ISSUE 4
2010

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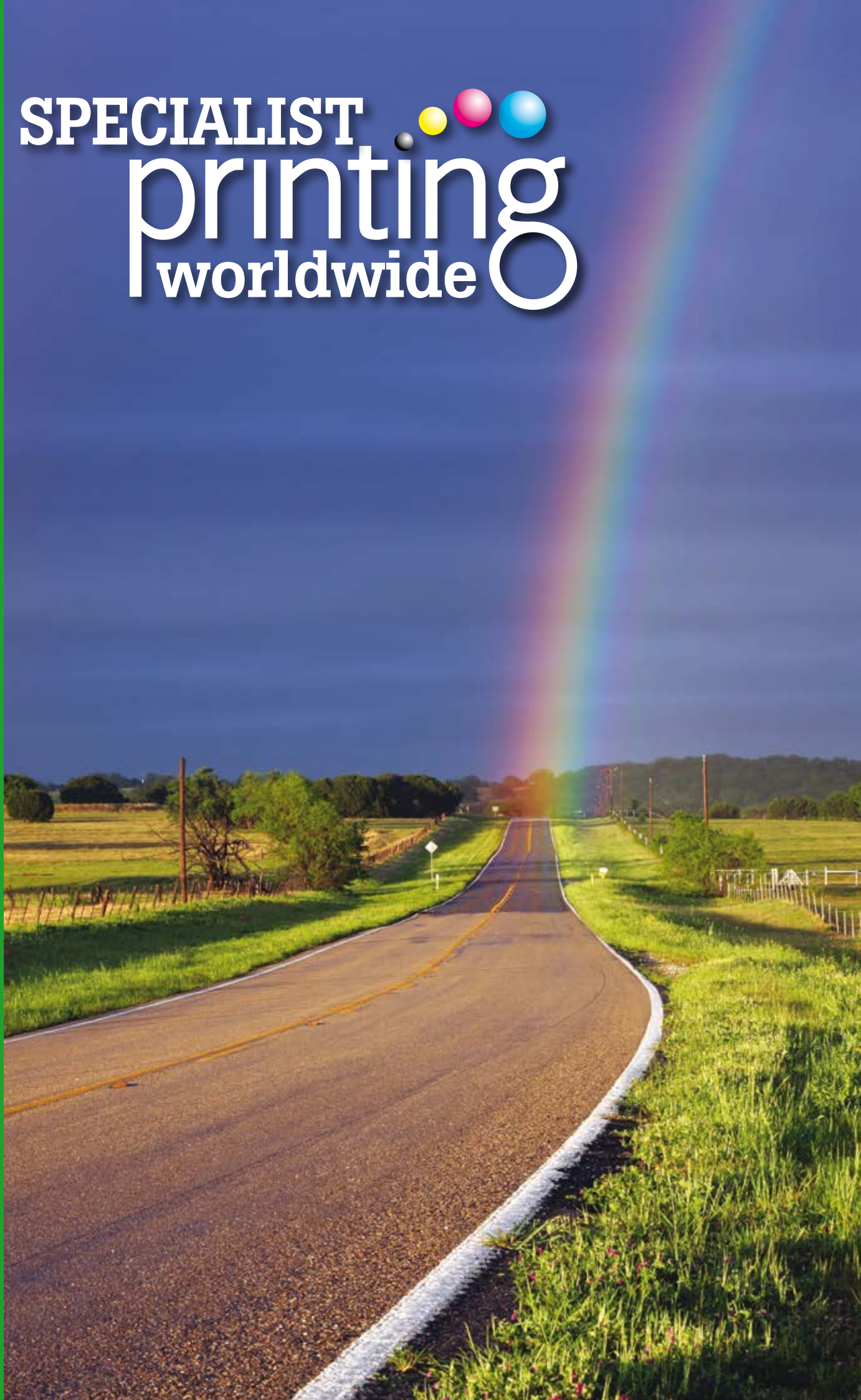

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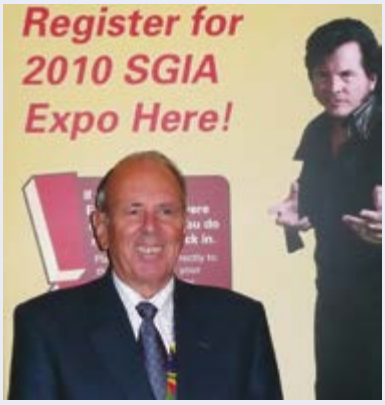

As I welcome you to our latest issue, a challenging 2010 draws to a close and a new year full of opportunities approaches.

If the comments I received from manufacturers and printers at the successful SGIA '10 show are a reliable indication, there is a definite improvement in the North American economic scenario. Most companies were talking of increasing volumes and a bubbling of the capital equipment market. With positive vibes also coming from recent events in Europe, we have to hope that this, combined with strong Asian markets, will lead a general improvement across all segments of the market.

I am pleased to announce that the global reach of Specialist Printing Worldwide will be extended in 2011 with the launch of a new annual Chinese language edition of the magazine, sponsored by the CSPIA. Alongside the four English-language issues in 2011, this launch further emphasises our commitment to present highly valuable technical information to printing professionals in every region of the world.

If you would like to receive copies of this magazine in 2011, please don't forget to order your subscription at www.specialistprinting.com/sub_form.htm for a total of only €55, $80 or £45.

Another of our sponsors, ESMA, shares our goal of spreading good technical advice and will stage their Advanced Functional Printing and Membrane Switch Symposium events in Düsseldorf in March. With a lot of interest anticipated, I recommend early reservations and you can take advantage of their 'early bird' discounts; see pages 30-31.

In the meantime, I wish you all compliments of the coming festive season.

Bryan Collings, Publishing Director,
Specialist Printing Worldwide

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VARIATIONS ON AN ORIGINAL THEME

Sophie Matthews-Paul

Now that I've settled in as Editorial Consultant with *Specialist Printing Worldwide*, it's time for me to raise my head above the parapet and comment on what I see going on around me in our sector of the industry. On a regular basis I can be found travelling to manufacturers, distributors and end users of equipment, software, inks and materials and it is the combination of these people which is responsible for shaping real and potential production opportunities.

Reflecting on activities throughout the specialist and digital printing arenas during the year, it is pretty clear overall that this has been a period where development has remained largely on a plateau. I am often recorded as saying that, where heuristic principles are combined with improvements and advances in existing techniques, technology sometimes needs to pause for a while to allow manufacturers and machine users time to catch up.

There is always the temptation for developers to move too swiftly away from the practical, everyday aspects of the equipment we use. As R&D is the root of their activities, they can be forgiven for trying to assess what the market needs next and work towards these goals. But, whilst innovation is what everyone needs to drive their production forward into new markets, the machines in daily operation still need to earn their bread and butter in their production environments.

As a result, it is hardly surprising that we are seeing extensions to existing technologies now take centre stage, with modifications reflecting what is perceived to be market demand. Thus, with platforms and ink formulations becoming widely accepted throughout different areas of ink-jet production so manufacturers are adapting what they do best to bring diversification integrated with existing key elements.

Today there is an interesting juggling act which combines existing experience and knowledge with the potential for new products, be they ink formulations, materials or printing machines. If we are now in the position where we are happy to accept production practices using existing technologies and components, the flip-side of the coin is that we can be in danger of sliding into complacency. The key throughout lies with application potential, and providing variations on an original theme.

