories, has released two Digital Squeegee hybrid garment screen printing-inkjet solutions — the DS-4000, reportedly capable of printing over 400 prints per hour, and the DS-2000, reported to print 200 images per hour. Both inkjet systems use Ricoh Gen5 industrial piezo printheads offering a maximum resolution of 600 by 1,200 dpi. The Digital Squeegee systems print on top of a screen-printed base, enabling them to print a wide range of fabrics, including cotton, polyester, blends and performance fabrics. In combination with M&R's automated garment screen printer underbase prints, Digital Squeegee

prints obviate the need for pretreatment.

Peter Walsh, M&R Executive Vice President, said, "M&R's target customer or market segment for Digital Squeegee hybrid printing systems is customers printing complex images, such as 10-plus color simulated process designs, or high-resolution images in quantities that are greater than can effectively be printed using traditional direct-to-garment (DTG), or less than what can cost effectively be produced using traditional analog screen printing systems. The Hybrid System also provides the opportunity for high-speed, athletic-style printing on polyester and poly/cotton blend garments with the use of a bleed blocker screen-printed underbase."

M&R's Digital Squeegee DS-4000 prints four-color process CMYK with 16 Ricoh Gen5 industrial inkjet printheads. The unit can be used with M&R's Stryker™, Challenger® III and Gauntlet® III garment screen printing presses. It can inkjet print a maximum image area of 40 by 48 centimeters (16 by 19 inches) with a throw distance selectable from 3 to 10 millimeters. The DS-4000 received SGIA's 2019 Product of the Year award in the Digital/Screen Print Hybrid Printing Systems category.

M&R's Digital Squeegee DS-2000 prints CMYK with 10 Ricoh Gen5 industrial inkjet printheads on a screen-printed underbase. It can inkjet print a maximum image area of 55 by 70 centimeters (21.7 by 27.6 inches) with a throw distance selectable from 3 to 15 millimeters, and it is compatible with M&R's Victory One automatic oval screen

printing press. M&R partnered with Hanglory Group of Shenzhen, China, and its CNTop division to design, develop and supply the modular VictoryOne.

Walsh also underscored M&R's efforts to find screen and inkjet inks that would be compatible and perform on the range of fabrics their customer market uses. "We have tested multiple ink chemistries for the screen-printed underbase, tie coat and overprint clear application and have found the high solids acrylic (HSA) water base screen inks to offer the best performance with regard to on-press performance and print durability," he said, adding, "The CMYK inkjet inks used in the hybrid print system are aqueous pigmented inks."

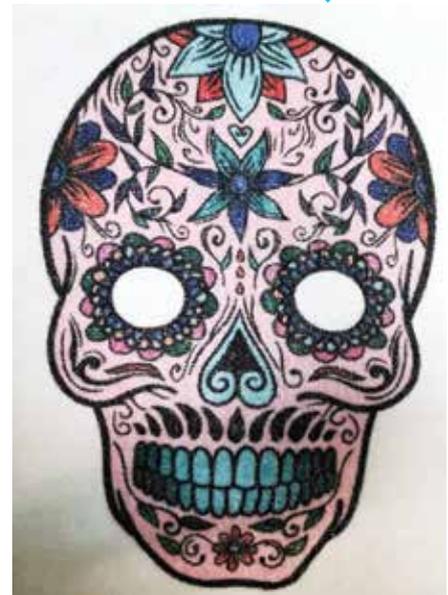
Walsh indicated that M&R has sourced solutions from ink chemists around the world and has not stopped looking for newer ink solutions. "M&R has worked with five or six leading HSA screen printing ink manufacturers to include companies from the United Kingdom, Europe, Japan and the United States, and have enjoyed success with most all manufacturers. More recently we have tested a modified plastisol screen printing ink system from a United States manufacturer that is showing some promise in the early phases of testing."

Among those manufacturers with which M&R has collaborated is U.K. ink formulator MagnaColours, whose MagnaEdge and Hybrid Fusion ink they used to print reportedly more than 8,000 T-shirts at an event earlier this year.

M&R Digital Squeegee print using MagnaColours Hybrid Fusion Ink for screened underbase and topcoat.



Courtesy of Machines Highest Mechatronic GmbH (MHM).



Courtesy of CSC Screen Process Supply.

Machines Highest Mechatronic GmbH (MHM)

Machines Highest Mechatronic GmbH (MHM) of Mühlgraben, Austria, began manufacturing screen printing equipment in 1980. Today, MHM manufactures several screen printing and hybrid screen and digital garment printing systems, as well as pre- and post-print processing solutions including gas and electric conveyor dryers, flash-cure units, screen making, computer-to-screen stencil making systems, print station automatic foiling units, and print station Pro Iron to flatten garments before printing and assist foiling unit. Its garment screen printing systems include carousels Synchroprint 5000, iQ- S-Type Xtreme and X-Type Plus and oval platen transport iQ Oval, and Oval/Compact.

