

Implementing Digital Print for Production Textile Printing

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Introduction

Digital printing is becoming more and more of an acceptable tool in many printing markets, from wide format graphic arts to variable printing for documents. In fact, some of the technology that is being used for these applications has been around for over 30 or 40 years. Nevertheless, until recently, certain technological limitations (such as quality, reliability and of course cost-effectiveness) have prevented the digital "breakthrough" in two additional aspects: both in new applications (such as textile) as well as production size jobs (reaching 1000 sqm/10,764 sqft).

Digital Printing on Textiles Today: Inkjet Technologies

There are numerous digital solutions on the market today which enable textile printers to achieve high quality results with a large color gamut on a wide range of fabrics. The different system level options available are derived from the various technologies on the market today.

As almost all feasible options today are based on inkjet technology, this will be my focus. Digital textile printers today are based on both types of inkjet technology: continuous (CIJ) and drop on demand (DoD). Each of these has its advantages and benefits to production printing on the one hand and textile applications on the other.

Continuous Inkjet

This technology is the more mature technology, being over 30 years old. It is characterized by expensive and complex print heads, which require costly maintenance procedures. Until date, and in comparison with DoD technology, resolution is typically low, while on the other hand, extremely high print speeds are obtainable. Another important factor is the fact that it is extremely difficult to successfully use pigment based inks with continuous inkjet print heads. Therefore, to date inks for this technology are dye-based.

Drop on Demand Inkjet

Thermal inkjet technology is familiar to most of us since it is the dominant technology used for small office and home applications. This is a natural choice since the price

per nozzle is relatively inexpensive, while the durability and lifespan of the print heads themselves is relatively short. In other words, while this product provides extremely high quality output and low cost, it is not suitable for industrial applications.

Piezo-electric technology provides the right combination of features for digital textile printing for the industrial market. The price per nozzle is reasonable, in between the continuous technology and the thermal DoD technology. The print head lifetime is extremely long, due to high reliability rates. The printing speed may reach high speeds, while the print resolution ranges from low to high depending on the supplier and application method. Furthermore, this technology supports a wide range of inks, including water-based (dyes and pigment inks), UV and solvent inks.

After this brief overview of the various technologies available and their advantages, we may look at the systems available on the market today. They may be divided into three primary categories:

- (1) Low-resolution systems (~150 dpi) with extremely high speed aimed at medium and high production jobs requiring limited quality. This category includes the ISIS printer such as is being developed by Osiris, based on CIJ technology.
- (2) High quality, low throughput solutions aimed at sampling. Examples of these systems include Mimaki, or Colorspan printers, utilizing DoD technology.
- (3) High quality, high throughput solutions aimed at short and medium jobs: the DReAM utilizing Scitex Vision's Aprion proprietary DoD piezo-electric technology.

Aprion Technology

Scitex Vision's Aprion technology features the unique piezo drop-on-demand technology that was originally developed by Aprion Digital. It embraces the fastest, most flexible and robust print heads available on the market. Numerous patents and patent applications protect the print head technology.

The technology is based on digital liquid delivery of small, highly repeatable droplets of liquid simultaneously delivered from thousands of nozzles at an extremely high speed of over 35,000 droplets/nozzle/sec, (with 200,000 droplets/nozzle/sec capacity demonstrated under lab conditions). The print head dimensions are 5.9 by 0.8

inches. Each print head has 512 nozzles providing true 600 dpi quality. The print heads are extremely flexible: the multi-layer head, protected by a steel casing, is only a few millimeters thick and can be shaped into virtually any length or width. Moreover, testing has proven that these heads have higher operating speeds, enjoy longer life and have a greater tolerance for a much wider range of inks than do other inkjet print heads. In addition, the print heads can be configured in very large arrays, are highly reliable and are manufactured using standard industrial processes. This, among other features, makes them well suited to industrial applications.