In terms of truly new products, currently they are fairly thin on the ground and, as an industry, we are becoming accustomed to those little surprises which show machine development has moved up to the next step. What we have are extensions to existing capabilities with a few notable additions and many of these are in ink. Now established, HP's latex printing technologies were considered pretty revolutionary at launch time and, since then, we have seen the introduction of metallic low solvent-based formulations by Roland and, subsequently, Mimaki, plus examples such as heat cured resin inks now coming to fore on piezo-electric printers like the Elements family.

In digital ink-jet printing, the industry has moved very quickly in a remarkably short period of time to become a mainstream process which has been accepted across the board. Everyone, from the home and office user, through to the screen-printing, litho and flexo sectors, has become accustomed to its flexibility and, in the commercial arena, short-run just-in-time production has become the de facto standard for many print service providers.

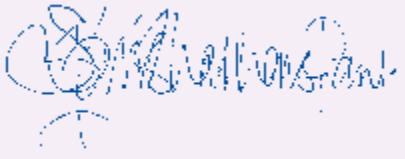
The versatility of digital ink-jet has, of course, played a major role in blurring the edges of each individual market sector. Because it is based on computerised technology, generation of jobs is more dependent upon the skills of an IT literate operator than on those of a trained press minder. The removal of boundaries between industry areas now means that a sign-maker with a relatively low-end colour printer can produce signs and labels as well as his traditional production offerings. Similarly, a screen-printer or digital bureau might invest in a superwide-format machine which serves a dual purpose in producing, say, three-up rolls of material for display jobs but is well suited to the output of scaffold and building wraps.

At the other end of the scale, there are several manufacturers confirming my own thoughts that wide-format is getting narrower. It is no surprise to see industrial single-pass machines for specific markets such as ceramics and labels, but these are joined by relatively inexpensive options such as the UV-curable Mimaki UJF-3042, which at A3 (420 x 297 mm) definitely comes under the desktop banner, and narrower combined print-and-cut options.

Visiting this year's trade shows also confirmed an increase in print-to-cut workflow opportunities with most major printer manufacturers now offering contour cutting, including step-and-repeat, nesting and, even, creasing. Take this one step further and look at packaging, and it's not difficult to comprehend the opportunities presenting themselves in the low volume and prototyping markets.

This apparent cornucopia of production options surely must mean there is plenty of work to keep the digital industry busy for decades to come. But, in truth, with so many run-of-the-mill jobs being driven by the lowest prices, those more than likely to reap the benefits of an equipment purchase are the people not restricting themselves to one particular sector when they decide to invest in a wide-format digital printer. Machine manufacturers are very quick to explain the versatility that such a purchase will bring but, for many, the accompanying flexibility needs to be handled sensibly for no printing company can truly be all things to all men.

During 2010 there has been greater emphasis on application strengths than in previous years. The introductions we've seen in the past twelve months tend to consolidate the fact that no two printing specialists need to be the same and, for those in the wide-format space, there is acknowledgment that efficient workflow is growing in importance. As a result, print service providers are starting to move into niche application areas, and savvy end customers are also helping to push the boundaries to what can be achieved using today's technologies.



Sophie Matthews-Paul

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The management team at 3A Composites in front of the new company logo. From the left are Michael Stanek, Alexandre Domingues, Ashwin Shanbhag, Pierre Monéton, Georg Reif, Joachim Werner, Rainer Sernatinger, Brendan Cooper, Steve Henning, Robert Sala and Tarek Haddad.

3A Composites introduces distinctive visual identity

Following the introduction of its new name a few months ago, specialist supplier 3A Composites has launched a comprehensive new corporate identity, including a dynamic logo and a visual identity concept.

3A Composites was previously known in the markets as Alusuisse Composites and, since 2001, as Alcan Composites. The company became a member of the Swiss Schweiter Technologies group in 2009. The 3A Composites portfolio includes brands such as Airex, Alucobond, Fome-Cor, Forex, Kapa and Sintra.

"The name 3A Composites stands for Advanced teams, Advanced material combinations and Advanced solutions for customers," explains CEO Georg Reif at the corporate identity launch. "The combination of people and talents within 3A Composites not only multiplies the strengths of our multi-cultural team, but also enhances the personal development and performance of each team member." Because of the close co-operation and the systematic utilisation of synergies within the company, customers can benefit from the shared global experience and technological experience of 3A Composites. Meeting current and anticipating future market needs is its primary goal and the company states that, as a leader in multilayer composite materials, it is committed to providing customers worldwide with the broadest range of segment-specific solutions and services through the most effective channels. ■

Colex wins SGIA Product of the Year Award

The Fotoba Dreamcut 1.7m automatic cutter

Colex, the exclusive distributor in North America of Fotoba cutters, introduced what it claims is the world's only 1.7m (67 inch) automatic cutter to SGIA. This system subsequently won SGIA's Product of the Year award in the Finishing Equipment category. The new Fotoba Dreamcut XLD-170 is designed for cutting and trimming flexible ink-jet and photo media.

The Dreamcut XLD-170 has the versatility and speed to eliminate users' bottlenecks in their finishing departments. It cuts and trims roll-and-sheet media up to 1.7m wide and 35 mil thick, reducing labour costs and increasing productivity.

With its automatic feed alignment Dreamcut users have no worry about feed misalignment as the cutter produces square-finished images even if the printer fails to print parallel to the media edge, or if the printer fails to wind up the rolls squarely. ■

Sun Innovations starts aqueous-based ink production in Russia

After successful testing, Sun Innovations Company has started production of two new products. The first is an aqueous-based ink for office ink-jet printers whilst the second is a specialist formulation based on natural gold and silver. Aqueous-based SunFlower ink is used for printing on regular office and photocopy paper, plus stocks with special coatings. Although there are popular brands imported into Russia, Sun has now decided to start its own production of ink for the domestic market. The recipe of the ink is free from any polymers and includes high-quality raw materials made in Europe by BASF, Bayer and Air Products. Sun states that this type of ink is ecologically safe and non-toxic, and it is inflammable. In addition, Sun Innovations has started producing a special ink based on precious metal (silver and gold) nano-parts, designed for the printing of decorative elements. The layer of the natural precious metals is very thin and the ink flow rate is low resulting in the end price of a print not being very high. The company believes it is the only manufacturer involved in this technology. ■

MACtac awarded the Viscom prize for its sustainable development policy

MACtac's award for sustainable development

MACtac Europe has won the prize for sustainable development awarded by Viscom-Signal'Etiq' France. The trophy was presented to the company during the Viscom Paris in September. MACtac says that the jury appreciated the new environmentally friendly IMAGin and Greenscreen media for digital and screen-printing as well as the 'green' packaging made of homogenous materials and easy to re-use or recycle in compliance with the 94/62/EG European Directive. The company says that the prize also rewards its efforts to reduce the energy consumption at its Belgian plant which, during the past five years, has been reduced by 14% while the use of gas has been reduced by 25% and water by 39%. ■

Specialist textile solutions from Dow Corning go on show

At October's Intertextile Shanghai Apparel Fabrics, Dow Corning Corporation chose to highlight its specialist solutions for the textile industry, including its brand Silicone Textile Printing Inks, Deflexion impact-protection technology and Easy Style 5-7288 Emulsion System.

Brand Silicone Textile Printing Inks are durable, colourfast and suitable even for tough-to-print, high-performance sports apparel. Dow Corning's patent pending Deflexion impact-protection technology is based on silicone technology, and engineered for protective equipment and apparel in a flexible, breathable form. Unlike traditional soft armor protection, these products are stated to achieve high levels of protection, while remaining comfortable and stylish.

