The Evolution and Progression Of Digital Textile Printing

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Abstract

Textile printing can be best described as the art and science of decorating a fabric with a colorful pattern or design. Over fifty percent of the world's printed fabric is produced in the Far East, compared to approximately twenty percent in the US and Europe. The majority of all textiles are printed using rotary screen print machines. While this technology offers high speed and low product cost, there are many drawbacks. The trend in textile printing is for rapidly decreasing order size, forcing textile companies to print shorter runs. Rotary screen technology offers obvious benefits for long runs, but does not allow economical short run production. As the price per yard continues to decrease, traditional manufacturers are forced to respond to the changing world of textile printing.

Indeed, the world of textile printing is rapidly changing. Customers are demanding a greater variety of color and design. Responding to this demand is a necessity in today's marketplace. Printers are forced to find new and innovative ways to provide printed samples while minimizing cost and waste. Digital printing technology allows customers to streamline the entire design, sampling, and production process. Unfortunately, production digital printing of textiles was not a possibility…until now.

When it comes to true inkjet production for textiles, there are not many choices. Most of the current inkjet printers were designed for graphic arts printing on paper, not fabric. Several companies have begun to address these problems, and the future of digital printing of textiles is beginning to take shape. Over the past two years, several machine integrators have released short run production equipment using a wide variety of ink jet technology. In addition, printers with speeds up to 100 m^2 / hour for direct textile printing and up to 200 m^2 / hour for transfer printing are becoming available this year. Most of the machines currently being developed for ink jet textile printing are based on existing material handling systems. These printers will be capable of utilizing multiple ink chemistries and will print both knitted and woven fabrics.

Though no one can predict when we will see a dramatic change from traditional to digital production, it is clear that the future of textile printing will be digital. Today's textile marketplace demands the benefits of digital printing, the textile industry has embraced this new technology, and most importantly – digital printing machines have finally met the challenge of textile production printing.

The Evolution and Progression Of Digital Textile Printing

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What is Textile Printing?

According to Webster's Dictionary, Textile Printing can be roughly defined as the act of impressing a pattern or design on a pliable material made usually by weaving, felting, or knitting fibers / filaments. While this is technically true, today's textile printing is best defined as the art and science of decorating fabric with a colorful pattern or design. From a commercial viewpoint, textile printing is one of the largest printing markets in the world. In 1997, textile printers across the world processed over 18 billion square meters of fabric. Although textile printing is a cyclical market, total printed production is predicted to grow substantially through 2005.

Where are Textiles Printed Today?

In the 1980's, textile printing was a stable and growing industry in Western Europe and the United States. However, low labor costs and less stringent environmental restrictions are allowing foreign printers to drastically drop the cost per yard and take an even larger piece of the printing market. Currently, over fifty percent of the world's textile prints are produced in Asia. North America and Western Europe account for 22%, and Latin American provides a fourth best 10%. Combining for the remaining 18 % are Eastern Europe, Africa, and the Middle East (Figure One). [1]

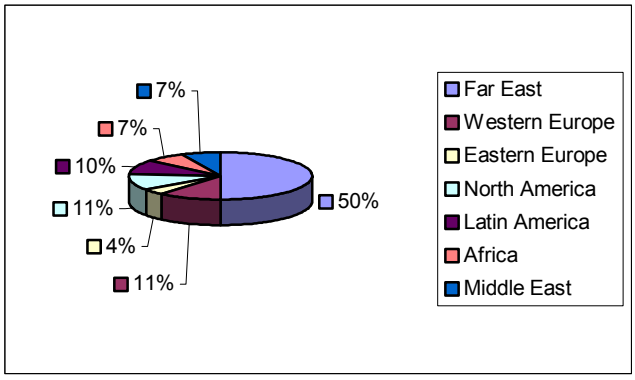

Figure 1: Worldwide Textile Print Production by Region
(Legend key is linked to percentages in a clockwise direction)

How Are Textile Fabrics Printed Today?

