White Paper

Sign & Display

PRINTING OF FABRICS WITH UV CURABLE INKJET

Introduction

The applications where fabrics can be used are only limited by the imagination: indoor decoration, banners & flags, exhibition stands, etc.

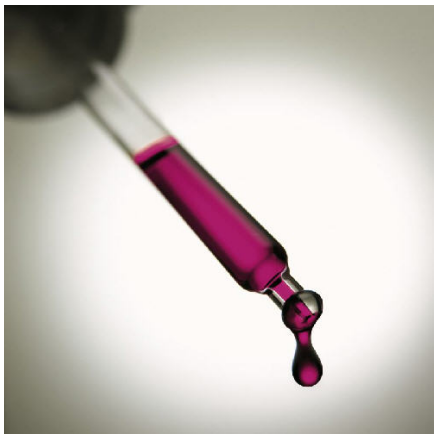
More and more printers are incorporating digital fabrics printing into their product portfolio. Until recently digitally printed fabrics could only be produced via indirect (using transfer paper) or direct printing on fabrics using special textile inks (dye sublimation inks, acid dye inks, reactive dye inks, etc.). Due to technological breakthroughs in ink development, print heads, etc., UV curable inkjet printing has developed enormously in the past few years.
The main advantages of UV curable inkjet printing onto fabrics are:
1) use of only one class of ink for all types of fabrics
2) no need for thermal fixation/sublimation after printing.

Needless to say that these advantages have convinced numerous printers to choose UV curable based fabrics printing.

Inkjet printing

Inkjet printing is defined as a non-impact printing technology in which droplets of ink are jetted from a small aperture directly to a specified position on a media to create an image. Inkjet printing can be divided into two types: continuous inkjet (e.g. used in industrial applications to mark and code packaging (bottles and cans), and drop-on-demand (DOD) inkjet. Unlike the continuous inkjet, DOD inkjet delivers ink to the substrate only when the internal print head receives a specific digital signal. The two most popular types of DOD inkjet printers are thermal and piezoelectric.

What is an inkjet ink?



An inkjet ink is one of the consumables being used during the inkjet printing process. One can identify four main types of inkjet inks: 1) water-based inks, 2) solvent-based inks, 3) oil-based inks, and 4) UV-curable inks. A UV curable ink is composed of different chemical components developed in such a way that the ink, after curing with UV light, meets the characteristics of the application. A typical UV curable ink formulation contains monomer(s), oligomer(s), pigment(s), photo-initiator(s) and one or more additives. Several decades ago UV curable ink technology was introduced in analogue printing (offset, screen, etc). Only a few years ago it made its commercial introduction in digital printing (inkjet). UV curable inks have a number of advantages over non-radiation cured digital inks, the main ones being 1) higher printing speeds, 2) ecological friendliness (no VOC's), and 3) compatibility with a wider range of substrates. In contrast to its digital counterparts, UV curable inkjet inks can be printed on a wide variety of rigid and flexible, both coated and uncoated substrates, including all kinds of plastics, papers, wood, ceramics, glass and fabrics.

Fabrics

A fabric or textile can be described as an assembly of fibres or yarns of sufficient surface area in relation to its thickness and of adequate mechanical strength to give it inherent cohesion. Fabrics are most commonly woven or knitted, but the term can also apply to other methods of manufacture including lace making, tufting and nonwovens. For the purpose of this white paper though the term will refer to woven and knitted fabrics. Fabrics can be made of natural or synthetic products. Examples of natural fabrics are wool, silk and cotton. Synthetic fabrics are mostly made of polyester or nylon.