The company's Easy Style 5-7288 Emulsion System, which makes fine and casual garments feel richer, adds a paper-like touch and helps fabrics resist wrinkles.

Offering a comprehensive selection of proven silicone-based performance enhancers and process aids for textiles, Dow Corning claims it is breaking new ground in the realm of eco-innovation. In addition to materials, the company provides supportive services and solutions tailored to the specific business and sustainability needs of the global textiles industry. ■

First F1612 flatbed cutters sold

Manufacturer and distributor of graphic imaging products Summa has shipped its first F1612s. These flat-bed cutters represent the company's first in a new product line designated the Summa F Series which was launched at FESPA, Munich during the summer.

Claiming to be versatile, user-friendly quality machines, Summa's F Series is said to be the result of years of extensive research. The first cutters have been shipped to the Netherlands, Germany, Italy and the USA.

The F Series of flat-bed units joins the company's existing product line of cutting plotters and wide-format thermal transfer printers. Summa's European head-quarters is located in Gistel, Belgium. ■

Summa has entered the flat-bed cutter arena with its F Series machines

Ruco's inks are designed for specialist plastics' decoration

Ruco puts its ink expertise on show

Ruco Druckfarben reports that this year's participation at K 2010 was a positive follow-on from the company's debut at K 2007. The specialist plastics' decoration company focuses on a range of inks designed for use in food packaging, the cosmetics and beverage industries, rotary pad printing, plus UV-curable flexo formulations.

Low migration products include Ruco's series 080UV/MA which has been developed for dry offset printing onto food containers made from polypropylene and polystyrene, such as yoghurt pots. ITX-free, these inks comply with Nestlé standards and offer excellent adhesion and wear resistance, even at high print speeds. They fulfil the regulations set by the Swiss Consumer Goods Ordinance.

The company's 945UV/MA inks cater for screen-printing onto PET hollow-ware for the cosmetics and beverage industries, as well as for the delicate field of baby bottle decoration. Their low migration and strong adhesion are complemented by high opacity and excellent flow characteristics.

Series 965UV/MA low viscosity barium free inks also come with a low migration formula, with good solvent and water resistance. Designed for rotary screen-printing onto plastic films, they have high reactivity, good curing and adhesion characteristics at high machine speeds.

Specialist products also include a range of pad printing inks for plastics' decoration which offers fast curing, good mechanical and chemical resistance, being lightfast, weather resistant and highly opaque. Finally, for flexographic printing onto flexible packaging, Ruco's series UVFX environmentally friendly inks have low viscosity, high colour strength and brilliance amongst their features, and also achieve excellent results in combination printing. ■

Integration of WP Digital into Polytype sees change in management

WP Digital has merged with Polytype AG and is now managed as a business unit of Wifag-Polytype Holding. WP Digital's current facilities in Wittenbach, Switzerland, will be dissolved and all business activities relocated to Polytype's Fribourg site with the aim of establishing a competence centre for digital printing in Fribourg. This move is based upon Wifag-Polytype's recognition of the potential of digital printing in its traditional product and market segments which cover packaging print, coating and converting.

The outgoing CEO of WP Digital, Kaspar Widmer, restructured the company, implemented important technical developments and established a new business unit for digital glass printing. At the start of 2010, he suggested a merger with the parent company due to the high synergy potential, and was instructed to implement it.

The management of the newly established Polytype business unit, Virtu, is headed up by Frederic Pavesi. He was previously business development manager for digital applications at Polytype AG and oversaw the WP Digital integration project.

The Polytype Group has four product lines in the area of packaging printing machines and coating/converting systems. It produces machines for the printing of plastic cups, plastic tubes, overall systems for the production and decoration of aluminium tubes, cans and bottles as well as coating machines for flexible packaging and special applications.

WP Digital's existing products will continue to be marketed and further developed under the Virtu brand as an independent business unit. The previous contacts in sales and service will remain. ■

Special effects fan from Marabu is a useful tool

Special effect inks are subdivided into ten categories for easy reference

Marabu's special effect fan

Marabu is now offering a collection of special effect samples in the form of a fan. Presented for the first time at FESPA Munich, the fan attracted much attention from screen-printers interested in new finishes.

Visual impressions and tactile sensations can evoke a subconscious emotional response, making them extremely useful in sales and marketing. Additionally, special effects can also convey important information, for example, improving product safety in the pharmaceutical and food sectors. Screen and pad printing, with their ability to transfer particles of any size to the substrate, are ideal for creating special effects with Marabu inks.

Two screen-printing specialists – Gerhard Russ, chief executive of Graffiti Siebdruck and Marabu's Pascal Iffland – joined forces to create the fan. It provides print samples of special-effect inks for industrial and graphical screen-printers. Russ says he was already using the fan as a highly effective sales tool while it was still in the production phase. It helped him secure a major screen-printing job from a well-known advertising agency, he recalls.

With a flick of the thumb, this fan shows customers all the many possibilities that Marabu Screen and Pad Printing Inks have to offer, along with information such as printing parameters, delivery times, and price level. By enabling customers to experience the special effects first-hand, the fan can stimulate a host of new ideas and also provides relevant technical details at a glance.

With all relevant information available at a glance, the fan has a short introduction, followed by a legend explaining the symbols employed. The effects are subdivided into ten categories of metallic, mirror, glitter, pearlescent, luminescent, thermochromatic, matt, varnish, writeable and scented. The sub-categories show exemplary variations on these themes. ■

This CAT is **cool.**

Gerber CAT UV inks offer superior adhesion and scratch resistance. When combined with Gerber's patent pending Cold Fire Cure technology, print on the widest array of substrates in the industry, including recycled and heat sensitive materials. Best of all, with the new Gerber CAT UV, enjoy prints at a higher resolution for sharper, more vibrant output.

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GERBER SCIENTIFIC PRODUCTS

EFI scores a swift century with its VUTEk GS Series

EFI has celebrated the sale of its 100th VUTEk GS Series grand format printer. The company has scored a swift century with Leeds-based Quarmby Colour's decision to purchase a GS3200, 3.2m UV-curable flatbed and roll-to-roll hybrid solution. This enterprising company, which already owns two VUTEk QS2000 machines, opted for eight colours plus white ink to extend its existing production capabilities and grow its position as a leading UK display producer.

A family owned and run business that was formed back in 1994, Quarmby Colour produces an extremely diverse portfolio of display applications, ranging from outdoor and indoor retail and event advertising, point-of-sale, exhibition graphics and wallpapers. Additionally, the company specialises in the creation of bespoke sets and backdrops for film and television, all of which are printed digitally using only its VUTEk grand format printers.

As the first wide-format print specialist to install two VUTEk QS2000 UV-curable printers, Quarmby Colour's decision to invest in the GS3200 was based on the system's high quality, fast throughput and quick and easy change-over when different types of jobs are being produced. The company admits to looking at alternative options, but quickly realised that the EFI VUTEk combination of high standards of output, excellent ink adhesion, versatility and reliability couldn't be bettered.

Since EFI launched its VUTEk GS3200 printers last year, the adoption by display producers wanting exacting levels of efficiency, plus high throughput rates across all types of rigid substrates and roll-fed materials, has exceeded expectations. With maximum speeds of 233 square m/hour and photorealistic quality at a true resolution of 1000 dpi, these 3.2m machines are now used world-wide by businesses wanting a fast return on investment whilst benefiting from greater productivity and time efficiencies on all run lengths, from one-offs to multiple prints.