The majority of textile fabrics are printed using two types of colorants: pigments or dyestuffs. The next section will highlight these colorants and the most prevalent method of production, rotary screen printing.

Pigment Printing

Pigments are easily the most common colorant used in textile printing. In 1994, the Stork Textile market survey [1] showed that over 45% of the world's production was produced using pigment printing (Figure 2). As a rule, pigment printing is a simple process that is economical and environmentally friendly. Pigment printing allows producers to print blended fabrics in one step without sacrificing durability and color. Like most simple processes, pigment printing does have a few disadvantages when compared to dyestuff printing. By in large, a pigment particle is chemically inert and insoluble. [2] Therefore, these particles have no natural affinity for textile fibers and require external means of fixation. In most cases, an acrylic co-polymer is used to "glue" the pigment particles to the fabric surface. The film formed by these polymers provides the durability needed for textile standards; however, it also gives soft fabrics a rough feel. While advances have been made in softening the prints, pigment printing is somewhat limited in its application due to this harsh "hand."

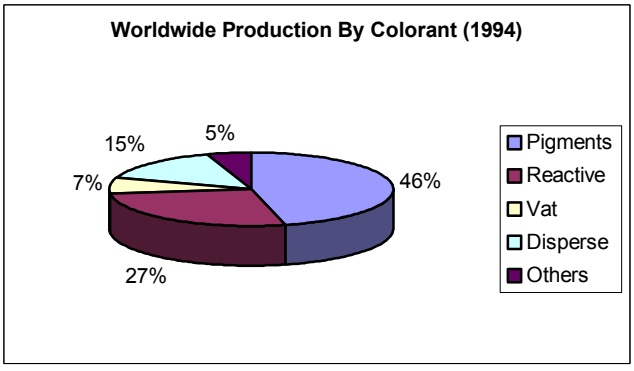

Figure 2: Worldwide Textile Printing By Colorant
(Legend key is linked to percentages in a clockwise direction)

Dyestuff ("Wet") Printing

Although most printers agree that pigment printing is the easiest method of textile production, dyestuff printing continues to hold over 50 % of the market. [1] There are several advantages to dyestuff or "wet" printing. Wet printing involves many different classes of dyestuffs, as each dyestuff has affinity for a different textile fiber. For example, in their alkaline hydrolyzed state, reactive dyes are attracted and absorbed into cellulosic fibers. Similarly, while under high temperature and pressure, disperse dyes are absorbed into polyester fibers through sublimation. This absorption into textile fibers provides excellent durability after fixation and does not negatively affect the soft hand of fabrics. In addition, dyestuff printing allows for a wider variety of color and unique appearances unachievable with pigment printing. Unfortunately, this unique fiber affinity can also limit the type of fabrics that can be printed. Blended fabrics containing two or more fibers must be printed in a multi-step process with fixation between steps. The inherent difficulties of creating a pattern using screens prevent this method from becoming more than a novelty. Wet printing also requires more energy for color development, involves fixation chemicals that are not environmentally friendly and produces a large amount of effluent in the washing process. [2] Typically, the cost per yard is higher than pigment printing and for the most part, wet printing is difficult, lengthy, and much more of a strain on the environment.

Regardless of the colorant used in textile printing, the most common method of production is rotary screen printing.

Rotary Screen Printing

Rotary screen printing is the most widely used method of traditional textile printing. On a rotary screen print machine, colors and patterns are applied through nickel or galvano screens. Each color in the pattern is applied individually, usually from dark to light. Engraved areas allow color to pass through and form one piece of the pattern. The screens are adjusted so that printed areas fit together and form the final pattern.

Rotary screen printing offers many benefits in textile production. Rotary screen machines offer high-speed production and economical long runs. The colorants available provide a large color gamut and are relatively inexpensive. Rotary screen machines are typically partnered with dryers and other finishing equipment to provide a continuous and simple procedure - print and dry or print, steam, wash and dry. The resulting print is durable to light or fade, crock (scrub), and wash.