Classical fabrics printing

Fabrics are classically printed via screen-printing. Due to personalization there are more and more requests for small print quantities. Here inkjet printing is the preferred technology. For many years digitally printed fabrics were produced via indirect dye sublimation technology. Here the image is first printed onto special transfer paper and subsequently brought onto the fabric via a thermal process at high temperature. The disadvantages of this technology are 1) very time consuming due to a two-step process, 2) need for printer and thermal press, and 3) method is limited to polyester fabrics or fabrics with at least 70% polyester content. In recent years direct-to-textile technology was introduced. Here the use of transfer paper is excluded but still needs a thermal press to fixate the inks. Another disadvantage of direct fabric printing is the fact that special inks and fabric pre-treatments are needed for almost every type of fabric: nylon, polyester, cotton, etc. Agfa Graphics has been at the forefront in developing fabrics printing based on UV curable inkjet technology. The advantage of digital UV printing is very clear: prints can be obtained much faster since no extra steps are required (no printing onto transfer paper, no thermal transfer/fixation step). Furthermore, only one type of ink is required, both for printing onto all types of fabrics and for printing onto other flexible and rigid substrates. Due to the technological differences between traditional fabric printing and UV curable inkjet printing, the latter also has some limitations: outdoor durability is limited to ca. 2-3 years, mechanical stability & washability, and flexibility). However, for lots of applications (indoor decoration, exhibition stands, etc.) UV-based printing is the preferred technology.

Why use fabrics?

There are many reasons why digital printers are using fabrics for digital print as opposed to conventional print media. Market trends suggest that there is a growing demand for fabric printed media replacing traditional media as the advantages become more widely recognised by the consumer of print media.

- *Tactility* is just one reason why fabrics are a popular alternative to traditional print media. The fact that they can be manufactured using state of the art knitting and weaving technologies means the resultant choice is broad and varied giving printers and their customers great choice. Being as they are highly tactile encourages and invites people to want to touch them and draws their attention to the printed media.

- *Aesthetically or visually pleasing to the eye* because of the diverse range of fabrics available this means that they are more interesting than traditional medias that are flat and uninteresting to the eye. The surface effects available range from very light translucent fabrics to heavy dense canvases allowing many possibilities to be fulfilled.

- *Flexibility* fabrics unlike traditional PVC and similar substrates, fabrics are highly flexible. This major advantage can be seen in many of the applications where fabrics are now widely used such as retail and exhibition environments.

- *Durability* is another key reason why fabrics are ever increasing in their popularity. This is particularly noticeable in the exhibition sector where fabrics are being widely used by blue chip and companies of all sizes at major exhibitions globally from one year to the next. Fabrics unlike heavy PVC and other bulkier medias can be easily transported and are more forgiving. Exhibition graphics are a major growth area and excellent examples can be seen at trade shows of all descriptions globally.

- *Cost effectiveness* is another very good reason to use fabrics because of the advantages given above. Transportation costs particularly in the exhibition sector mean that fabric elements of exhibition stands / booths can be transported from one country to the next more efficiently with a much lower risk of damage. More ambitious exhibition stand designs are possible using fabric elements.

Applications for fabrics

The applications where fabrics can be used are only limited by the imagination. New uses are being found for digitally printed fabrics on a near daily basis. There is however a number of key areas where textiles are used and some of these are summarized in the following.

- ***Flags*** are perhaps one of the most obvious applications whether it is National or corporate flags, one offs or multiple flags means they can be printed using the most up to date digital printing technologies. The uses are wide and varied ranging from state visits, the sports sector, entertainments, indoors and outdoor events of all sorts. Beach flags are a sector that uses specialty fabrics suited to this application. Typical knitted flag fabrics weigh anything from 85gsm up to 160gsm with 115gsm probably the most common weight to be used. If longevity of the print is required, flags for external applications are perhaps the only application that at present are better produced through more conventional routes i.e. solvent print, dye-sublimation or screen-printed. However as ink and machine technology advances are made, in the future it may mean that they can then be equally satisfied through the UV route.

- ***Banners*** are another area where digital print fabrics are being used in the events or promotional sectors whether indoor or outdoor. Major sports events such as the Olympics, motor racing, football, skiing, swimming, yachting, running, are good examples. Other events such as air shows, music concerts, country and agricultural fairs, grand openings, motor shows (cars, trucks, motorbikes etc), beach events (volley ball, surfing etc), show the diversity of events that use digitally printed fabrics to the best effect.

- ***Retail*** is another important sector with promotional campaigns lasting anything from a day to a few weeks making it one of the most buoyant sectors. The appetite for fabrics in this sector is immense due to the massive product spread offered by today's retailers. Retailers demand new and exciting fabrics for forthcoming promotions and events that reflect the prestige, corporate image and the quality of their products. Examples can be seen in many retail shopping centers and malls and on the high street.
- ***Exhibition*** as already briefly mentioned above finds ever increasing usage of fabrics as designers and builders of exhibition stands / booths offer their Clients new and exciting designs incorporating fabric elements into their design. Visit any major trade show and examples can be seen, these fabrics have invariably been digitally printed. Either incorporated in to flat panels, sail sections or using the most advanced fabric patterning technologies make the possibilities endless.
- ***Specialty applications*** cover perhaps the most diverse opportunities from highly personalized luggage goods to stretch frame art reproduction, handbags to shower curtains, widow blinds to deck chairs, murals to upholstery to cushions and many, many other applications only limited by the imagination.