MHM's Digital V Pro combines its S-Type Xtreme and all other MHM machines with an add-on in-line digital inkjet printer and ink. (CSC Screen Process Supply of Johor, Malaysia, developed the ink for MHM.) CSC also offered its clear inks for adhering foils, inks that produce 3D effects, and full-color inks for printing nylon fabrics.

MHM bills its Digital V Pro as a starting model to introduce companies to digital textile printing. MHM claims the Digital V Pro can print — for less than €0.09 (\$0.11) — a maximum of 18 by 18 inches (46 by 46 centimeters) at a resolution of 720 by 1,200 dpi, and estimates its potential production at about 200 prints per hour, depending on material and design. The Digital V Pro uses two

Seiko Epson Precision Core printheads and, according to MHM, can print “wet on wet” so that the need for flash curing of the screened base print is not necessary. The Digital V Pro control systems include Caldera V11 RIP software and a Zeus V Printer Controller.

Thomas Fröhlich, MHM's CEO since 2012, emphasized that MHM's advantage is the unique design innovations present in MHM printers. He noted several beneficial features of MHM automated garment printers, including an automatic screen positioning system, platen registration, platen transport system, operator fail-safe safety system and M-Touch controls. Earlier this year, MHM showcased an innovative device combining an in-line Tesoma dryer system with one of its garment printers, in addition to the iQ-Oval II, the company's new Central Drive System and the Digital V Pro compact cost-effective hybrid printer.

MHM also offers its Hybrid Digital models for use in-line with apparel screen printing equipment and the advanced iQ Digital hybrid high-production printer that MHM developed with Italian digital printer manufacturer Arioli. Arioli owned MHM for seven years, until MHM's management and Loser Holding, the owner of German dryer manufacturer Tesoma, acquired MHM in April 2018.

ROQ

ROQ, formerly S. Roque — Máquinas e Tecnologia Laser, S.A., has manufactured textile printing equipment for over 30 years. ROQ currently operates from its

270,000-square-foot facility in Portugal's Ave Valley region and employs over 350 people.

Like the other garment printers reviewed here, the ROQ Hybrid combines DTG inkjet and screen printing technology. Typically, the screen section prints a first layer of pigmented white underlying the image and then the inkjet system prints the colored image with ROQ Micropigment ink. Fujifilm Dimatix Starfire printheads provide the inkjet printing with a 24 picoliter drop and a maximum resolution of 600 by 1,200 dpi. Fujifilm Dimatix designed the Starfire piezo inkjet (PIJ) heads to be repairable, thus saving users considerable expense. The inkjet heads use a throw distance from the printhead nozzle plate to the print surface of 1 to 6 millimeters. The Z-axis of the printhead to the garment is adjustable up to 20 millimeters to accommodate print fabric thickness.

ROQ configured its H8C4XL and H8C42XL hybrid printer models to print CMYK with eight Starfire PIJ heads, and its H12C6XL and H12C62XL to print CMYK plus two spot colors using 12 Starfire heads. The XL models can print a maximum area of 50 by 70 centimeters (19.68 by 27.56 inches), and the 2XL models print a maximum area of 75 by 90 centimeters (29.52 by 35.43 inches). ROQ claims that all four of its hybrid models can print 450 A4-sized images per hour operating at medium speed. The ROQ Hybrid system can also screen print special effects such as glitter, foil, flock and 3D features.



Lawson Screen and Digital Products' HD-Zeus shown at PRINTING United.



OmniPrint International showed its Freejet at PRINTING United.

Bihong (Guangzhou Bihong Printing Equipment Co. Ltd.)

Bihong, the trade name of Guangzhou Bihong Printing Equipment Co., offers the Q-Jet inkjet-screen printing production garment printer. The Bihong Printing Machinery Co., Ltd (Pingyang Shunlong Packaging Machinery Co. Ltd.) was founded in 2008, owns the Bihong brand and established Guangzhou Bihong Printing Equipment Co. Ltd. in 2016.

The printing equipment company has its own research and development team for creating automatic digital and screen printing equipment solutions for decorating garments. The team developed the Bihong Dual-Jet (D-Jet) and Q-Jet Oval Digital Screen Printing Machines.

Bihong claims its Q-Jet Automatic Oval Hybrid Digital Screen Printing Machine can print 300 to 600 images per hour. It uses Fujifilm Dimatix SG-1024 Starfire repairable printheads with ink recirculation and grayscale. The Q-Jet offers print resolutions of 600 by 800 dpi, 600 by 1,200 dpi and 1,200 by 1,200 dpi. As with other hybrids, it uses pigmented ink screen printing white plus inkjet printing CMYK. The Q-Jet prints a standard 400-by-550-millimeter (15.7-by-21.6-inch) print area and a maximum area of 450 by 650 millimeters (17.7 by 25.59 inches).

