1. **Digital Textile Printing :**

By Cassandra Balentine

Textile printing is a hot and growing industry segment. Wide format digital print technologies evolve to better serve this market, especially for direct printing methods. Advancements in inks, and media—including pre-coatings—are essential. However, printheads specifically designed for textile printing help improve speed and quality as well as reduce challenges commonly associated with textile printing.

Water-based inks are popular for printing to textiles, and printheads designed for textile printing are advancing to better accommodate these inks. The number of nozzles per channel, droplet size, firing frequency, the area between the printhead and substrate, and ink circulation capabilities are all characteristics that may have an effect on fabric printing.

Above: The Ricoh MH5421MF printhead utilizes piezoelectric drop on demand technology featuring an ink recirculating structure.

**Printheads for Textile Printing**  
Digital printing to textile materials continues to advance as the applications multiply, from signage to apparel and décor.

“Digital print in textile banners was the initial frontier, now there is demand for digital printing of apparel,” says John Harman, director of sales and strategy, Ricoh Printing Systems America. He explains that print technology has evolved from indirect transfer printing to direct printing to textile substrates and because of contact with the skin a shift to a predominance of aqueous inks.

It is important to note that generally, application of a primer is required prior to printing directly on fabric to enhance the image quality and image density. Harman says a larger drop printhead—15 to 27 picoliters (pL)—is ideal for this type of application, where high definition is not required. The use of white inks, which feature high pigment content, has led to the development of printheads with flow-through technology. This mitigates the settling of the pigments and nozzle blocking. “In summary, printhead technology has advanced to meet the challenges of printing aqueous textile inks including compatibility and performance robustness,” shares Harman.

Further, the adhesive technology and internal design of textile printheads are optimized to jet the lower viscous aqueous fluids. Harman points out that the larger drop size printheads enable efficient primer deposition. “The flow-through technology feature enables print robustness of heavy loaded pigment inks,” he explains.

Ricoh offers the seven pL MH5421 and MH5421MF flow-through printheads and most recently the five pL MH5320 printhead with enhanced aqueous ink performance, including enhanced aqueous ink compatibility. The 15 pL MH2620 and MH2820 27 pL apply primers and the 27 pL flow-through MH2810F printhead prints heavy pigmented white inks. In addition, Ricoh provides the lower cost GH2220 three to five pL printhead. In 2021, Ricoh plans to launch its 5.2-inch thin film technology flow-through five pL printhead TH64320F, which will offer value and performance advantages by enabling single-pass, high production volume textile printing.

Printhead productivity improvements are important for moving digital textile printing into true production speed capability. Bailey Smith, SVP sales, marketing, and business development, Fujifilm Dimatix, Inc., points out that advancements in printhead technology will make a significant difference in the adoption of digital printing in the textile marketplace. “Higher production speeds, more aggressive inks, and longer printhead life are some of the keys to faster adoption in our view.”

He says ink recirculation in ceramics provided a big improvement in process reliability. “Using ink recirculation at the nozzle also makes big improvements in textiles because of the open time management challenges with textile inks, priming, and reducing blocked jets in pigment applications. This feature improves the uptime performance of the printer and reduces maintenance.”

Further, a larger print gap between the printhead and the substrate provides a benefit in the reliability of printheads due to reduction of contact with the fabric. “The type of printhead technology used is directly related to the ability to print reliably with a large print gap,” adds Smith.

He explains that printhead reliability can also be a challenge with the typically more aggressive textile aqueous formulations compared to many other industrial printing applications. “The material selection and manufacturing process are key drivers to printhead life in textile inks.”

Additionally, Smith says higher nozzle count is becoming more common. This strategy provides more redundancy in the printing system allowing faster speeds and better printer uptime performance.

Fujifilm offers the StarFire SG1024 with ink recirculation at the nozzle range from seven up to 80 pL native drop sizes and can cover just about any application. The StarFire SG family is repairable, improving total cost of ownership in the event that a printhead is damaged, according to Smith.

Additionally, the StarFire SG600 is available in seven and 12 pL drop sizes. These printheads also include recirculation at the nozzle and repairable architecture.

The Fujifilm Samba G3L provides three pL native drop size with 1,200 dpi and recirculation at the nozzle. Smith says this product is intended for high-productivity applications where the finest quality prints are required.

Fujifilm plans to launch a new product family in 2020 incorporating many of the advantages of its other products into a package, which the company believes will be ideal for digital textile printing.

