Digital Printing for Textiles

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Digital Printing in the paper market has been around for some time. Since 1998 there has been inroads into the textile market. However due to the way the printing textile industry has been organised the traditional market has been slow to take over the advantages of digital printing. There are good examples of sites successfully running short run production and industrial sampling in the textile world but many firms have not got past the ideas stage.

The textile industry is still at crossroads with more and more manufacturing being done elsewhere while the marketing and sampling remains closer to the market. This has meant that the traditional manufacturers are looking at a different economic market compared to before and with their heavy traditional investments they are extremely vulnerable. Flexible and very responsive to make a profit from using digital printing is a real requirement but the organisational changes are large. The problems of order in and order out the door with handling continuing repeat short run orders has not been fully addressed neither within Europe nor within North America. Stock is still a dominant factor for quick response.

Within a small and very tough organisation where hours worked are also flexible to handle peak loads the digital printing service organisations are profitable both for samples and for short run production. Some firms in Italy with high value cloth are getting orders on digital printing up to 1800 meters. I see fully made product lines made and sold directly to the public within the USA. In India I see up to one million units made to deliver quickly to Wal-Mart. So firms, which decide the ratio of price and quality level and market demands, are making good business today. However it is only a minor portion of what should be happening.

Pricing ratios are very interesting as the first meter is considerably more expensive than the succeeding meters. Pricing for samples can range up to 100 US$ per yard for a meter and 50 US$ per yard for 5 yards while production is frequently 30 US$ – 18 US$ per yard. I see wonderful silk fabrics selling as 40 meter pieces at 50 US$ per yard. This causes uproar within the traditional market as they would price samples from 40 US$ upwards. However this is without taking into consideration the real costs of handling the separations, making the cylinders and doing the samples on the production tables or the sample tables. Making samples either cuts into production time which is extremely expensive or the time to do the samples correctly, takes hours per design and per color way.

Some payback samples are contained in the following tables:

Payback for Rotary Sampling

Assumptions:		
Collection 40 designs for sale to the buyers		
5 design ideas have to be made to get one design chosen for the collection.		
Separation costs for 1 design with 10 colours is 3000 US$		
Rotary Screen costs: 4000 US$		
Samples to be made on sampling table: 50 US$ x 10 gives a cost of 500 US$ per sample		
Ideas sorted using digital printing prior to separating the 40 chosen ideas to make up into the collection. 7 US$ x 200 designs gives a cost of 1400 US$		
Separation of the successful designs: 120000 US$		
Screens for traditional production: 40 x 4000 US$ gives 160,000 US$		
Digital printing costs to sample ideas: 1400 US$		
Digital printing costs to sample the separated designs: 280 US$		
Comparison:		
Description	**Digital Costs**	**Traditional Costs**
Sampling ideas	1400	10000
Separation designs	120000	600000
Making screens	160000	800000
Making samples of designs (10 color ways)	2800	20000
Total:	**284200**	**1430000**

These figures ensure that there is no other way to avoid going overseas for production and industrial sampling unless digital printing is extensively used.

Payback for Digital Short Run Production

Short run production using digital printing is ideal where multiple samples are necessary to get the order and where speed to get the production done is of essence. Of course this does not mean producing necessarily 1000 meters per design and color way at the same time but instead it could be over 4 weeks, 4 orders of the same design each being between 50 – 400 meters.

Let's take the 7 US$ per digitally printed yard versus traditional production which people will prove is considerably less. Of course what is not said in traditional printing is that usually the costs of design and separation and cylinders are spread over 1000's of yards.

- If we assume therefore that the price of the design is the same for both digital and traditional printing.
- If we assume digital printing is used to sort ideas for both workflows.
- The design is separated only for traditional printing.
- The cylinders are only made for traditional printing.
- The price for traditional printing is estimated at 3 US$ per yard as to set the printing table wastes cloth especially for the first run.
- The costs of the cloth, the pre-preparation and finishing is assumed to be the same giving a cost of 2 US$

Description	Digital Costs	Traditional Costs
Sorting ideas		
200 designs ideas	1400	1400
Sampling	2800	20000
Separation		12000
Cylinders		160000
Printing 100 meters to order	700	300
Totals:	**4900**	**301700**

With these extremely positive figures there has to be other very clear reasons why the textile industry has not jumped into digital printing.