"We were looking for reliability, versatility, high-quality and high-speed in our search for our first 3 meter printer, said Damian Quarmby, director of Quarmby Colour. "It also was vital for us to have a solution where changing from flatbed to roll-fed and back again was quick and easy, enabling us to move from one job to the next swiftly and smoothly. The GS3200 was the logical choice in terms of capability, quality and productivity. We expect to meet our customers' demands for wider-format capabilities to produce television and movie backdrops, for example."

The VUTEk GS Series is also making its mark with users and end customers seeking greener solutions in their printed output. By removing non-environmentally friendly elements from the overall production process, display specialists can offer direct-to-substrate solutions which don't need additional laminating or adhesives. Its UV-curable eight-colour ink-set plus white are formulated to optimise both quality and durability, and are VOC free. The configuration can be switched to VUTEk's Fast-4 mode when four-colour print is required at even higher throughput rates.

"The swift adoption by print service providers world-wide endorses the powerful capabilities of our top-of-the-line VUTEk GS Series printers, helping companies make the move from analogue to time saving and energy efficient digital production," states Frank Mallozzi, senior vice president of sales and marketing, EFI. "I'm thrilled, but not surprised, that we have achieved our 100th sale of the GS Series so quickly. In combination with our EFI Fiery XF RIP solution and our own UV-curable seventh generation inks, these innovative machines are helping users to grow their businesses with guaranteed colour-accurate, durable and vibrant results across all types of media." ■

International Coatings launches black light effect ink

International Coatings Company has introduced a new special effects ink, 3826 Astro Clear direct print ink which is nearly invisible ink under normal lighting conditions, but illuminates when exposed to UV black light.

"Black light effects today are as popular as ever," states Steve Kahane, President of International Coatings. "A lot of fashion prints incorporate black light designs to showcase hidden elements or messages within their designs. In addition, many restaurants, clubs, amusement parks, and private parties often use black light to enhance ambiance, so using Astro Clear in garment designs adds an unexpected or surprise element."

3826 Astro Clear can be used as a decorative tool as well as to highlight certain portions or hidden aspects of a printed design. Letters or designs can be outlined or highlighted, or 'hidden' motifs can be incorporated that only become visible under a black light. The ink can be printed directly on 100% cotton and cotton/polyester fabrics. The resulting print has a very soft hand and can be used to overprint other colours where black light illumination is desired. ■

HartBoard production is now "earth friendly"

25 successful years for specialist foam board producer

Founded in the mid-eighties, Pennsylvania foam board producer Hartman Plastics is celebrating its 25th anniversary during which time the company has concentrated exclusively on manufacturing an extensive product range under its HartBoard name.

The product line includes standard white, clay-coated foam boards for mounting, printing, signs and picture framing whilst HartLite a conservation board, used for applications in direct contact with valuable artwork and articles, with heat activated and pressure-sensitive adhesives. The availability of colours is complemented by a range of standard and custom sizes.

The company also produces a tri-fold presentation board for displays, mounting and printing, and all products have excellent foam memory characteristics. The centre is resilient and provides a clean open edge when cut manually, using a sharp knife, via rotary slitter or with a die cutter.

Hartman also extrudes polystyrene for outside sales, as well as for the production of their boards. As rules regarding VOCs become more stringent, the company has restructured its processes to be "earth friendly" with new working methods designed not to emit harmful pollutants into the atmosphere. ■

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YES WE CAN

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Agfa builds in the future with its Jeti Titan

Agfa's new modular Titan is designed to be future proof

A future-proof wide-format print solution has been added to Agfa Graphics's portfolio of UV-curable ink-jet engines, which enables display producers to balance their investments, inline with business growth. The Jeti 3020 Titan is a high production flat-bed machine, designed and constructed using a modular format so that, as users' demands increase, the printer's colour and speed capabilities can be extended.

The Agfa Graphics Jeti 3020 Titan's entry-level version incorporates 16 robust Ricoh Gen 4 greyscale print-heads resulting in fast, high quality CMYK output at a native resolution of 600 dpi, able to deliver 1200 dpi for photorealistic image quality. The machine has a maximum print area of 3 x 2m prints up to an impressive 113 square m/hour (1,216 square feet/hour).

The Titan can be extended to incorporate more colours and higher speeds. The modular concept and new electronics' platform simplifies upgrades to ensure that the machine is future-proof, guaranteeing a healthy ROI for investors who can add options, in keeping with their business strategy, to broaden their output capabilities and enter new markets.

The Jeti 3020 Titan can be configured from a minimum of 16, up to a maximum of 48 greyscale heads, according to individual requirements, with a maximum print speed of 226 square m/hour (2,432 square feet/hour). The standard CMYK configuration can be extended with double the initial print-head arrangement for high-speed throughput, along with other colour options.

Additional versatile ink choices for the Jeti 3020 Titan enable the incorporation of light cyan and light magenta for better image rendering, double white, white and clear varnish to add an artistic touch, or orange and green to extend the colour gamut. As a consequence both the speed and the colour selections define the number of heads in the system offering optimum throughput and image quality; these enhancements can be added when required.

Designed as a completely new concept in wide-format printers from the ground up, the Titan's rugged flat bed architecture and solid vacuum table work effortlessly with flexible and rigid materials up to 5cm in thickness. Its robust steel frame platform, with Agfa Graphics's advanced linear motion technology, feature state-of-the-art digital encoders for precision dot placement to the finest quality even at the fastest throughput speeds. This industrial design, integral to the high standards of the Jeti 3020 Titan, is vital for maintaining consistently precise results, essential for creating accurate graphics and fine text down to 8 picolitre drop sizes. Even in its initial, four-colour output configuration, the printer performs flawlessly on photographic and solid colours, with no banding, and crisp, clear text output in sizes as small as 4pt.

Agfa has also incorporated a new electronics' platform, which not only makes processor upgrades simple to carry out but also provides online interactive diagnostics and monitoring.

As well as speed and quality, Agfa Graphics has ensured that the highest safety standards have been built into the Jeti 3020 Titan. The enhanced UV light screening, automatic head height adjustment and an optional laser media height detection system, minimise operator intervention and improve the user's working environment.

The Jeti 3020 Titan is designed to output borderless prints across 2 x 3m dimensions. Multiple boards can be printed simultaneously, with retractable register pins. The operator can position rigid materials accurately and consistently on all run lengths. ■

Gerber takes its latest display products to Milan

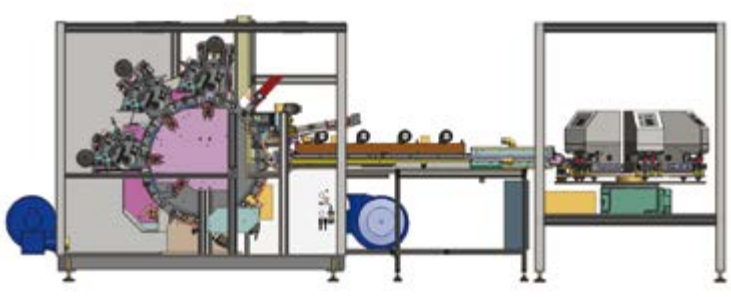
Gerber Scientific Products used Viscom Milan as a platform for demonstrating its latest wide-format UV-curable ink-jet and thermal transfer printers. The GerberCAT UV now prints at a higher resolution whilst the Gerber Edge FX continues to impress with its versatility and durability.