Unfortunately, rotary screen production is not proving to be an effective tool for traditional producers trying to survive the changing world of textile printing.

Rotary Screen vs. Digital Printing

Although rotary screen printing offers many benefits, there are also several important drawbacks to this type of textile printing. One of the biggest drawbacks is machine efficiency (downtime). A pattern setup can take up to one hour, and clean up can take 1 to 2 hours. Due to lengthy pattern changes and printing problems, the typical print machine runs approximately 40 % of the time. Because of this inefficiency, short print runs are not economical. For example, if the setup time and clean up time is a total of one hour, and the print machine operates at an average speed of 30 yards per minute, the printer must print 1800 yards to match printing time with setup time. Unfortunately, print buyers are now asking for one-time runs of 500 yards or less and printers have to refuse the orders. To summarize – printers don't have enough business because they must refuse the small yardage runs that cannot be economically produced.

In addition to the machine efficiency, traditional printing also involves a lengthy and expensive sampling process. Each design is colored, separated into screen files and engraved. Once screens are ready, colors are matched and patterns are "struck-off" on the print machine. With an average strike-off time of 5-6 hours and screen engraving turnaround of 5 – 10 days, the total time design origination to finished product can be several weeks.

The Changing World of Textile Printing

The world of textile printing is rapidly changing. For the last ten to fifteen years, textile printers have been talking about decreasing run sizes and fewer repeat orders. A recent survey showed a worldwide print run average of only 2,250 yards. In Western Europe, the average print run is as low as 700 yards. [1]

One possible cause of this new trend is change in the average consumer. Consumers of printed textiles are demanding a greater variety of color and design. They want fabrics that express their individuality in their homes and in the clothes that they wear. In addition to these demands, the need for quick order turnaround has never been greater. [3] With no promise of a return to the good old days of 20,000-yard average runs and a constant group of loyal customers, printers have been forced to look for other options. Almost all of the traditional textile printers are asking the same question –how can we respond to these changes in the marketplace?

A New Type of Production – Mass Customization

The answer to this question is subjective and complex; however, one popular solution to this problem is mass customization. Mass customization is a new theory of production that specializes in short runs (as little as one unit) in which customers dictate exactly what they want. Mass customization involves nearly unlimited design, multiple colorways and is very customer oriented. In order to better understand mass customization, we will look at a few examples of how it is currently being implemented in other industries.

1. Dell Computers: In the computer industry, Dell Computers is a pioneer of mass customization. On their website, Dell allows each consumer to "design" a PC or laptop that best meets their needs. The consumer can select from various base models and upgrade the components for improved performance. In some cases, the consumer can purchase optional accessories and change the color of their computer. The end result is a product the customer feels like they have personalized and is very happy with. Dell has been very successful in their efforts and is a perfect example of successful mass customization.

2. Gerber Technology – A less familiar entity but a better example of how mass customization can be accomplished in the textile industry. Gerber has produced software that allows a designer or buyer to look at different designs on a finished piece of apparel or home furnishing. Viewers can change design colors or put various designs together to see how an outfit will look before producing that outfit. In the very near future, consumers will have similar technology available to them via the Internet and possibly in retail stores. If a consumer likes a dress or piece of apparel but not the design or color, he or she will be able to choose different patterns and colors and have the garment shipped to them. Combined with 3D body scanning technology, consumers can virtually try on a new outfit from the comfort of their own home.

3. Ink Drop Boutique.com – A great example of mass customization and just in time inventory using digital printing. On this Internet site, users can browse through a wide variety of designs and place an order for a printed scarf. Only after the order is placed are the scarves printed. In the near future, users will be allowed to change colors and personalize the scarf to their liking.