The outstanding advantages of Aprion drop-on-demand technology over other inkjet technologies are numerous. Compared with continuous inkjet, the head provides for higher quality and is reliable. Compared with thermal inkjet, the head tolerates a wider range of ink formulations; has better control over drop volume and velocity (which affects image quality); lasts longer and will work with high-viscosity inks. Compared with other piezo-type technologies, the heads' drop firing rate is higher.

Digital presses based on this technology are viable alternatives to conventional presses in terms of speed and cost effectiveness. As the technology continues to develop, print quality and printing speed will reach even higher performance.

Industrial Digital Printing on Textiles

The DReAM Printer

Many different markets may benefit from the advantages of digital printing for industrial applications, however, the requirement for textile printing for short to medium runs already exists. Thus, the DReAM was created to provide an answer to these market needs. A partnership was established among Reggiani Macchine of Italy, Ciba Specialty Chemicals of Switzerland and Scitex Vision. Reggiani Macchine S.p.A. is a leading company in manufacturing rotary and flat screen-printing machines for clothing and household fabrics. Located in Bergamo, Italy, Reggiani has been Certified ISO 9001 since 1995. Reggiani has an installed base of over 1000 systems worldwide. CIBA Specialty Chemicals is a world leader in development and manufacturing of inks, additives and chemicals. It specializes in the field of textile inks and dyes, with significant investments in R&D and is dedicated to its customers in more than 120 countries. The three companies have partnered with each of their strengths to develop a system level solution for digital printing of textiles for short and medium production jobs. Scitex Vision brings its print engine implementing Aprion print head technology. CibaSC is responsible for developing and commercializing the four unique ink ranges for the DReAM system: reactive, acid, disperse and pigment. Reggiani integrates these assets together with its renowned conveying systems into a state-of-the-art digital printing solution revolutionizing the digital printing textile industry.

The DReAM is the complete cost-effective package for short and medium run industrial textile printing. Customers

can now provide rapid responses to market needs: reducing turn around time from 6-8 weeks to 1 day! The DReAM delivers high quality throughput in six colors at speeds of 150 sqm (1614 sqft) per hour. As with any digital workflow, there is no need for films, screens or set-up. Furthermore, digital proofing is on-line, and only a single operator is required for machine operation. Due to the unique design of the conveying system, there is a blanket with permanent glue and a continuous integrated washing system to keep the blanket clean. In addition, there is an on line drying system (using a hot-air dryer with adjustable temperature up to 100° C, 212°F). Finally, together with Ciba Specialty Chemicals inks of all types (reactive, acid, pigment and disperse) the DReAM supports printing on all substrates: woven, knitted and non-woven. These advantages relate to the cost-effective design implemented by the partners. Finally, the heart of the system is the Aprion technology: piezoelectric DoD inkjet heads enable the printer to achieve high speed (over 35,000 droplets/sec/nozzle) at true 600 dpi. Additionally, their simple design and built-in automatic print head maintenance system increase product reliability.

Applications

The DReAM is designed to print on a wide variety of fabrics for many applications, including:

- High fashion: dresses, pants, shirts, blouses, and more
- Home textiles: curtains, sheets, towels, placemats, upholstery
- Technical textiles, such as automotive and specially designed fabrics
- Specialized apparel, including swimsuits
- Flags and banners
- New applications

Challenges Facing the Implementation of Industrial Inkjet Printing

Many challenges exist when trying to introduce new technology and new printing concepts into traditional printing environments. For example, in traditional printing the "color kitchen" (using spot colors only for printing) is an acceptable part of the workflow. The concept of printing with four or six process colors, although they support a very wide gamut and enable unlimited colorways, may be difficult to absorb and accept. Another example of a challenge facing digital printing is the switchover to an entirely digital workflow. Here the customer may benefit from a much less expensive process (both from storage and procurement aspects) as well as the ability to store previous files for as long as the customer desires. In order to support a digital workflow, the appropriate staff must be available, suitably trained and updated on new workflow tools and software updates. Thus, the new concepts create a much simpler, cleaner, environmentally-friendly workflow and work environment full of opportunities. Nevertheless, in order to be introduced effectively and implemented successfully the new technology requires executive management support and backing.