The GerberCAT UV uses cationic UV-curable ink and can produce sharper and more vibrant output, with precision accuracy and registration which supports double-strike and two-sided output. These inks are claimed to provide superior adhesion and scratch resistance and, complemented by the company's Cold Fire Cure technology, support printing onto a wide array of substrates, including heat sensitive and recycled materials.

The time-proven Gerber Edge uses thermal transfer technology for durable output, and still proves to be an easy-to-use solution for sign-makers and display producers who want to produce customised short-run graphics. ■

Tampoprint shows off its tampon printing expertise

At K 2010 in Düsseldorf, Tampoprint demonstrated tampon printing specialities which included its Rotary Flow, Hermetic 13-12 Universal, the Top Spin LC and Speed Modul with complementary Speed 40-2. The first of these products is a high performance rotary tampon printing machine for use on the circumference of disposable syringes, and boasts output speeds of up to 800 parts per minute. The Rotary Flow is targeted at medical technology and automotive industries. The Hermetic 13-12 Universal has a variable tampon stroke, integrated ink residue pick-up system and electromechanical drive. This printing machine is suitable for precision applications with a maximum image size of 125mm. Finally, Tampoprint's Top Spin LC handles circular and top printing in a single operating process, reaching production speeds of 15,000 parts per hour with the ability to print 360 degrees without distortion. The Speed Modul has two ink/doctoring cups which enable flexibility during automated production. Combined with the Speed 40-2 transport, a fully automatic line for circular and top printing can be created. ■



Combined with the Speed 40-2 transport (centre), The Top Spin LC (left) and Speed Modul can create a fully automatic line for circular and top printing.

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BREAKING THE BOUNDARIES OF ELECTRONICS PRODUCTION

Ian Board and Richard Costar look at how innovative technologies create a unique production process for manufacturing high value components

Autotex steel offers a remarkable combination of mechanical, chemical and optical properties

In today's challenging economic climate, businesses are working increasingly hard to develop new technologies and production methods in order to distinguish themselves from the competition and meet ever complex consumer demands. This is especially true of the design and manufacture of high quality electronics, such as membrane switches and keyboards and fascia panels. These applications now offer as standard a wide range of sophisticated functions, with multiple circuit layers, tactile keys and integrated displays.

In particular, increasing focus has been placed on the aesthetic qualities of these electronic components as the demand for highly stylised parts continues to grow. In order to meet these requirements, two leading suppliers have been working in partnership to develop what is claimed to be a unique range of specialised metallic style designs for the production of high value membrane keyboard overlays, fascia panels and industrial or display graphics.

Bex Design Services and MacDermid Autotype are pioneering the use of a combination of screen and digital print processes, with the use of flexible mirror inks and a proprietary high performance hardcoated film that has a stainless steel grained surface texture, Autotex Steel, for producing stainless steel style finishes. In so doing, the two companies have discovered an extremely cost effective method of producing high definition images with metallised finishes on flexible film substrates. It is believed that this is the first time anybody in the UK, and possibly beyond, has combined these four technologies – screen, digital, ink and film – in this way.

Bex can achieve small and larger volume runs of components, produced at far lower costs than traditional metal overlays. Perhaps more importantly, using Autotex Steel enables Bex to create a low gloss, stainless steel grain textured surface that is impact resistant, will not mark or show fingerprints and which can be reverse printed to protect text and graphics from wear.

REVOLUTIONARY PRODUCTION

This revolutionary method of production capitalises on the high definition capabilities of digital print, to produce multi-coloured fine line text and graphics that are reverse printed onto MacDermid Autotype's Autotex Steel film. The digital print is then overprinted using conventional screen techniques with the latest flexible mirror inks to complete the stainless steel effect; a final black print is then added to give additional depth to the colour and enhance the overall effect. The films can then be embossed, cut and

Unlike stainless steel, the stainless steel grain texture surface is impact resistant, does not show fingerprints and can be reverse printed to protect graphics

finished depending on the needs of each application.

Critical to the success of this production technique is the use of Autotex Steel, a polyester based film substrate that offers a remarkable combination of mechanical, chemical and optical properties. The use of this film allowed the two companies to achieve a product that delivers real benefits, both technically and commercially, creating an innovative high quality solution, with excellent definition and colour rendition, which can be produced easily and at an extremely competitive cost.

Indeed, the exclusive characteristics of the Autotex Steel film make the overall production process quick and simple. For example, the new film is easy to handle and print, combining high levels of colour reproduction and definition with a tough outer surface that offers excellent resistant to abrasions and wide range of chemicals and solvents.

The innovative film is manufactured using a conventional flexible polyester substrate. This is coated with an ink adhesion layer on the second surface and a specially developed hardcoat outer layer, which is chemically bonded and UV cured. The hardcoat layer has a stainless steel grain effect finish which, when the film is printed on the reverse with standard metallic or silver inks, creates the appearance of a brushed stainless steel panel.

Furthermore, the film is easy to reverse print and, unlike competing materials, does not have an inherent colour cast, so printed colours are easy to match. Additionally, the Autotex film will not bow or buckle during UV ink curing and can easily be embossed for use with domed tactile membrane switches or in applications where keys or panel areas need to have raised edges. Embossed areas have an excellent flex modulus, with a typical flex life for domed keys being in excess of five million actuations.

NUMEROUS ADVANTAGES

Bex and MacDermid discovered that using this film based solution represented a number of advantages over conventional stainless steel materials. Unlike stainless steel, Autotex Steel does not show fingerprints, and can easily be printed with clear display windows or contain 'secret-until-lit' graphics, with the film offering excellent colour rendition and light transmission in clear areas. Graphics are reverse printed, so are protected from wear and abrasion by the body of the film substrate and the brushed stainless steel style textured hardcoat layer. This layer has also been formulated to resist a wide variety of common industrial solvents and cleaning fluids, including alcohols, ketones, weak acids and hydrocarbons.

This latest film technology offers product designers and screen-printers an efficient and versatile method of developing striking and high quality graphics products with the appearance of stainless steel. Without this film technology it would have been impossible to develop such an effective solution, as the film is particularly easy to handle and process. Just as importantly, it helps control panels provide a long and trouble-free operating life in even the most challenging applications.

As businesses explore ever innovative ways with print, films and inks they are opening up a world of opportunities for the production of high value keyboard, fascia and panel components, which are ideal for instrumentation, industrial equipment and even consumer white goods. ■

Ian Board is Company Director at Bex Design Services and Richard Costar is International Sales Executive at MacDermid Autotype

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MY NAME IS BOND – SCREEN BOND!

State of the art methods for bonding mesh to screen frames are described by Günter Perner

Polyester mesh is most commonly used for the production of screen-printing stencils today and, for technical applications, the use of stainless steel mesh is on the increase, both types being bonded onto aluminium frames. Due to the high quality requirements regarding mesh tension, tensional stability and solvent resistance of the stencil, a good and lasting bond takes on an even greater significance.

To raise user awareness of certain hazards and to optimise even further a bond which is already good, the problems connected with mesh bonding will be discussed step by step in this article. Particular attention will be paid to aspects of advanced bonding methods with a brief troubleshooting list rounding off the information on mesh bonding.