Key Reasons for a Slow Changeover:

- The way the business is currently organised – highly labour intensive
- Accustomed to a very deliberate workflow, which is engrained over many years.
- The machines are considered still to be 'toys ' as there are no big machines really running at speeds of 100 sq yards/hour versus 2000 sq yards/hour on traditional rotary printing tables.
- Multiple slower machines will require a different organisation with different software programs needing to be learned to handle the different type of workload.
- Cloth uses a large amount of dye compared to paper so the costs of dyes need to be different compared to ink costs.
- Color is expected to match and not just to look good.
- Color is expected to be reproducible continuously and across different substrates. Color is expected to be similar in sampling and in production.
- Color is not based on C,Y,M,K
- People are accustomed to make their recipes by choosing from 10 – 11 base colours for traditional printing.

Arguments Why It Is Possible to Introduce Digital Printing Successfully Despite the Above Points:

- People can be retrained or new businesses started in parallel with the traditional printing mills.
- There are already very good examples within the market who are showing the way.
- Computer programs are available for flexible manufacturing.

- Consulting is available for setting up the new workflows.

- Dye costs are coming down as the quantity of the dye per machine reaches close to 1 ton per year with newer machines coming into the market.

The Real Problem is the Handling of Colour

Getting the colour right first time is possible from very few suppliers and as this is software based the buyers are not aware of this crucial point until they have burnt their fingers. Some people have learned this is a necessity but many have not. It is ignorance, which needs to be overcome, and expectation levels need to rise. It is an expert field and not something, which can be bought for a pittance.

Color appearance also requires software, which selects the right pattern so that the resulting appearance camouflages the dots. The viewer does not want a dotty or striping image independent of the number of dyes available within the digital printer.

Workflow from Design to Digital Printing Today:

- Design made on many different graphical programs

- Common format for transfer of data in the textile industry is LAB TIFF

- Depending on the separation technique used the file has to be adjusted for the printing technique when transferred from one system to the other system.

- People are using color books and manually choosing colors. This works for flat colors and when using continuously the same substrate.

However many designs are scanned designs or photos in 4 bit file format and 16 bit format with mixed colour effects and fine halftones or other shading effects. These are the designs which are failing when doing digital printing. It also limits many traditional mills, which cannot handle the more complicated printing techniques.

Successful Colour Workflow for Designs in Digital Printing:

A color profile per coloured monitor, per substrate, per dye type set, per printer type and per resolution option needs to be developed. This is made and stored to be used to transform the design so that it will print similar to its appearance viewed on the colored monitor.

This part of the process must use comprehensive software, which works within the framework of scientific color theory and which enables the transformation of the design image into a realistic 'print image'.

A major requirement is to be able to work within a calibrated environment from the scanning of the design to the viewing on a calibrated colour monitor to the printing out using calibrated color profiles for the digital printers.

Another major requirement is not to think of color as a set of recipe data such as C,Y,M,K but as a colour that is a set of spectral values. These spectral values are transformed to make the recipe to view the color on the colored monitor; these spectral values are transformed into different recipes for printing on to the substrate. Again the colors are transformed into different recipes when there are different dyes different substrates and different printers.

As well as the color profile for a printer there are also the machine characteristics, which includes the pattern of dither dots, the resolution, the variable dot possibilities, the options to montage and print areas of the design and the number of passes. The last is a very useful way to cover misfired nozzles and depending on the type of design and fabric there needs to be more or less number of passes.

It is possible to do digital printing today with the correct choice of software and the desire to spend money on intensive training to introduce in the correct workflows to avoid multiple errors.

Summary

The textile industry works to some very demanding levels concerning color matching.

The economics are positive so that with the right business plan and people trained to cope, firms may be very profitable. However today this is not mainstream and people are slow to change and take advantage of these types of opportunities. It could be that the new manufacturers using digital printing will not be the traditional printing mills.

The workflow needs to be learned, as it is different to the traditional printing work process. In digital printing wrongly printed cloth gives immediate loss. The expectation must be ' Get it right first time!'

To get it right first time everything must be preset and used as a reference library including color profiling and it is essential to work within a known calibrated environment at least from the colored print image to the printing on to the cloth.

Digital Printing is possible today. It is very successful so long as people buy software that really works, do the necessary learning, spend money on effective implementation and continue to learn. It is not a process which once learnt is static. It is an ongoing process. Fundamental to this process is the implementation of good quality control practises.

Biography

Ann Noonan is the CEO of Sophis Systems. She was born in New Zealand but moved to Europe in 1976. As a person she is addicted to fast moving technologies but she is also very determined that technologies will be packaged for the users so that it is much easier to implement new skills into customer sites while ensuring users may continue to maximise their skills while meeting tough deadlines.