Reggiani DReAM Main Specifications

Technology	Aprion proprietary piezoelectric drop-on-demand print heads
Workflow components	Internal RIP Print engine with 7 print heads for each of the six process colors Blanket with permanent gluing and integral continuous washing system On-line drying system using hot-air dryer with adjustable temperature up to 100°C
Print resolution	True 600 dpi
Media size	Up to 160 cm (63") wide
Media type	Woven, non-woven and knitted fabrics
Media thickness	Up to 40 mm (1.57")
Inks provided by CibaSC	CIBACRON® RAC: reactive inks for cellulose fabrics LANASET® RAC: acid inks for polyamide, silk and wool fibers IRGAPHOR® RAC: pigment inks for all fabrics TERASIL® RAC: disperse inks for polyester fabrics
Colors	Full process colors: Cyan (Turquoise), Magenta, Black, Yellow, Blue and Orange or CMYK and lights
Image size	Up to 160 cm (63")
Throughput	150 sqm (1614 sqft) per hour for high quality printing
Physical characteristics of printer	Weight: 6500 kg (14330 lb) Size(HXWXL) 217x300x821cm /85.4x118.1x323.2 in.

Summary

The unique DReAM industrial digital printer, manufactured by Reggiani Macchine of Italy and based on Aprion inkjet technology, enables extremely high quality textile printing at turn around times which will never be possible with conventional printing. Moreover, due to the fact that the DReAM provides cost-effective results at jobs exceeding 1000 sqm (10,764 sqft), this solution is not just for sampling but rather full-scale short run production. These characteristics make it possible for the printers to provide reasonable priced printed output to their customers within time-frames that were unheard of in the past!

The DReAM is the first industrial digital inkjet press for textile applications. An entirely digital workflow facilitates direct-to-fabric inkjet printing on woven, knitted and non-woven fabrics at true 600 dpi resolution. As with all digital workflows, there is no need for films, plates, or set-up. The DReAM allows you to achieve high throughput (over 150 sqm/ 1614 sqft per hour for high quality printing) with a single operator. This robust industrial printer prints on a wide range of substrate widths (up to 1.6 meters, 63 inches) and thickness (up to 40 mm, 1.57 inches).

Scitex Vision is a leading developer, manufacturer and service provider of cutting-edge digital printing presses and consumables for industrial applications including wide format graphic arts, packaging and textile. Backed by global marketing and support networks, Scitex Vision is committed to continuously provide high-quality, flexible and cost-effective solutions to printing houses all over the world. The company owns a core technology based on Aprion's patented drop-on-demand piezo inkjet print heads and water-based inks. Scitex Vision employs more than 450 employees worldwide with headquarters located in Netanya, Israel, and subsidiaries in Atlanta, Georgia and Brussels, Belgium. More than 200 of Scitex Vision employees are devoted to the sales, distribution and servicing the existing 1000 systems installed at more than 550 of its customers, and of course deals with expanding the company's business.

Beta testing of the DReAM in Europe began at the beginning of 2003 and the system is now widely available throughout Europe. Sales to North America are scheduled to begin at the upcoming ITMA (scheduled for October 2003 in Birmingham, U.K.).

We look forward to the exciting implementation process of digital print for production textile printing.

Biography

Vibeke Dank has been with Scitex Vision (previously Aprion Digital) since 2001. With a background in business (MBA from Tel Aviv University) she has recently been appointed as Manager of Partnership Programs at the newly-merged Scitex Vision.

Ms. Dank is responsible on behalf of Scitex Vision for the three-party relationship between Reggiani Macchine of Italy, Ciba Specialty Chemicals of Switzerland and Scitex Vision regarding the Industrial Textile Printer (DReAM) for production printing based on Scitex Vision's core technology: Aprion inkjet drop on demand technology. Vibeke's roles at the company also include building strategic relationships between Scitex Vision and various partners worldwide.