So how do textile producers offer mass customization? How can the large textile printer offer this option, not completely stray from his existing business, and still make a profit? The answer is by totally changing how products are created and supplied to the marketplace. But how? – digital printing. Digital printing is a relatively new technology that offers multiple benefits to the traditional textile producer. It has dual application in printing, acting both as a sampling and production tool. In sampling, digital printing offers immediate results, provides tremendous flexibility in design and coloration while saving time and money. As a production tool helps to minimize inventory and provide the option for mass customization.

The Benefits of Digital Printing

So how does digital printing help to eliminate the problems associated with traditional textile printing? One of the biggest benefits digital printing provides is the reduction of downtime. Digital printers do not require lengthy setup / cleanup time between patterns and can theoretically print 24 hours a day, 7 days a week, 365 days per year. In addition to increased efficiency, digital printing also provides the elimination of screen cost in sampling and short-run production. Printing without screens eliminates the registration problems and most importantly – allows for mass customization. Designers can make pattern and color changes immediately and print a sample before engraving screens for the final run. On a digital production machine, the printer can produce as little as one repeat of several patterns using multiple colorways, all in a few minutes.

Based on what we have just discussed, you must be thinking – "digital printing sounds great; what's the problem?" As I mentioned above, digital printing of textiles is a very new technology and the available machinery does have limitations. One of the most common questions from textile producers is, "why does it seem that digital printers for textiles are progressing so slowly?" There is no one answer to this question, but a look at the evolution of digital printing technology shows us a few of the limiting factors.

The Evolution

Digital Printing is a relatively new technology. CH Hertz of Lund University recorded the first continuous inkjet patent in 1968. [4] In 1977, Canon and Hewlett Packard received patents on thermal ink jet technology. Until today, most of the development in digital printing has been focused on the office document and home printer industry. The print head technology for these markets has a short life span – from 500 hours to a maximum of one year. As a result, most of the available ink jet print heads are not adequate for industrial use or production printing. Fortunately, quite a bit of work has been done on digital textile machines in the last five years. Currently, several companies are working to create production printers using a wide variety of ink jet

technology. Though other types of digital printing exist, inkjet print head technology has proven the most effective method for direct textile printing.

Ink Jet Technology – A Brief Overview

There are two fundamental types of inkjet technology – Drop on Demand and Continuous Ink Jet. Both have benefits and drawbacks, depending on the construction and engineering of the print head.

Drop on Demand Technology

Drop on Demand (DOD) ink jet print heads use either a Thermal (TIJ) or Piezoelectric (PIJ) mechanism to "fire" nozzles and place droplets (drop) onto the substrate only when they are needed (on demand).

Thermal Ink Jet Heads use thermal excitation to form a bubble in the ink chamber, thus force a drop of ink out of a given nozzle. Up to 85% of all print heads in the office document ink jet market are thermal, and most use water-based inks. Thermal ink jet heads are inexpensive to manufacture and well-suited technology for low-volume printing. They produce high-resolution prints by using small drop size; however, the low viscosity and high temperature restrictions limit the types of chemistry that can be formulated into ink for thermal print heads. Thermal technology is sometimes referred to as "bubble-jet."

Piezoelectric (Piezo) ink jet print heads use a piezoelectric transducer to excite and warp the interior of a given ink chamber, forcing a drop of ink out of that chambers nozzle. Piezo print heads are well suited for high-volume printing, because reliability is built into the design of a print head. They also produce high-resolution prints by using small drop size; however, piezo heads allow for higher ink viscosity. Piezo print heads also allow for a wider range of ink formulations; including pigment inks formulated for textile standards of durability.

With print resolution up to 720 DPI, DOD inkjet printing is now the standard in direct textile printing.

Continuous Ink Jet Technology

Continuous ink jet print (CIJ) heads use a continuous stream of ink that is broken into droplets after leaving the print nozzle. The droplets are given a charge and pass through a deflection area where they are either recycled via a "gutter" system or placed onto the substrate. The two main types of CIJ are Binary and Multi-Deflection.