**Traditional Versus Textile**  
There are several differences when comparing the requirements of printheads used specifically for textiles versus those used for more traditional media.

Smith notes that for graphics applications there are typically no seams, creases, dust, or fibers in the production process. This normally means the print gap can be small. As previously mentioned, he says the print gap capability is highly related to the printhead design and is an important consideration.

Additionally, ink composed for textiles is different from inks used for graphic applications, so printhead construction and features—such as recirculation at the nozzle—are critical to address the needs of the textile market, admits Smith.

Harman sees an increasing demand for aqueous inks across multiple markets; therefore the broader performance requirements are common across these segments.

The relationship between the printhead and substrate is another critical factor.

Smith feels that many discussions with substrate manufacturers are managed by the ink manufacturer. “It is important to us that we understand these interactions to ensure our printhead will meet the needs of the final application. We work closely with ink companies to ensure we are producing the right product.”

He adds that features like productivity and printhead life directly relate to the total cost of ownership for the printer and should be considered when a print provider or manufacturer is researching digital textile printing solutions. Fujifilm is heavily focused on meeting these demands with its products.

It is also important to consider the ability of the printhead to meet the image quality of the applications of interest. “Will the native drop size and resolution of the printhead in combination with the printer architecture provide what you need for your customers?” asks Smith.

“Consideration of the printhead, jetting fluid, and substrate in addition to the drying mechanism are critical as these combined ultimately determine the image quality, and robustness of the print and productivity of process,” offers Harman. “Ricoh has expertise in all the above mentioned areas, thereby bringing this value to all of its digital print customers,” he adds.

For high-productivity textile printing the use of flow-through technology printheads should be considered for productivity robustness, shares Harman. “The use of printheads to apply the primer should also be considered as this will enable application of the primer to the specific areas where it is required, thereby saving on the cost of primer and delivering a more efficient print process.”

**Textile Printhead Challenges**  
Printing to textiles can be challenging, but the right printheads can help address concerns like productivity, image quality, and printer reliability.

Harman says the biggest challenges are jetting heavier pigment loaded inks, which are addressed by utilizing printheads with flow-through capability and delivering the increasing production volume requirements for textile printing.

Smith points out that the right printheads enable textile producers to reliably print all types of patterns at high speed to improve productivity.

For image quality, Smith explains that each application has somewhat different requirements. “The selection of the printhead can have a significant bearing on the final output, but it is not the only factor,” cautions Smith.

Printer reliability is also improved with the right printheads. “From the morning startup to the number of print runs before maintenance to mean time between failures, the printhead can have an influence in the overall output. Again, the printer design, machine maintenance, and substrate type are also contributing factors,” shares Smith.

Textile printing is an attractive market segment, however it does present challenges. Advancements in inks and substrates as well as printheads continue to move this segment into new applications. Consider the droplet size, firing frequency, and flow-through of a printhead when investigating an investment in a digital textile printer.

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**2. Dye Sublimation : Upcoming Industry**

By Elizabeth Quirk

Dye-sublimation (dye-sub) is the process of converting ink into a gas that fuses to textile fibers. There are two types of dye-sub printing—direct and transfer. Direct dye-sub printing involves sublimating ink directly to the fabric. It eliminates the need for transfer paper but requires pretreated fabrics. However, printed fabrics need to be run through a heat press or calendar for the sublimation process to bond the ink to the fabric.

In transfer dye-sub printing, the images or graphics are first printed to transfer paper. The paper is run through a heat press. When the transfer paper makes contact with the fabric in the heat press with temperatures between 385 and 400 degrees Fahrenheit, the paper releases the ink onto the fabric. The process allows for a wider range of fabrics to be used.

This article discusses both methods, with a focus on the latest demands.

*Above: The Mimaki TX300P-1800 Mkll printer prints on natural fabrics, such as cotton, linen, and rayon, as well as any polyester.*

**Comparing Benefits**  
When deciding whether direct or transfer dye-sub best suits your specific needs, it’s important to first determine what type of products will compose the majority of your output.

According to Randy Peters, president/CEO, The Mosaica Group, most customers do not understand that the fabrics for dye-sub transfer and direct printing are different. The weave and type of fabric may be the same, however, fabrics used with transfer paper do not need to be prepared for digital printing like fabrics used for direct dye-sub printing.

