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Image courtesy of Ambrose Frøsaaker Lunde.

Controlling Color: Sampling to Production for Polyester in Fashion

Color — probably the most misunderstood topic of all. A complex science, color must eventually be standardized for textile manufacturing, but for now, designers and manufacturers must find a common language.

As the digital print marketplace grows, it's essential to understand the basic principles and diversity within the market. Technology is disrupting the entire fashion workflow like never before and is set to revolutionize how we print for our clients, regardless of volume.

It seems simple. Order your product, upload your artwork, then receive your printed fabric. Simple, right? Then why does it not always go to plan when using digital technology? Let's look a little deeper.

The Textile Market Today

Digital textile printing — although now over 20 years old — is still an emerging industry. We produce \$12.4

billion of printed fabric per year worldwide, of which digital print accounts for just 5%. Fashion utilizes digital, analog and flatbed technologies alongside multiple print processes and ink sets for reactive, acid, dye sublimation or pigment printing.

Democratizing print has had its issues — as with any new marketplace, there is a huge variance in the skillset of clients, designers and printers. Early adopters of digital technology were established textile print companies who harnessed the commercial freedom, particularly for sampling, in the early days. These early adopters were also (unknowingly) a live beta trial for the machine manufacturers and the bedrock of the technology we have today.

Excited by the creative freedom digital printing offered in comparison to the previously limited access to low-volume print, designers were quick to utilize the technology. But the industry remains peppered with a lack of knowledge, partly

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By Debbie McKeegan, CEO, TextIntel



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due to the textile recession of the late 90s, when many of the highly skilled textile practitioners were forced to leave a broken industry. In order to move forward, we must educate the next generation who — as millennials, Gen Zers and digital nomads — are the developers and the future of the textile industry.

Manufacturers and designers alike have embraced the commercial and creative freedom digital technology provides. The demographic of digital print and its application crosses multiple industries, and overall, we see huge disruption. Once a

third-party trade, we now see huge fashion brands and retailers bringing print in-house to control and maximize the efficiency for their supply chain. Print-on-demand is big business, and digital technology has facilitated a growth of new print providers at all levels worldwide. Designers can now print for themselves, and with a new generation of entry-level machines at an affordable cost — plus the availability of fabrics and consumables in small volumes — this market is set for huge growth.

In the meantime, the fashion industry has changed beyond all recognition and

faces new challenges. At the high-volume end of this sector, print clients need speed and flexibility to meet the demands of the consumer whose thirst for new products is infinite. Print meter volumes have grown alongside design diversity and new emerging technologies for retail.

Utilizing artificial intelligence (AI) data, fashion buyers can now react in real time to their clients' sales behaviors. This has not only driven the need for manufacturing speed, but it is the driving force alongside the sustainable agenda for new technology and the growth of digital textile printing.

Color and the Supply Chain

Let's examine the expectations and challenges faced by all sides (designers, buyers and digital printers) with a look the supply chain and how to manage color.

First, the buyer must now react with warp speed to serve the consumer, commissioning print just-in-time within an ever-decreasing timescale. Print, however, is just one component of a complex supply chain. Automation plays a huge part in the buyer's workflow and communication is key. Cloud-based software now increasingly provides access to the necessary intelligence, data and embedded files required for print.

The print designer, however, works according to a creative design brief often completed before the final print output process and before the digital textile printer is defined. Therefore, the artwork — more than likely a digital file with no physical sample — may not be print-ready. This is where software leaves us in a very gray area, with no industry standard or file format available to control the color of the final output. Currently, it is not possible to take a textile design and print across multiple platforms and print providers with one file format and ultimately achieve a consistent color yield.

In comparison to printing paper products — for which digital technology was first utilized — textiles present the digital manufacturer with a multitude of challenges in addition to color. Textiles by nature, whether of natural origin or man-made, are not consistent. There are thousands of substrates and options, each affected by minute variances in manufacturing, which, if not carefully monitored, will affect color.

Practically speaking, digital color specification and print management, along with almost all the challenges we face today, exist in analog print, where they are overcome by years of industry practice,

standardization, production process and the benefit of time and labor. However, the expectation is often that digital technology can magically sweep away the color issues of the past, providing an instant replication of an image or design — displayed on any screen, in any location, at any saturation — onto any fabric in minutes, perfectly. If only life were so simple!

The Perfect Print

Digital print is not an exact science. While it's undoubtedly an incredible technology, we cannot ignore the technical skills needed in our industry to calibrate and provide accurate color for our textile clients. Textile technology and color management are the key to successful printing. We must remember that "print" is simply a method of application onto a textile surface. Color has a science of its own, and as design and print professionals, we have to help our clients bridge the gap to provide the perfect print.