Binary CIJ print heads use a simple gutter and ink reclamation system to control drop placement on the substrate. As ink droplets pass through the charging area in a binary system, they are either deflected into a gutter or allowed to drop onto the substrate. Some ink jet experts claim that binary continuous ink jet is poorly adapted to process colors. As a rule, binary CIJ print heads are expensive to manufacture and maintain; thus a poor choice for reliable production printing.

Multi-Deflection CIJ print heads are the newest form of CIJ technology. A multi-deflection CIJ print head uses the same basic principle as binary CIJ, but provides more drop placement control. As droplets of ink pass through charging areas in a multi-deflection head, the print system can give varying amounts of charge to the droplet. As droplets then pass through a deflection area, they can be placed on the substrate at a variety of angles. Most multi-deflection CIJ print heads have up to 5 angles of drop travel, excluding the path into a gutter system. The varying angles of drop placement provide wider substrate coverage with fewer print heads than other forms of CIJ technology.

The Progression

Although digital / inkjet technology has been widely used in other markets for over 20 years; the first inkjet printer for textiles was introduced in 1991. Based on a modification of the Hertz Continuous inkjet principle, the TruColor Jet Printer from Stork was truly revolutionary. Combined with a highly purified line of reactive dyes from Zeneca, the TruColor printer provided CAD users the ability to print a pattern directly onto fabric without the need for screens. [4] Stork's TruColor printer opened the door for designers and print manufacturers to modify designs, colorways, and evaluate each new pattern on cotton fabric. In addition, the use of reactive dyes allowed the samples to be steamed and washed – providing a durable sample for customer review. The original TruColor Jet Printer from Stork (TCP 1122) has evolved into the TCP 4000 Series – still a popular form of inkjet sampling.

From 1991 until 1997, the TCP series was the only inkjet textile printer providing direct textile printing. Although others tried, no printer could match the color gamut and print quality of the Stork TCP 4000 Series. In 1995, ENCAD, a California ink jet integration company, identified the textile industry as a good market for their wide format ink jet printers. ENCAD was losing market share in the graphic printing market and needed to find a way to increase sales. They approached the textile industry with their 1500 TX as a sampling / short production tool. ENCAD was not widely successful, due to their limited color gamut and lack of ink durability. ENCAD's attempt at entering the Textile market left most ink jet machine manufacturers wondering if the textile industry was ready for inkjet printing. [5]

The Limiting Factors

Though ENCAD did not initially enjoy success in their attempt to penetrate the textile market, they did heighten the awareness of the textile industry to the benefits of inkjet technology. As a result, ENCAD began selling their 1500 TX printers for textile sampling. The majority of textile companies were still not using inkjet printing; however, the proposed benefits of short-run inkjet printing were too great to ignore. In addition, several of the large inkjet machine manufacturers began researching the best way to provide an production machine for textiles.

Unfortunately, this proved to be more difficult than they ever imagined. As mentioned above, most of the available print head technology was not appropriate for industrial use. In order to have success in textiles, system integration companies would have to find new print head technologies and build machines around them. Their initial marketing efforts did not generate much customer interest and there was not enough incentive for manufacturers to invest in an unproven industry. Further compounding the delay in development was the lack of proper ink chemistry. Traditional digital printing inks were designed to maximize print quality on paper, not for durability up to textile standards. While all of these issues severely limited development of digital printing, arguably the biggest limitation was proper material handling systems. Textile substrates are flexible and porous and traditional digital technology manufacturers had to learn how to print all over again.

When considering all of the limiting factors, it is also important to examine the role of textile producers. Textile manufacturers are historically very conservative and sometimes reluctant to adopt new technologies. In many cases, a textile producer will wait to adopt new technology until someone else buys it first. This reluctance, although justified in most cases, has prevented some developmental efforts in digital textile printing. The initial marketing efforts of companies like ENCAD were not well received because the technology did not meet the needs of the textile producers.