Bihong also manufactures the BH MINIJet Digital Direct DTG printer with Fujifilm Dimatix Starfire PIJ printheads.

Aeoon Kyo Hybrid

The Aeoon Kyo Hybrid Series provides industrial inkjet textile production combined with screen printing's capabilities. Customers can have the Kyo Hybrid tailored to be fitted with four, eight or 12 Kyocera KJ4B PIJ 40 kHz grayscale heads, each with 2558 nozzles. The heads produce 600 native dpi digital prints and maximum resolution of 2,400 dpi. The inkjet system provides the printheads with

an automatic cleaning and capping station. Printing can occur on three different pallets. The Kyo Hybrid features an in-line flash dryer for its screened prints and, like other hybrids, can produce effective and durable prints without the need for a pretreatment. Aeoon designed its Kyo Hybrid as a stand-alone unit, but with the flexibility to be used as an add-on unit for other Kyo printers.

Lawson Screen and Digital Products

In May 2019, Lawson Screen and Digital Products of St. Louis, Mo., introduced its own hybrid garment printing solutions. Lawson placed the Zeus V digital printer in-line with its manual, semi-automatic and automatic garment screen printing systems. Using its HD-Max manual screen carousel press to screen an aqueous white image base coat, the system then inkjet prints its colored overlay image without the need for pre-coat or flash cure.

The Zeus V uses two Epson micro-piezo heads printing CMYK colors with maximum resolution of 720 by 1,200 dpi and an 18-by-18-inch print area. Lawson rates production for its hybrids at 200 printed garments per hour.

OmniPrint Hybrid Freejet

OmniPrint International is offering a new hybrid screen print inkjet system, the Hybrid Freejet, which includes the Freejet 330TX Plus DTG garment inkjet printer, a Vastex 1000 garment screen printing press, a flash cure unit and workflow software.

Like other hybrids, the OmniPrint system eliminates the need for pretreatment. The operator first screen prints the image's white underlayer on the Freejet's detachable platen unit, which is positioned on an arm of the Vastex 1000. After flash curing the white print, the operator inserts the printed platen unit back into OmniPrint's Freejet inkjet printer for the addition of the image's process color image. The company claims

the screen-printed image and platen are "easy to register" on the Freejet. Screen printing the white underlayer frees the inkjet system from having to print white and enables the user to double the number of inkjet heads available for printing process colors, thus speeding up production.

Because the production process is not fully automated, and the Freejet is relatively slow, the Hybrid Freejet is not designed for high throughput production. The relatively low cost of the system, however, suggests it as a starter, short run or prototyping system for printers interested in a hybrid print strategy. The Freejet also includes an airtight wet capping system for its printheads to prevent ink drying in their nozzles. OmniPrint claims that, "Even when not in use, the Freejet can stand for weeks at a time with no daily maintenance."

What's Next?

Looking forward, questions should include: Will garment printing equipment manufacturers continue to develop and produce hybrids that combine two different print technologies with differing strengths and limitations in one print system? Will print providers continue to acquire the hybrid systems?

Hybrid solutions range from the relatively inexpensive low-productivity systems to expensive high-productivity hybrids — one of the previously referenced systems could deliver two or three dozen prints per hour with another said to be capable of producing over 1,000 prints per hour. In between are systems that can deliver several hundred printed garments per hour. Equipment and per print cost along with production speeds and print performance will undoubtedly determine market acceptance of screen and inkjet hybrid systems for garment printing.

The hybrids, however, are not without competition from several new and upcoming DTG inkjet systems, including

Kornit Digital's Atlas & Avalanche Poly Pro, YiliJet's COLTEX CF-9700 DTG, Aeoon Kyo Link Series and AnaJet's RICOH Ri 1000.

Kornit has been a major developer of DTG and digital textile printers. In 2015, it introduced the Paradigm II, an inkjet printer that could provide hybrid capabilities to automatic garment screen printing devices. The market did not embrace the Paradigm II, and Kornit no longer offers it, so the company promotes its DTG Inkjet Systems as preferable to hybrid screen printing and inkjet systems. As noted previously, CNTOP introduced

its Wings Compact using a platen base oval transport, but replaced the screen-printed underlay with a digitally printed one. Developers of pure DTG systems are working to improve performance and costs associated with their systems so they can compete against screen printing and hybrid systems. For the near future, however, all three apparel printing methods — DTG, hybrid inkjet-screen printing and screen printing — own a segment of the apparel decorating market.

Other print markets can also benefit from combining the strengths of analog printing methods like screen printing

with digital methods like inkjet. Some developers of print applications, such as printed electronics, are already exploring combining the strengths of analog with those of digital.

Vince Cahill began screen printing in 1969, eventually managing an operation in Frederick, Md., and establishing The Colorworks, a custom screen printing business with his wife, Claire Hunter, which they sold in 2008. In 1995, they established VCE Solutions, a print consulting business. In 2003, they formed Industrial Printing Solutions to distribute digital printers.



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