The first step in this process must be to understand color gamut and why it's critical to a successful fabric print. With four, six or even eight colors, it is possible to create a wide gamut. Automated software, a designer or the printer will use this information to select accurate color for print. However, there are weak areas in the color space (as there are in analog), and it's important to create artwork that is printable. The challenge is that every machine (and no two machines are the same) has its own personality. There is no standardization for ink sets, and no two ink suppliers will provide the same

output with the same settings. The screen, print machine, transfer paper or fabric on which you are going to print must be calibrated using a spectrophotometer. Once calibrated and dependent on the RIP software and its link to the design software, the system can preview the available print colors on the CAD screen, alerting the operator to any colors outside of the gamut. Over the last few years, extensive research has developed many automated functions for this calibration process. What once took hours can now be done in a fraction of the time, however, this is a critical part of the color process and cannot be taken lightly.

Sustainable print is highly dependent on color management. Single-pass machines now capable of in excess of 90 meters per minute can generate a vast pile of fabric destined for landfill if not correctly managed. Print-on-demand at these speeds is only viable if the print is correct the first time. In an industrial environment, accurate color management is essential and pre-production sampling statutory. As with analog print, a small run of just a few meters that is approved by design or production establishes a color contract that cannot be broken. You cannot reverse the process, and color must be perfect for every manufactured batch. As touched on earlier, there can be variances in the color achieved between batches of unprinted greige cloth — as well as the print mark achieved — even though the supply chain is unchanged. This applies across the board for all ink sets, fabric types and production processes, whether dye sublimation,

pigment printing, etc. A small run prior to all volume production is an essential discipline.

For large brands and global companies, it is possible to calibrate the entire supply chain. For example, a studio in London can pass accurate files to a manufacturer in China, ensuring every screen views the same color. It's also possible to embed this information in the file to be printed. All digital artwork, regardless of the software that created it, carries a generic printer profile. Embedding a customised ICC profile into the production artwork ensures the color will be accurate within a set commercial tolerance as identified and specified by the source at the design stage and agreed upon with the print provider for approved output. However, sampling is still advised for consistency in supply.

It's important to remember that as we automate the management of the supply chain, there are key stages from which humans cannot be erased completely — color being one of them. The human eye is unique, and ultimately the trained textile practitioner can spot a rogue color in seconds, as can a designer when balancing a design's color while creating colorways and palettes for the next season's bestselling collection.

Color profiling is also critical for companies utilizing augmented reality (AR) software in their supply chain. If the product is created and/or sold using software, the preview must be accurate. Different fabrics produce different color yields when printed. For example, in polyester printing, where fiber blends are

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used (polyester mixed with spandex) to produce the common fabric lycra, the higher the percentage of polyester, the more vibrant the color.

Fabric density also affects visual color. When printed, chiffon, for example, appears transparent in comparison to a satin weave. Therefore, an accurate product render is critical. Once completed, it follows the product from the consumer at the point of purchase all the way down the supply chain to printed output, cutting, sewing, sewn manufacture to dispatch and delivery.

At the opposite end of the scale, low-volume printers who print any volume from just 1 meter upwards are equally at

risk. This is when managing your clients' expectations is paramount. Without the luxury of on-screen calibration with the source, a bureau relies on the files it receives and must be careful in its terms and conditions to specify how artwork should be created to avoid costly mistakes and miscommunication — all of which can result in lost time, unhappy customers and critical lost profits. As a side note from my observations, what often causes frustration between the client and the printer is that the web-to-print provider does not account for artwork or color correction costs in their business margins. It's in this area of the marketplace that color is greatly misunderstood.

Advice for the Next Generation

As touched on earlier, with a new generation of consumers — all of whom are keen to access the advantages of print-on-demand — there are issues with skills and expectations. For the designer and the creative customer, it's important the print service provider specify guidelines for best practice. Ultimately, however, there is no digital printer or print process that can accurately match a client's remote CAD screen or uncalibrated paper printout. It's a frustrating reality that must be communicated and further demonstrates why color specification and costing is critical in pre-production sampling.

It's also important to note that many clients expect the same colors to print across all substrates, cottons, silks, polyesters, etc. and across all processes (dye-sub, reactive and pigment). Again, without accurate color calibration this is impossible. There is no doubt digital printers are clever, but they're not magicians (although they perform miracles on occasion).

Choosing the correct print partner for your product must be carefully researched. Print providers work to a specific method of manufacturing which cannot be broken or interrupted without a cost to productivity. The order is placed, programmed and printed. As with any new industry, ours desperately needs color standardization.

The fashion industry faces a massive reform, and digital textile printing has a significant role to play. It is imperative we meet the expectations of our consumers while striving to maintain and build a sustainable agenda. Technology is moving at an unprecedented pace, and it's important to remember that the textile industry is one with an incredible heritage. Digital printing is just one piece of the vast manufacturing supply chain where collaboration is an essential element and the key to a sustainable future for the next generation.

Award-winning British designer Debbie McKeegan began her digital journey almost two decades ago. With a manufacturing background, a vast knowledge of traditional textiles (from both a design and production perspective), and an interest in CAD from its onset, Debbie serves as an expert in the world of digital print. Debbie has developed many new digital production practices, and speaks as an authority on digital design and print worldwide. She is the CEO of TexIntel — an expert advisory practice serving the creative, digital and print textile manufacturing industry.