In defense of textile producers, inkjet printers offered much slower speeds than traditional printing methods and lowered the available color gamut. The original inkjet printers provided only CYMK process color, and special pretreatments were required to achieve proper print quality. In addition, textile customers were required to purchase special fabrics and did not have an option to use their own fabrics. Printers that did allow customers to use their fabrics limited the type of fabrics that could be used. Most of the roll handling systems could not control stretch knits or performance fabrics and capable printers limited print runs to 10 - 15 yards.

A Unexpected Breakthrough

Just when it seemed as though inkjet printing would fade away as a viable method of textile printing, a relatively unknown company made a huge breakthrough in the textile industry. Mimaki Engineering, a Japanese inkjet integration company, began marketing their JV2 series printers for textile sampling. Mimaki introduced the TX-1600, a seven color inkjet printer based on the EPSON piezo print head. The Mimaki TX-1600, capable of printing at 720 DPI, was just the second digital printer to provide high quality textile print samples with a reasonable color gamut. In addition, the TX-1600 provided roll-to-roll printing; something the Stork TCP series lacked. The result was the ability to create enough printed yardage to create finished apparel and home furnishings for showrooms and customer samples. The combination of high quality printing, increased color gamut and roll to roll printing has provided Mimaki with great success in the textile market. It is estimated that Mimaki now has an installed base of over 1,500 TX series printers. They have recently released the TX2; a second-generation textile printer with 5x increased speed and the capability of printing with two different sets of digital inks. As a result, Mimaki has emerged as the leader in inkjet textile printing and their print quality serves as the standard for future machines.

So What Is New In Digital Textile Printing?

Although the success of Mimaki has proven that the textile industry is ready for inkjet printing, most traditional manufacturers are still waiting for a better method of digital textile production. Mimaki has emerged as the quality standard; however, their technology will most likely be restricted to sampling or production of niche products (scarves, ties, etc.). The EPSON print head used in the Mimaki printers is a good middle ground between desktop and production technology. Unfortunately, it does have limitations. Because it was designed for short runs and has a limited life span, long runs are not easily accomplished. In addition, the print heads require low viscosity inks. This limits the use of pigment inks; essential in the future widespread acceptance of production inkjet printing.

Mimaki's success provided an additional benefit for traditional textile producers. The willingness of these textile manufacturers to invest in inkjet technology was enough to reenergize the efforts of other inkjet machine manufacturers. A second turning point in inkjet textile printing came at the 1999 ITMA fair in Paris, France. In addition to the already successful TX-1600 from Mimaki, several other inkjet textile printers were introduced. More importantly, the entire textile printing world saw that inkjet printing was quickly emerging as a viable method of textile printing.

The Role of the Integrator: Designing a Machine for Textile Short-Run Production

Arguably, most of the innovations in digital printing machinery come from machine integrators. An integrator brings together the collective talents of companies involved with digital printing to offer complete, innovative printing solutions for a specific market. While some integrators may have no prior printing experience in that market, their detailed knowledge of digital technology proves invaluable in creating a successful machine. Over the past three years, the need for production inkjet equipment has pushed integrators to revisit the capabilities of existing technology. As a result, several new machines have been introduced that are rapidly inching closer to true production printing.

Contrary to popular opinion that Piezo DOD print heads were the only option; a wide variety of print head technologies are being utilized in these printers.

Thermal Inkjet Technology

Toshin Kgoyo, a Japanese rotary screen and flatbed print machine manufacturer, introduced the Ichinose Image Proofer at ITMA in 1999. The Ichinose image proofer provides 20 m^2 / hour of printed production with a resolution of 360 DPI. The image proofer is a 12-color system that utilizes the same Lexmark thermal print heads used in ENCAD printers. One truly unique benefit of this system is the ability to print both knit and woven fabrics.