1. The screen-printing frame/surface preparation:
The best adhesive results are achieved on pre-treated aluminium frames from leading frame manufacturers. In general, we are talking about welded hollow section or cast frames, the alloy of which is well suited for best adhesion results. Special profile shapes provide additional stability. Since smooth aluminium surfaces are not conducive to good adhesion, surface preparation is carried out by roughening. The adhesive surfaces of new screen frames are usually supplied already sandblasted by the manufacturer. Such surfaces must be treated before bonding by degreasing with fast dispersible solvents and any abrasive dust also has to be removed. The degree of sanding should not be too coarse – a depth of about 40 microns is sufficient. The best-known manufacturer in Europe, Hurtz GmbH of Nettetal, Germany, produces screen frames commensurate with the high standards required for precision screen-printing requirements and offers a wide range of choice. Thus, the slope profiles supplied by Hurtz not only give higher stability but, at the same time, simultaneously facilitate the complete drainage of screen cleaners during cleaning.

Sanded or ground frame surfaces are a bit more problematic, however. Often, the grinding is somewhat overdone, resulting in deep scratches in the aluminium surface, preventing overall surface contact of the screen mesh with the adhesive surface. Under certain circumstances this can even lead to capillary formation, in which the subsequent use of printing media and cleaning agents can accumulate; this can result in the mesh coming off. For such adhesive areas, it is recommended to reduce of the level differences of the surface by using a belt sander with 80-100 grit paper. After appropriate degreasing and cleaning off any residual dust, good adhesion results can also be achieved.

We would like to draw special attention to old adhesive surfaces when a large number of previously used frames are re-stretched. If the residual adhesive bed is contiguous, compact, clean and at the same uniform height, bonding can be carried out on these surfaces. In many cases, the adhesive layer has broken off over a large area, is porous and has a 'frothy' look. Then the adhesive residue should definitely be removed using a grinder, or chemically using solvent pastes, such as Pregan DL.

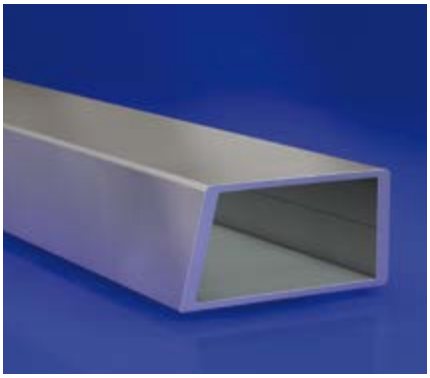
With smaller screen-printing frames, it is possible to immerse them for five minutes in boiling water and by removing the old fabric immediately, while still hot; the old adhesive will be completely stripped with it.

An environmentally friendly process for cleanly removing the old adhesive layer is to use one of the newer types of pressure washer, which only need small amounts of water but act with very high pressures up to 1,700 bar. The initial roughness of the original adhesive surface is restored without even weakening the frame. Using this technology, Grünig AG based in Schwarzenberg, Switzerland offers an environmentally friendly and fully automated unit called G - Prep 370.

2. Screen printing fabric/tensioning systems:
Depending on the application, polyester, nylon, stainless steel or metallised fabrics are bonded to screen frames. During bonding the different stretch properties have to be considered, especially with stainless steel mesh, which can be stretched to tension values of 50 N/cm and more. In these high-precision applications, only state of the art adhesives can be used to maintain high tension.

Grünig's G-Stretch 270A electromechanical stretching machine

This screen is being cleaned with environmentally friendly high pressure (for demonstration purposes, only partly cleaned)



The Hurtz Aluminium Profile Slope 80-70 x 40

Old, well enduring, coherent adhesive layers can be left on the frame for new stretching

In order to produce silk-screens with the correct mesh tension, the recommendations of the manufacturer for the stretching process must be observed in all cases. In order to benefit from the advantages of special mesh, special stretching techniques are often necessary. Whether pneumatic tension clamps (for example Sefar 2, Sefar 3A) are used, or mechanical or electro-mechanical devices (such as the D-270A Stretch made by Grünig AG), is rather a matter of personal preference. For both systems, the proponents and differences lie more in details.

Due to the variety of mesh counts and the associated different ink volumes, the viscosity of the stencil adhesive is important. Firstly, the adhesive mixture should not run sideways down the frame, and good penetration of fine mesh to the frame surface should be achieved.

A particular challenge for the adhesive is the bonding of the entire surface of pre-coated fabric. As two impermeable surfaces are to be bonded together, only solvent-free polyurethane or epoxy resin based systems come into question. Mesh manufacturer Sefar AG, based in Thal, Switzerland, offers its adhesive system Sefar PCF Bond for the adhesion of its pre-coated fabric Sefar PCF. Partially pre-coated fabric has no emulsion on the adhesive surfaces so that they can be traditionally bonded.

3. Adhesive selection:

The mesh bonding and the type of adhesive used are of crucial importance for the life of the printing screens.

Simple adhesives based on polychloroprene, processed as either one- or two-component, can be used on many different frame materials, but without specific requirements in terms of mesh tension, durability and resistance to cleaning media. Applications include stencils for textile, flock and ceramic printing, which mostly use water-based printing media and water-based cleaning processes. This market is served mainly with cheap adhesives from local providers.

Continued over

The most widespread family of adhesives is the solvent-based two-component polyurethane adhesive. These adhesives have the highest solvent and detergent resistance and are especially designed and capable to maintain permanently the high tension values of high module mesh. Fast cure and associated short dwell times in the stretching device are the other demands of trade stretching services. The addition of special pigment pastes to a colourless adhesive mixture creates different brilliant colours, which can then be used for mesh identification. Since the cost factor of the adhesive is low in relation to the fabric to be bonded, a higher quality adhesive should definitely be the first preference.

Figure one is a summary of current Kissel + Wolf stencil adhesives and their special characteristics.

Over the last few years, the UV-curing stencil adhesive is being more widely used. This adhesive group has the combination of being one-component, solvent-free and having the best solvent resistance. By using modern adhesive application units incorporating curing and stretching, a high degree of automation and time saving is possible. In the environmental debate, the UV adhesives score by the absence of solvents.

So-called instant cyanoacrylate glues are widely used in the USA, but are relatively seldom found in Europe, due to the lack of solvent resistance. Only screens for one-off use are produced in small quantities with it. One problem is the toxicological aspect, with contamination of the workplace by the activating spray agent.

4. Applying the adhesive:

The most frequently used screen adhesives are solvent-based, two-component polyurethane adhesives which have to be mixed with the hardening component before processing. In order to benefit from the whole spectrum of these adhesives, it is imperative that both adhesive and hardener are correctly mixed in the right proportion, which means that exact weighing of the components is indispensable. Then, the mixture should be stirred well to homogenise. It is important to know that the (isocyanate) hardener component is also sensitive to moisture not only for storage of open pots in use, but during the whole process. Hardener containers must also be hermetically closed again immediately and high humidity during processing should be avoided. Processing temperatures of 20-25ºC and a relative humidity of 35-65% are ideal. The frame itself must be at room temperature, so that the formation of condensation due to dew point deviation is avoided.

The mixed adhesive has only a limited processing time (pot life), within which it must be used. The actual adhesive is applied by brush or spatula, and the following methods are common:

1. Applying the adhesive using a short, stiff brush: Here a short-haired, hard brush is used to brush the adhesive through the fabric onto the adhesive surface. This has the advantage of low adhesive consumption with good bonding between the frame and mesh. This relatively thin layer of adhesive dries quickly and hardens very quickly. Before stretching new fabric, as a rule the old screen mesh can easily be removed.

2. Applying the adhesive using a soft round brush: This is similar to 'painting' a larger amount of adhesive onto the mesh and spreading it evenly. The subsequent gravity and capillary action then impregnates the adhesive in the fabric to be bonded and connects to the screen frame. This application method is indeed less strenuous, but requires a longer dwell-time in the stretching device and on removal requires more force, as more adhesive was applied.

