

TECHNICAL GUIDE

TEXTILES

DIGITAL AND SCREEN PRINT
IN TEXTILES COMPARED

Second Edition

 **FESPA**
profit for purpose

Digital and screen processes for fabric printing

The digitisation of the textile supply chain is well underway, in all sectors of the print industry traditional processes are being disrupted. The impact of technology to facilitate sustainable production and the benchmarking of progress against the UN's sustainable development goals (SDG'S) offers both environmental and commercial benefits. As innovations emerge, the textile and graphics industries are progressing towards industry 4.0 where technology and creativity flourish.

Digital data processing, for pre-press, content creation, and print production has transformed the manufacturing workflow. The convenience and reduced costs involved have driven uptake of digital output worldwide. Digital printing has gradually spread to new areas of application and created many entrepreneurial opportunities, opportunities, where print quality is consistent and commercially viable for large and small volumes alike. This is true for all forms of print and most recently for industrial textile printing.





M&R's robust lower volume DTG printer



A leading provider of digital textile printing systems is Kornit. The Poly Pro is capable of printing onto polyester sportswear and represents further progress in Direct to garment decoration.




MHM iQ Digital hybrid press for garment decoration offers screen print for special effects, white and foiling in-line with digital inkjet full colour printing.

Screen printing process

Established industrial methods for traditional fabric production are iterations of flat-bed screen technology, which involves complex and specialised prepress production for panel printing. As a result, small scale production is often costly and uneconomic for short runs. The high downtime, fabric wastage, and inks alongside the high engraving (screen making) costs and the expenses of labour in what is a specialised manufacturing process are not justified for short-run work produced on demand.

Screen printed textiles whether flat-bed or rotary, are well suited to high volume production. There are some types of “special effects” on fabric that for now are only possible using screen printing. For example; devoré whereby mixed fibres are chemically etched to remove cellulose fibres and leave protein-based fibres such as silk intact, is as yet, not possible on a digital press.

Like all print processes the industrial textile screen printing process starts with a design to be prepared for reproduction. The design whether vector or bitmap based is separated into



Some effects on fabrics are difficult or impossible to create using digital print technologies, for example Devoré, shown here. However, innovation within the digital sphere continues to evolve.



its individual component colours. Each separation leads to a set of stencils, one for each colour in the design that is to be printed with the necessary trapping for the final print sequence. Screen printing is not limited to the CMYK process that uses four subtractive colour separations to produce many thousands of different hues it additionally offers a multitude of spot colour opportunities. In textile screen printing colours are printed one at a time, layer on layer, with the ability to choose ink film thickness by selecting the most suitable mesh. It can be challenging to accurately produce halftone images using conventional screen technology, high quality separations are required to replicate continuous tones because each step in a tonal gradation requires its own screen. The process is uniquely capable to print vibrant, fluorescent, metallic colours, and functional inks as in the case of electronics.

The stretched screens or rotary cylinders are coated with photosensitive emulsion that once exposed to UV light are ready for developing. Exposure is often made by contacting a film positive with black areas to block light and clear to allow UV cross-linking to take place. The positive is held in position using a vacuum frame which has been engineered in a number of

forms to cater to screens of all sizes from those for printing T-Shirts to the very large screens on flat table presses. The use of Computer to screen (CTS) systems where the screen is directly exposed using UV laser, DLP projector or soluble inkjet blockout have in many cases eliminated the requirements for film positives. Some of the latest UV laser systems offer image resolutions that reach 1200dpi.

Once exposed, the screen is transferred to a washout unit where the unexposed emulsion is washed away, and the screen dried and checked before being mounted on press. Again, the range of applications requires manual set-ups where a handheld hose is used in a booth, through to fully automatic lines that process screens from start to finish in line. The screen might be a frame for flatbed printing or as a rotary screen as is the case with continuous rotary screen printing. Flat-bed screen presses can be very wide, but they are slower than rotary screen presses so high volume textile production is in the main achieved using rotary screen technologies.



Low volume screen making equipment – Manual washout booth and Self contained exposure unit from Natgraph.



Lüschert JetScreen LT computer to screen exposure system

Print is created when each ink is transferred through the holes in the screen's mesh, one screen and stencil for each colour for areas that are not blocked by the stencil. Individual inks are forced through the mesh to the substrate using a flexible polyurethane blade that moves across the screen for flatbed presses. In the case rotary screen the inks are continuously fed into the screen through an inking unit. Multiple screens are required to print a multicoloured image and how the ink gets transferred through the screen depends on the size and type of press, so it could be by hand for t-shirts or in an automated process for industrial scale screen printing. Once printing is complete the screens and/or cylinders must be removed, washed and stored for reuse.

Multicolour screen-printing presses, both rotary and flatbed need to be very long in order to print all the colours in a design, so they can take up a lot of space. All screens must be precisely aligned to avoid registration problems or colours bleeding into each other. Registration accuracy is also important to ensure that the correct outline of a design is precisely printed, so process control is extremely important for printing textiles with conventional technology.



However, process control in screen printing can rely on two important graphics standards. ISO 2834-3 (Graphic technology to Laboratory preparation of test prints to Part 3: Screen printing inks), which outlines a test method for producing test prints with screen printing inks. The standard provides a useful method for checking a print's optical qualities including colour, transparency, and density, as well as gloss, lightfastness, and resistance to mechanical or chemical impacts.

ISO 12647-5 specifies the requirements for the screen printing of four-colour process-colour material used for display, signage, and graphics using flat bed or cylinder printing equipment. However, there is as yet no part in the ISO 12647 series for textile printing nor is there a part for digital printing. In both cases the diversity of technologies and practices does not lend itself to standardisation.

Screen printing is a mass production method suitable for long runs but not for print on demand and this is the fundamental difference between digital and conventional processes.





Digital technologies reinvent the production workflow, here we see Durst digital printing dual fabric side by side for maximum efficiency and customised production.

Think different

There are many iterations of digital and screen production processes and the business contexts these technologies support. Working with digital data gives the business and manufacturing processes all the benefits of direct output and control through data management rather than conventional process management. In a digital system, content data is delivered direct to the fabric, on-demand and can include complex photographic images and variable data. With no need for mechanical separations and processing, digital printing is much cheaper for short runs and so well suited to e-commerce environments.

Digital print technologies offer the designer unlimited creativity. With no limitations on the number of colours (when compared to screen providing they fit inside the colour gamut), and support for higher resolution photographic images, digital offers designers an inspiring media for fashion, sportswear, and the Interior Décor sectors. Digital printing supports runs of one, making it ideal for on-demand production and e-commerce applications.

The simplification of the textile workflow is the primary reason for the excitement surrounding digital printing. Digital is a technology that makes the impossible, possible. The convergence



MS Solutions Lario single pass textile press prints at 120 linear metres per minute.

of digital data, design software, and e-commerce unlock the value chain to provide opportunity. Digital printing cannot yet compete with conventional processes, in all circumstances, and yet, advances in digital printing including the advent of single-pass inkjet make it increasingly viable as an attractive alternative and importantly a sustainable technology.

The infinite diversity within digital technology is driving sustainable change to offer new applications, that empower printers to explore new markets.



Durst Alpha multi-pass industrial textile printer.

Digital print technologies continue to disrupt the conventional textile space, where energy efficient, waterless processes provide the industry with a sustainable manufacturing solution". Credit: Kornit Digital.



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