Piezoelectric Inkjet Technology

Sophis Systems, a Belgian CAD / CAM software manufacturer, has proved to be a force in the advancement of digital textile printing. While not traditionally an integrator, Sophis partnered with Raster Graphics to create a short-run machine for textiles. Introduced at the Heimtex fair in 2001, the Print Express provides 20 m^2 / hour of printed production with a resolution of 720 DPI. Print express is a 6-color system that utilizes a new EPSON print head. The high quality prints produced with the Print Express made it an immediate success in the exclusive Italian silk printing market.

DuPont, one of the largest chemical companies in the world, entered the inkjet machine market in 2001. At the Heimtex fair in Frankfurt, Germany, DuPont introduced the Ink Jet 3210 printer and the Artistri system – a combination of pigment inks and color matching software. The Inkjet 3210 was the first printer wide enough for the bedding market. With a printing width of 3.2 meters (125 inches), the Inkjet 3210 provides 30 m^2 / hour of printed production with a resolution of 360 DPI. The inkjet 3210 is manufactured by Vutek and is based on the Spectra print head.

Digital Printing Systems, a New York based ink company, introduced the DPS 85T for direct textile printing and the DPS 65 for transfer printing in 2002. The DPS 65, a six color printing press, provides 185 m^2 / hour of printed production with a resolution of 600 DPI. With a print width of 65 inches, the DPS 65 provides an impressive 2 linear yards per minute. Using a selection of disperse dyes with a uniform transfer rate, the DPS 65 is the first inkjet printer in the world to provide speeds defined in yards per minute, not hours. The DPS 85T, an eight color printing machine, provides 50 m^2 / hour at 720 DPI and 100 m^2 / hour at 360 DPI. With a print width of up to 2.1 meters, DPS 85T provides wide format printing for a variety of applications. Based on traditional textile material handling systems, DPS 85T provides the capability of both woven and knit printing.

Binary Continuous Inkjet Technology

Although Binary CIJ technology has been very successful for sampling in the Stork TCP Series printers, it would be very expensive to use this technology for a production machine. Because Binary CIJ print heads can only cover one pixel at a time, it would take 5 times as many print heads to cover the same area as one multi-deflection print head. As a result, Binary CIJ technology has been pretty much abandoned for production textile printing.

Multi-Deflection Continuous Inkjet Technology

Making the transition from sampling to short-run production, Stork introduced the Amethyst in 1999 at ITMA. Based on their proprietary Mulit-Deflection CIJ technology, the Amethyst provides 8 m^2 / hour of printed production in high resolution mode using reactive dyes. The Amethyst boasts 16 hours of uninterrupted operation and provides 8-color process printing.

One big surprise of 2001 was the introduction of the Chromotex SPM flag printer from Zimmer machinery. Zimmer, an Austrian manufacturer of rotary and flatbed printing machines, introduced their latest inkjet printer at the ATME-I show in Greenville, SC. Based on the Jemtex Multi-Deflection CIJ print head, the Chromotex SPM printer provides 15 m^2 / hour of printed production with 8 colors and 30 m^2 / hour of printed production with 4 colors. One of the most unique features of this printer is the introduction of spot color digital printing. Spot color printing provides a wider color gamut and flat colors.

The "Speed" Question and the Future of Inkjet Textile Printing

Based on the advancements show above, it is clear that the future of digital printing of textiles is beginning to take

shape. In addition, most of the machines currently being developed for textiles are based on existing print machines and material handling systems. These printers will be capable of multiple ink chemistries and will print both knitted and woven fabrics. While it is clear that none of these printers is capable of replacing current rotary screen production; the benefits they provide in sampling and flexible manufacturing clearly outweigh the delay in their advancement.