3. Applying the adhesive using a plastic spatula: The adhesive is applied by pouring the adhesive mixture from the mixing container to the surface to be bonded. The adhesive is then spread evenly with a plastic spatula. This application method, mainly practiced in the USA, is very fast, resulting in uniform coating thickness, but not without problems when screens are placed close together in a multi-stretching unit.

In all cases, it is important that mesh and frame have the most direct contact with each other. Unfortunately, many frames can be found which are twisted or have deep cavities in the corner areas caused by grinding down the welds. About 75% of the volume of a screen adhesive consists of solvent and this evaporates during the drying process. Everywhere where there is no direct mesh contact to the frame, a 'fern frost' effect occurs. This leads to the formation of hollow areas after solvent evaporation and resultant adhesive shrinkage. With the subsequent use of cleaners, these are retained as in a sponge, which can cause the mesh to come off. In many cases, pressing down the mesh to the adhesive surface of the frame with weights can help to avoid these defective areas. The experienced screen maker can already identify problem areas before bonding and uses weights where necessary. However, when it comes to tensioning, which has to be accurate to a specific Newton value, weighting inside the actual screen area can be problematic because, when these weights are later removed, the mesh tension can be reduced.

Screen adhesives, dyed with different KiwoColor pigment pastes, for marking varying mesh types

Normally, the adhesive-hardener mixture is ready for use; but when using very fine mesh, when for example, printing with UV ink systems, especially at higher ambient temperatures, the addition of about 5-10% thinner is recommended. This gives better penetration of the adhesive through the fine screen mesh guaranteeing full-surface contact with the frame surface.

Because of the elasticity of polyurethane adhesives, it is possible to brush the adhesive into the mesh resulting in a 2-5cm wide, permanent edge block out. Limiting this adhesive layer to spread inwards is done by taping the area with masking tape.

Just as it is important to allow sufficient relaxation time of the screen fabric before bonding, the adhesive film needs sufficient dwell-time in the stretching device, in order to maintain the screen tension. The drying and curing of the adhesive occurs in three stages, which merge together fluently:

1. Physical drying by evaporation of the solvent: The phase of total evaporation of the solvent contained in the adhesive depends on good ventilation of the workplace. Hygiene in

Continued over

PRODUCTS	CHARACTERISTIC PROPERTIES
KIWOBOND 930 *+ KIWODUR 930*	All-round adhesive for different frame materials, good adhesion and good solvent resistance, long pot life
KIWOBOND 1100 PowerGrip *+ KIWODUR 1100 PowerGrip*	Very fast adhesive with a very short dwell time in the stretcher, very good adhesion and very good solvent resistance, high tensional stability, no re-bonding
KIWOBOND 2000 COLOR *+ KIWODUR 2000 COLOR* *KIWOCOLOR Y-03 YELLOW* *KIWOCOLOR R-04 RED* *KIWOCOLOR B-05 BLUE* *KIWOCOLOR G-13 GREEN*	Fast colourless adhesive for high module fabrics, for use with *KIWOCOLOR* colour pastes for mesh identification, bleed-fast colouration
KIWOBOND UV 3000 - Series	Single component, UV-curing adhesive series with different viscosities, from easy flow low viscosity to high viscosity firmness, solvent-free, excellent solvent resistance, immediately usable after cross-linking

Figure 1.

WANT TO GENERATE WHITE-HOT REVENUE?

THREE-LAYER

print capability from VUTEk provides superior

WHITE INK

image quality in a single pass.

The VUTEk GS3200 brings high-impact, high-income power to your shop.

The VUTEk® GS3200 UV-curing superwide printer from EFI™ offers 1000 dpi colour quality and consistency, two to three times higher print capacity and unique three-layer white ink printing that extends your offering into high-end, premium-margin applications. All backed by EFI advanced workflow solutions, ink, service and training.

Make your business white-hot with the VUTEk GS3200. Our GS3200 Advantage Kit will help you get started. Visit efi.com/whitehot30 or call 800-875-7117.

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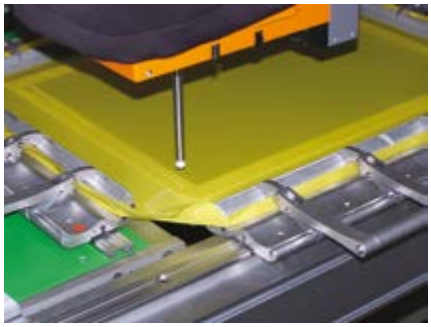
Learn how EFI products and support can give you an unfair advantage.

efi print to win.



Adhesive application with G-Bond UltraCure, fully automatic

the workplace is not the only reason for ensuring that solvent vapours are removed quickly. Solvent vapours are heavier than air and, therefore, collect at floor level.

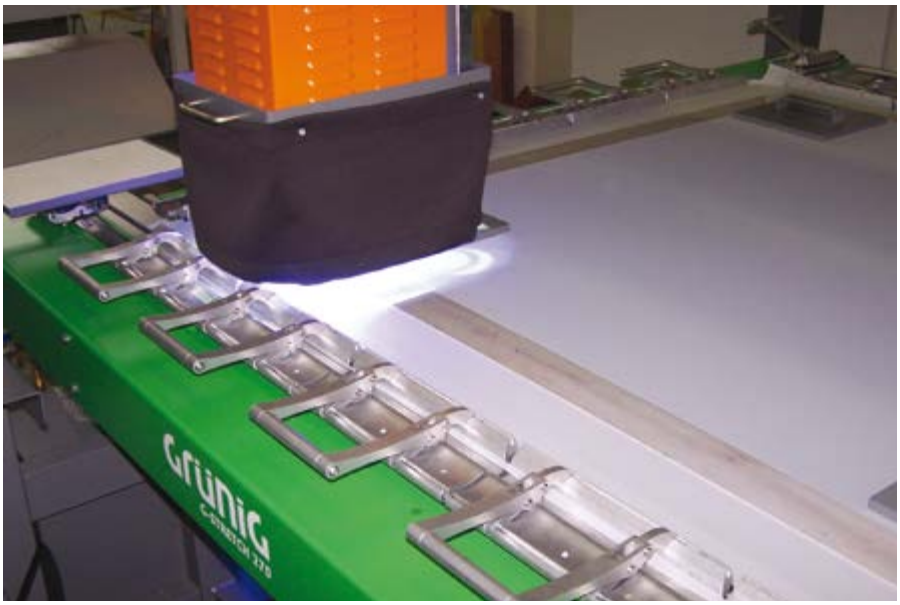
2. Re-crystallization of the adhesive polymers: This phase follows immediately after solvent dispersal and is crucial for a high degree of tensional stability of the screen fabric. At this point, the adhesives found on the market start to differ quite widely.

3. Chemical curing: The curing agent added to the adhesive component is responsible for the subsequent solvent, detergent and temperature stability of the bond. The chemical cross-linking begins with the preparation of the adhesive mixture and, depending on temperature and humidity conditions, is fully completed after about 72 hours. The hardener reacts with the adhesive component as well as the relative humidity. Therefore, even after removal from the stretching device, it is important not to store the screens in too cool a place or at a humidity level which is too low. This should be especially noted for stretching work carried out in winter.

Using today's high-performance adhesives, a dwell time of 10-20 minutes in the stretching unit is usually sufficient after the adhesive application. The screens themselves should be allowed to chemically cross-link at least overnight, before they are processed further. If necessary however, a protective lacquer coating can be applied after 2-3 hours, such as Estelan R 224-04 made by Kissel + Wolf.