As such, there is a lot of environmental waste and cost associated with coating and preparing these types of textiles for the digital printing process. “Most fabrics need to be bleached, washed, and coated with an ink receptive coating before they can be printed on. In addition to the chemicals used to apply these treatments, there is a lot of water waste involved in the process of preparing these fabrics. Textile preparation is quite messy as these treatments are applied to the total fabric, not just a surface treatment,” continues Peters.

Mike Wozny, senior product manager, EFI, says dye-sub transfer typically provides an advantage for high-volume businesses that may have multiple dye-sub printers because users can offload rolls, move them to heat presses, and then free up those printers to continue printing. “The transfer workflow also makes it easier to change fabrics during a shift, as loading/unloading fabric is easier at the heat press than at a printer,” he explains.

Peters argues that the primary benefit to dye-sub transfer printing is quality. He believes the quality exceeds that of direct dye-sub due to the methodology of ink transferred to a substrate.

“Coatings on transfer papers are designed to keep the ink droplet on the surface of the paper, allowing for less ink to be used during the transfer process, thus saving customers money in the amount of ink needed to get their desired results. Overall, transfer printing produces better resolution, more vibrant colors, and crisper details. Additionally, the versatility of using a variety of substrates and applications is more appealing in the transfer method. Transfer printing enables printing on nearly every kind of surface or rigid product such as fabric, metal, aluminum, acrylic, glass, fiberglass, and plastic,” he adds.

Lily Hunter, product manager, textiles and consumable supplies, Roland DGA Corporation, argues that one of the biggest benefits of direct dye-sub printing is that there’s no paper waste, as you’re not printing onto transfer paper. “It’s a one-step printing method that’s ideal for fabrics and applications requiring heavier ink saturation and penetration.”

“However, keep in mind that while this method reduces costs because transfer paper is not needed, you need to buy coated fabrics that are more expensive than non-coated materials. Additionally, the final output may have less detail and image brilliance than output produced via dye-sub transfer printing,” she adds.

**Customers Asking**  
Many types of dye-sub customers express different needs and wants. For example, Ryosuke Nakayama, textile and apparel business solutions manager, and Victoria Harris, textile application specialist, Mimaki USA, Inc., say their customers are asking for more options or versatility in the amount of fabric types that can be printed with one machine.

Up until now, the biggest limitation with textile digital printing was the lack of a complete ink solution that worked equally well on every fabric type. In response, Mimaki recently introduced a textile pigment/sublimation transfer, direct sublimation/sublimation transfer, and textile pigment/direct sublimation printer, the TX300P-1800 MKII. The machine prints on natural fabrics, such as cotton, linen, and rayon, as well as any polyester. It offers great application versatility.

Durst Image Technology US, LLC also experiences this. According to Mike Syverson, textile manager, North America, Durst, printers that support direct or transfer dye-sub are more appealing to most print service providers (PSPs), so they have choice in print methods and can sell a wider array of goods.

Customers are also always looking for higher quality output. “Features like seven picoliter droplets, grayscale printing, light inks and gamut expansion, unattended operation, high productivity, and low operating costs are equally important. A system that requires very little user interaction—watching the printer constantly, repetitive purging, and adjusting media—is very valuable to PSPs as companies today are hyper-focused on reducing operating costs and reducing touches on the print jobs,” adds Syverson.

On the other hand, speed, increased productivity, and reduced cost are also primary concerns. While speed is prioritized, it shouldn’t reduce the quality of the final result when it comes to accurately capturing color and detail.

Other considerations when investing in a dye-sub printer include overhead expenses, ease of maintenance and operation, ink drying capabilities, carbon footprint, and space.

“Clients want to understand how frequent the ink sets need to be changed based on usage, and when it’s necessary to replace the printheads. Some sublimation printer manufacturers consider printheads to be a consumable, meaning upon purchase the printer may not even include the printheads and they may need to be replaced frequently, which can be quite expensive over time,” offers Peters.

Randy Anderson, product marketing manager, Mutoh America, Inc., explains that for rigid substrate customers, it almost always boils down to performance, with a smooth oftentimes glossy surface, every anomaly can be a potential problem and with metal substrates being the new art application, these customers want photo-like quality that requires small dot high-resolution capacity.

“Most of these are smaller businesses running much smaller volumes, who want the ease of use and quick maintenance, with Mutoh they are purchasing an industrial-built printer with that ease of use,” he adds.

In Hunter’s opinion, people want to get the most “bang for the buck,” so a printer that is versatile and can print both directly and indirectly with the same ink, like the Roland Texart RT-640M multi-function dye-sub printer, is advantageous. It allows for printing directly onto coated polyester fabric, as well as dye-sub transfer paper using the same Roland Texart SBL3 sublimation inks.