The choice of fabrics is enormous with woven and knitted fabrics able to fulfil all of the above applications. For all of these applications there are fabrics ranging in weight from voiles at 45gsm through to heavier and denser fabrics at 200gsm to 300gsm and up to 500gsm making the possibilities endless.

Types of fabrics

The print industry commonly uses two main categories of fabrics - woven and knitted – and these offer them great diversity and choice enabling a broad range of applications to be fulfilled. Knitted fabrics offered to digital printers are commonly manufactured from 100% polyester, from lightweight voiles at 45gsm up to display type fabrics in the of 205gsm to 245gsm range. The lighter weight fabrics can be fairly transparent and have very fluid drape and allow for semi-translucent images. Heavier fabrics in contrast permit stronger bolder colours and images to be printed to achieve the maximum visual impact. There are no hard and fast rules to govern how these fabrics should be used. Several different widths of fabrics with different pre-treatments enable them to be printed by most if not all-leading state of the art printing technologies.

Woven fabrics also provide great scope and opportunities to fulfil many applications and printers can choose from fabrics as light as 50gsm up to 500gsm. Canvases are particularly popular because of the diversity of different weights and aesthetics possible meaning that many different applications can be satisfied. Other woven fabrics that afford an engineered level of stretch mean that they can be used for sophisticated display solutions. A rich choice of different fabrics means that there is no limit to the possibility of applications that can be fulfilled.

Results of Brook Intl. – Agfa Graphics studies

In collaboration Brook International and Agfa Graphics completed a highly successful test programme to assess the suitability of Brook International fabrics on the Agfa :Anapurna XL and the :Anapurna M UV curable print engine. A selection of popular knitted and woven fabrics with end use applications such as soft signage, banners, flags and in-store displays graphics were chosen. The results that were achieved will exceed customer's expectations whose businesses and clients demand and rely upon high quality output.

- :Anapurna M -

The knitted fabrics included Brook FKPP - 115gsm Knitted Poly flag, Brook FKPP3 - 135gsm Knitted Poly Satin and Brook FKPP1 - 205gsm Textured Poly display fabric all of which produced excellent results. These fabrics are some of the most successful and widely used. In addition to these woven fabrics tested included Brook WCAN - 300gsm Digital Canvas FR and Brook WARTC - 500gsm Artists Canvas and these too produced outstanding results.

The colours of the prints achieved using the Agfa :Anapurna engines and inks were bright and vibrant and the inks showed good flexibility not often possible with UV technology from other machine manufacturers. Even the lightest knitted fabrics retained their handle and drape. Fine text and line detail is possible showing that even the most intricate designs can be printed and translated onto fabrics.

In the near future further tests will be performed using other fabrics, thus giving customers even greater choice and possibilities to fulfill their wide range of applications.

Conclusions

The appetite for fabrics in the print market is ever increasing and this trend will continue for the foreseeable future. The advances in machine technologies coupled with fabric manufacturing and finishing techniques mean that greater scope and potential will be possible. Some countries are more advanced than others in their use of fabrics for digital print for many of the applications detailed in this white paper.

As digital print technology becomes more widely recognised, the possibilities will develop at the same time. Test programmes will inevitably become more important as machine manufacturers and their resellers and distributors need to provide their customers with complete printing solutions. These solutions will inevitably include fabric-printing capabilities as greater demand is placed upon printing companies to give their customers the solutions they seek to fulfil their requirements. Completion of test programmes will prove fabrics and confirm their suitability for use on more sophisticated print machines.

The print results that one can obtain with UV curable inkjet technology clearly show that 1 + 1 can be a perfect 2 when combining state of the art UV curable printing technology with excellent quality fabrics. It is this combination that will inevitably identify new markets and satisfy more and more customers that will step into the high potential digital fabric printing market.