Probably the most asked question regarding digital printing of textiles is "when will digital printers be as fast as my rotary screen printer?" Well, a look at the actual speed of Rotary Screen vs. Digital Printing today paints an interesting picture:

Rotary Screen
•Average Pattern Speed of 30 yards / min
•Average of 40 % Efficiency or 60 % Downtime
•Net Speed = 30 yd / min * 40 % = 12 yd / min

Production Digital Technology
•Available in Speeds of 100 – 200 m^2 / hour
•At a width of 65 inches, Speed is equivalent to approximately 1 – 2 linear yards / min

Current Speed Comparison
Rotary vs. Digital
12 yards / min *vs.* **1 – 2 yards / min**

When you analyze this speed comparison, notice that the gap continues to narrow! [6] In addition, the elimination of pattern setup / clean up time and the ability of production ink jet printers to produce short-run yardage must be considered in the comparison of the two printing methods.

The "Other" Side of Digital Textile Printing

While the traditional textile manufacturers are slowly coming around and accepting digital printing technology, perhaps the fastest growing group of textile printers have no experience with traditional printing at all. This group of entrepreneurs consists of advertising groups, design companies, and even producers of complementary furnishings from adjacent industries. Many of these companies have begun experimenting with digital textile printing with great success. While their knowledge of textiles may be limited, their presence in the market should not be underestimated. Through the use of the Internet and retail organizations, several firms plan to offer custom fabrics for home furnishings, apparel, and just about any other fabric application you can imagine by the end of 2002. One of the most impressive ideas offers the ability to design and coordinate a complete room – carpets, bedding, drapery, wallcoverings, and even furniture; all with patterns and colors chosen by the end user. Another group plans to offer customized apparel that can be design and colored by the user and even viewed for fit through special 3-D body animation software. The customer can input body measurements or have a body scan performed to generate a computer simulation of their figure. Special software then takes garment design data and simulates a virtual dressing room experience. Most of these businesses are in the early stages of development, but they will most likely be a strong force in textile markets by 2002.

How Can My Company Utilize Digital Printing?

As mentioned earlier, digital printers play a dual role in textile printing and offer many advantages over existing technology.

In sampling, digital printers can shorten the time from design origination to production, reduce and / or eliminate traditional strike-offs, and get multiple colorway samples to the customer before your competitors.

As a production tool, digital printers provide Just In Time (JIT) manufacturing and allow textile producers to print only the number of yards that have been sold. A prime example of JIT manufacturing, digital production offers inventory reduction and better control. If a textile producer receives a small repeat order and they have no stock, or if they receive a large order and are a roll short – the order can be filled with digitally printed fabric. In addition to inventory control, production digital printing allows textile manufacturers to differentiate themselves; complementing their current product line with creative digitally printed products. A textile manufacturer can offer unique products that were previously too costly and possibly create new markets. Arguably the most important benefit of production digital printing is capacity to accept short print runs and one-time orders. With run size decreasing and repeat orders becoming a rarity, textile printers must adapt in order to remain competitive.

Conclusion

Though no one can predict when we will see a dramatic change from traditional to digital production, it is clear that the future of textile printing will be digital. Today's textile marketplace demands the benefits of digital printing, the industry has embraced this new technology, and to meet this demand – printers are being developed that fulfill the needs of both traditional textile printers and entrepreneurs. For a traditional printer, digital printing saves time and money and will allow them to remain competitive in a changing world

of textile printing. For an entrepreneur, digital printing offers all of the benefits described above; but most importantly, the freedom of unlimited design and a true vehicle for creative ideas.

Biography

Brooks Tippett is the Director of Sales & Marketing for Digital Printing Systems. He is responsible for the development of new textile inkjet solutions as well as the worldwide sales and marketing for all DPS products. Prior to working at DPS, Brooks held the position of Technical Manager for Excel Products in Los Angeles and Plant Chemist for the sheet printing operation of Fieldcrest Cannon in Kannapolis, NC.

Brooks has focused the majority of his career on digital printing of textiles and has become a frequent speaker on this topic. He is a senior member of AATCC and the chairman of the printing technology committee. Brooks has been published by IS&T, IMI, AATCC, and frequently contributes to the digital printing knowledge library at techexchange.com.

Brooks holds a Bachelors of Science degree in Textile Chemistry from Clemson University.

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