**Five to Ten Years**  
Just in the past five years, new innovations in dye-sub technology make it an increasingly viable replacement for other forms of printing processes. Let’s take a closer look at what these professionals think about the future of dye-sub printers.

Many believe in continued improvement, offering faster speeds, more automation, and higher quality printing. This includes inline systems where the pre- and post-processing—in addition to print—are in one seamless, compact operation.

Marco Girola, marketing and communication manager, JK Group and MS Printing Solutions, states that the future of these printers will reach the highest level of automation and customization, overpassing distance limitation—ideally remote management, and highest energy and water saving.

“I believe inline sublimation will continue to be a popular and useful feature that will only become more prevalent over time. The ability to print transfer paper at the highest quality and the lowest cost will still be important, however. The biggest trends and advancements will apply to digital textile printing in general—including advancements coming to market in the industrial textile and apparel space that could make their way into graphics production,” states Wozny.

Hunter thinks ingenuity will come from the inks itself—new formulations that have improved lightfastness. “On the printer side, there will definitely be more smart technology features that can help troubleshoot and detect potential errors, making it even easier to use and maintain machines.”

Ink sets will also expand in regards to color choice—with some already doing so. For example, Epson’s SureColor F9470H dye-sub transfer printer features fluorescent pink and yellow ink. “The new SureColor F9470H introduces fluorescent ink support to further expand bold color applications, creating eye-catching output and providing greater versatility for customers,” Tim Check, senior product manager, professional imaging, Epson.

“I believe future systems will increase in speed and quality, similar to other aspects of the large format inkjet business. Further development in inks are likely a primary focus area for manufacturers. Features such as dry time and color gamut are always in development and have come a long way even in the past five years. Another area that continues to develop are the fabric and paper suppliers. There are constant improvements in fabric pretreatments in addition to the amazing variety of fabrics for virtually every application, from silicone edge graphics and trade show displays to home textiles, furnishings, and apparel,” says Syverson.

In Anderson’s opinion, printers should be recognized for what they truly are—printing robots. Using the Internet of Things, future printers will interface with laser cutters, robotic sewers, and production/costing software to produce products for customers waiting for clothing created specifically for them, while at the same time providing data to minimize cost and maximize output.

“I can envision a robotic arm with a printhead that prints on virtually any shaped surface by following the surface of that object with sensors to determine the distance between the object and printhead continuously,” he suggests.

**Final Thoughts**  
When deciding whether direct or transfer dye-sub best suits your specific needs, it’s important to first determine what type of products compose the most of your output. The differences between direct and transfer dye-sub printing may seem small because they tend to yield the same result, but in reality they are very different. It’ll be interesting to see how these printers evolve and adapt to new and emerging technologies as well as customer demands.

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Dye-Sublimation

# **3. Sublimation Ghosting Busting**



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Submitted by Aaron Montgomery on Sun, 02/12/2017 - 10:26.

A close up of a logo

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Ghosting mainly occurs in sublimation when the ink is still active even after you have opened the heat press as the transfer paper could have slightly moved during this process. When opening the heat press, the substrate and paper might move slightly resulting in the image to be slightly skewed from where it was intended to be pressed. This will leave a ghost-like image and ruin the blank. Unfortunately, there is no going back from this and you just have to start over.

Hopefully, these three ways of preventing ghosting from your sublimation production process can help save you time and money.

