Digital Color Printing Beyond Paper

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Abstract

A number of non-traditional applications in digital printing have been presented at NIP 18. The poster session from Folex intends to show applications on non-traditional substrates, namely plastic films, which offer certain features to facilitate special applications.

Introduction

Digital Printing on plastic substrates such as Polyester, Polyethylene, Polypropylene or Vinyl is a market segment for speciallity applications, which is becoming increasingly important in short run printing for displays, point of sales informations, multimedia, trial marketing and personalised promotions.

The Peculiarities of Plastics

Plastic films, unlike most papers, need special treatment, so the non-porous and mostly inert surface will accept inks and toners and can keep them with good bonding over the whole periode of their use.

This treatment is mainly accomplished with selected coatings, which provide a bridgeing layer between the chemistry of the colorants and the plastic substrate. Without interfering with the inherent properties of the plastic carrier this interlinking layer may be altering surface tension, will provide bondage to resins, dyes or pigments, which make up the marking materials and in some cases may even emphasize light scattering, a desirable effect for backlit displays.

Chemical nature, composition with various additives as well as thickness and drying conditions of the coating layer are the major factors, which are determining the functionallity of the final product.

In addition back-coatings may add further desireable properties, such as anti-stat, lay flat, reflective, adhesive or cling functions. Tip sheeted paper or removable opaque stripes at various locations on the reverse side of transparent films are sometimes mandatory to activate machine-sensors and/or for smooth runs through equipment.

Obviously the design of plastic substrates for digital color printing is both technology- and application-driven and requires custom tailored coatings and attachments for excellence. Any so called “universal” substrate constitutes a compromise in performance one way or the other.

It makes sense, to break down the term “Digital Color Printing” into distinctive categories based on throughput and technology:

Commercial Digital Color Presses (HP/Indigo, Xeikon, Nexpress, Xerox)
Desk-Top (A4/A3) Color Laser Printer
Large Format Inkjet Imaging
Small Format Inkjet

Digital Color Presses

Total installations	~ 16.000 units
HP/Indigo	> 2.200
Xeikon	> 2.200
Nexpress 2100	170
Xerox (Docucolor)	> 11.000

Although the Xerox Docucolor 40 and 2000 series are mainly placed in copy-shops and inplant printing departments and thus do not directly compete with the commercial digital presses, it must be noted, that digital color capacity has grown at an awsome 48% from 1997 to 2001.

The slowing economy led to an overcapacity and quite a number of digital printers now have to look for additional clients and new applications. Specialising in unconventional substrates may be the answer for some.

There is no magic behind a well-performing plastic film in a digital press - on the part of the manufacturer however, there should be serious product development, thorough testing and an evaluation process by independent certification institutes such as RIT, Digital Academy and PIRA.

Some equipment specifics are good to know, for instance, that HP/Indigo uses liquid “ElectroInk”, which comes embedded in Isopar, a hydrocarbon solvent with a tendency of swelling and diluting film coatings if not properly designed for this purpose.

It’s also worthwile to know, that Xeikon presses are fixing their dry microtoner in a non-contact procedure with infrared rays, avoiding the need for silicone oil and that Nexpress has a bunch of sensors incorporated in their 2100 model, which give transparent films a hard time to pass.

Color Laser Printer

Dropping unit-prices and the convenience of speed led to a surge of new CLP placements. This in turn has beefed up efforts for further improvements regarding speed and consumables. The original 4-pass technology is giving way to a tandem or single pass process and toners are changing their nature and composition from grinded down bricks toward “chemically engineered” micro-

particles with a constantly narrowing size distribution and incorporated features like hot melting wax to substitute the unbeloved silicone, lubricating the old fixing rollers.

All these changes must be reflected in the design of new plastic substrates. In addition elevated fixing temperatures and sometimes a prolonged printing path in a hot printer put high demands on flatness, toner bonding- and adhesive coatings of films.

Large Format Inkjet

A great way for imaging large pictures and posters. Expanding applications like banners, signage, posters etc. made physically durable substrates a necessity indoors and even more so for outdoor use. Synthetic materials must have similar properties as their paper counterparts in terms of ink-take, color gammut, non-fading characteristics and surpass any paper in durability, dimensional stability, weather resistancy, gloss and either whiteness or transparency. Backlit applications even demand tightly controlled translucency values and special pigmentation on top of everything else.

Commonly termed “fleet graphics” demand strechable substrates bending along curved outlines and edges. Soft PVC, also called Vinyl, may be used to decorate cars, trucks, trains and other vehicles with photorealistic images printed in inkjet and with pigment inks to survive the onslaught of sunlight, ozone and heavy rain.

Small Format Inkjet

One is always surprised about the abundance of creative products for the home market. Beyond the conventional paper there are a multitude of products, which are supposed to be fun-related, such as Artist Canvas to reproduce paintings, Transfer material for textiles and toys, Tatoo Films for temporary body decoration, Magnetic Films for signs and tags, Scratch-proof plastic for mouse pads etc. to mention just a few examples of a range, widening with each day.