1. One of the great things about sublimation is the fact that you are not only limited to just one or two styles of products. You can make items from garments to cell phone cases, awards plaques to mouse pads, metal panels to beach towels, floor mats to blankets, and so on… you get the picture. The options are almost limitless. For each item, you need a little different pressure, temperature and time. One thing that many sublimators do when they get going too fast is change from one substrate to another without getting their time and pressure correct for the new item. They close the heat press or try to and then realize that they need to make an adjustment. Unfortunately, the ink has already started to activate and when you close the press the again, the transfer has slightly shifted. This will cause a ghost image and a ruined blank. The best way to eliminate this from happening is to slow down and plan ahead.
   1. Document all of your processes in detail so when you do need to switch from one substrate to another, the correct changes will occur for a successful press. Here is a great article from David Gross of Conde System about [documenting your process](https://a-e-mag.com/question-answers/why-should-i-document-my-sublimation-process?utm_source=SilverpopMailing&utm_medium=email&utm_campaign=20160718_AE_eNews%20(1)&utm_content=).
   2. When switching substrates, make sure to prepress your item between two sheets of blow-out paper first to make sure the pressure is correct.
   3. Have everything you need laid out ahead of pressing from a blow-out paper to heat resistant foam and protective gloves.
2. Everything is set to press and your heat press is ready to go. At this point, make sure you have selected the best method for holding the sublimation transfer sheet to your substrate. Remember, this will depend on the type of substrate.
   1. For soft goods, like garments, mousepads, bags and totes, make sure to use a specifically designed spray tack adhesive or a tacky sublimation transfer paper. Unfortunately, if you have small format equipment, at the writing of this blog, there is not a tacky paper available. You would have to have a wide format roll feed machine to be able to print on tacky paper. For small format printers, you want to take spray tack adhesive sold by your sublimation supplier, and spray a very fine mist on the transfer sheet. If you can see any of the adhesive puddling up on the sheet, then you were too close to the transfer sheet and sprayed too much. Check out my video / blog about using spray tack adhesive. The tacky paper and the spray tack adhesive helps to eliminate ghosting by keeping the transfer sheet stuck to your substrate even when the press opens up so the transfer sheet does not move while the inks are still active. With tacky paper, it is actually heat activated so it makes it easy to work with. I do not recommend using tacky paper or spray tack adhesive with hard surface items. The adhesive in both cases causes additional roughness to the transfer papers and therefore on a hard surface item that roughness will cause the ink to transfer with some graininess and you will not get as clean of a transfer.
   2. For hard surfaces, like photo panels, coffee mugs, serving trays, mobile device cases, it is best to use a special heat resistant tape. There are several types of heat tapes available with varieties of colors and thickness. You will need to find the one that you like the best for how you sublimate. Personally, I like a thinner tape that has some decent tack to it. When it comes to the color of the tape, you will find that everyone has an opinion, but I have talked to several of the tape manufacturers and they all say there is really no difference when it comes to the color of the tape as to how it works. Their claim is that the colors are just a chance in the pigment to the tape base and it plays no role in the adhesion of the tape. Now you will find people out there that swear by a certain color tape, but at the end of the day, the only factors should be the type of adhesive on the tape and the thickness of the tape base that works best for your process. After the selection of the tape, you will use the tape to lay out your projects, noting use a small amount of tape in two or three locations to hold the transfer in place during pressing. The tighter you can get the transfer to the substrate, the less likely you will have ghosting. You may even need to trim down your transfer sheet a little so the transfer sheet does not roll over the edge or do something else weird, as the paper heats up. Not only is the ink activating in the heat, but the paper is changing as the moisture leaves it and the tape is also fighting up because of the heat as well. Plan ahead for that!
3. The product has been pressed; time to get it off the press and take the transfer paper off without causing ghosting during this step. Be prepared to interact with the product immediately after the press is done by having some heat resistant gloves on and having a cooling area ready for the finished goods once they are done. Also, have your recycling bin nearby to clear out the used transfer paper when done so you can be ready for the next item. I recommend getting the transfer paper off as quickly as you can without rushing to eliminate opportunities for the transfer paper to move.  In addition, when the paper begins to cool, some of the transfer paper coatings could stick to the substrate as well, so try not to set the item off to the side taking the paper off later. Personally, I am not a fan of the bucket of water to cool items, as the temperature needs to be just right or ceramics will start breaking and it just makes a big mess. I recommend having a concrete area nearby or some sort of a cooling slab of rock like granite or sandstone. Then once the product is done in the press, open the press gently but deliberately, so the item will not shift too much right away. Carefully move the product from the heat press over to your cooling area. Immediately remove the transfer carefully and deliberately so you do not lift the transfer off and then let it fall back on it. Try not to touch the imprinted surface too much as the polyester or polymer coating is still soft and malleable. Keep in mind, when you stretch fabric items, you can permanently change the fabric shape. For soft goods, you can just set those to the side to cool as the heat will quickly dissipate. For hard goods, like ceramics, aluminum and hardboard, you will want to put them on a cooling surface like concrete which will suck the heat out of it. Place hardboard items face down so that way the natural warping that occurs during transfer will come out and flatten the items back down. Once the items cool to where you can safely handle it without gloves, the ink is no longer active and you can prepare it for delivery to the customer.

By following those three steps you should be able to almost eliminate ghosting from your production and be ready to deliver beautiful profitable jobs to your customers.