With the use of UV adhesives, manual adhesive application by brush and curing with a hand lamp or exposure lamp is possible; however, a quality-assured result is only achieved with suitable equipment. The combination of tensioning device, adhesive application system and UV-curing device – all computer-controlled – enables high-quality printing screens to be produced in the shortest possible time. The process steps are as follows:

- Placing the frames in the pre-programmed arrangement on the stretching unit
- Placing and tensioning of the fabric
- Raising the stretcher against the mesh and, if necessary, weighting the mesh
- Starting the process of automatic adhesive application with pneumatic dosing on the defined frame contour
- Automatic start of the adhesive curing process by means of focused UV radiation on the adhesive geometry
- Removal of the printing screen from the stretching device and then immediate use is possible.



UV curing of adhesive KiwoBond UV 3004 UltraCure

In cooperation with Kissel + Wolf, the G-Bond UltraCure, made by Grünig AG, is a unit which has proved to be very suitable in practice for the production of printing stencils for solar technology, for example.

5. Troubleshooting: Below are some of the most common questions and problems, with answers or recommendations.

A. Problems during bonding:

Problem: Thickening of the mixed adhesive during processing.

Cause/Recommendation: Probably the processing time (pot life) has been exceeded. Verify time and temperature conditions during mixing. Higher temperatures reduce pot-life, so only mix smaller amounts.

Problem: Slippage of the mesh after removal from the stretching device:

Cause/Recommendation: Dwell-time in the stretching device too short; processing temperatures too low; excessive dosing of adhesive; adhesive viscosity too high. Significant extension of the dwell-time in the stretching device if necessary; adjustment of temperature.

Adhesive too thick for fine fabrics. Dilute the adhesive mixture for better penetration.

Problem: Tension loss of the mesh within the first hour.

Cause/Recommendation: Premature removal from the stretching device; ambient temperature too low; incorrect mixture ratio of adhesive to hardener. Check dwell-time and temperature in the stretching device; always weigh adhesive mixture carefully.

B. Problems when using the screen:

Problem: Mesh slipping to one side after screen cleaning.

Cause/Recommendation: Excessive application of aggressive screen cleaners causes the adhesive layer to swell and results in detachment. Check the exposure time, temperature and circumstances in the draining area; changing the cleaning agent may be necessary.

Problem: Colour change after a number of cleaning procedures:

Cause/Recommendation: Deterioration of the colouring component through solvent cleaning. Use stable colour pastes for dyeing.

Problem: Brittleness of the glue layer after extended use.

Cause/Recommendation: Normal process of UV-A ageing and dispersal of the elastic polymers from the adhesive layer from cleaning process. In general, this goes hand in hand with mesh ageing and stretching a new piece of mesh is recommended.

Problem: Detachment of the adhesive layer from the aluminium frame with shiny metallic underside of the adhesive.

Cause/Recommendation: The shiny metallic layer is made of blast or abrasive dust from the frame pre-treatment and indicates insufficient cleaning of the adhesive surface. Pre-treatment process should be checked and improved if necessary. ■

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HOW PARTNERING WITH A HEAT PRESS MANUFACTURER CAN IMPROVE YOUR BOTTOM LINE

Heat transfers need low investment and little production skill. Nathan Anderson outlines the benefits.

Continued economic uncertainty has forced more companies to take a closer look at the practices that impact their bottom line. In most cases, the cost to acquire a new account is greater than the cost of selling another product to an existing customer. Still the marketing efforts of many printers focus on acquiring new customers and pay little attention to developing existing accounts or improving customer turnover rates.

The return on investment (ROI) of customer acquisition improves with every new order resulting from the customer relationship. Instead of relying on traditional advertising and promotions to hopefully squeeze more of the same product orders from your current print buyers, consider adding complementary products and services that fit their varied needs. For example, a customer who buys signage and brochures for a trade show is likely a good candidate for promotional tote bags and t-shirts.

There is a fear that developing new product offerings would carry high initial costs and further expand overhead. However, partnering with a heat transfer manufacturer can help boost your textile decoration capabilities without significantly increasing overhead. Heat transfers require low investment and little production skill. These features combined with your company's in-house ability to send print-ready art to the manufacturer make heat transfers an easy fit for your existing business model and can improve revenue per customer (and your bottom line).

MINIMAL INVESTMENT

Suspend the perception of a heat press being a tool for hobbyists and start-ups, and consider the potential return for your specific business model. The investment in a heat press can range from $300 to $4,000. A basic manual press can handle all your application needs and carries a lower cost. These presses usually work in standard outlets, which make them ideal candidates for transportation to events for on-site decoration.

An automatic machine will pick up production efficiency and limit operator fatigue. This machine requires an air compressor and access to higher voltage wiring (220V). These machines easily pay for themselves in the first few orders, if not the first.

A full-colour heat transfer on a recyclable non-woven bag

Custom lower platens can be purchased to accommodate specialised applications. For example, a pallet may be designed to hold a set of four can coolers or gloves, or fit a small pocket on a backpack. Adaptations like these maximise production efficiency by allowing you to perform multiple applications at the same time in one press cycle.

TAKE A FULL-COLOUR ADVANTAGE

Just because your company doesn't have direct screen-print capabilities doesn't necessarily mean you are at a competitive disadvantage. Using four-colour process heat transfers from your partnering manufacturer allows you to produce full-colour graphics with relatively low minimums (eight to 24 pieces). Most direct screen-printers are equipped to produce only spot (one to six) colour.

Direct-to-garment printers do have full-colour capabilities that are best suited for short runs. But DTG production times of two to three minutes per shirt (compared to ten to 15 seconds per shirt) limit their effectiveness on longer runs. They cannot be price competitive in higher quantities because of the extended production time.

SERVICE CUSTOMER UNCERTAINTY

Customers often have difficulty projecting the quantity they need to order for a particular item. This leads to smaller reorders that are difficult to fulfil in a limited time-frame and at the original price per piece. When ordering custom transfers, you can increase the quantity to meet the next price break from your manufacturer and average the entire cost into the opening order. The remaining pieces can be temporarily inventoried to accommodate the smaller re-orders at no additional cost. If the re-order does not occur,

Heat transfers applied to team uniforms

you can use it as an opportunity to follow up with a customer and offer the remaining inventory before it is discarded.

Transfers also provide an advantage in the uncertain retail sector. Instead of embellishing a full line of retail garments for a season, guessing which colours and sizes will sell, heat transfers can be stocked for on-demand decoration. The flexibility provided by this just-in-time inventory model can make the difference in a retail season.

PROVIDE ECO-CHOICE

With environmental concerns increasing, efforts to reuse and recycle have grown exponentially. The imprinted sportswear and the promotional products' industries have turned to new synthetic textiles with recyclable and reusable characteristics as an environmentally friendly alternative to traditional polyesters and nylons.

Two popular choices for promotional products, non-woven polypropylene and recycled PET (polyethylene terephthalate), have relatively low melting points that make them difficult to decorate. Most ink systems require curing temperatures higher than the 286 to 331 degrees F (130 to 166 degrees C) melting point of non-woven polypropylene. Screen-printed heat transfers with low application temperatures produce optimum opacity and colour vibrancy on these sensitive substrates.

CHANGE WITH THE SEASONS

Consider filling seasonal slow-downs with team uniform and apparel decoration. If you have a seasonal slowdown, there is likely a team sport or school activity that coincides with that season. During March and April in the United States, hundreds of kids are outfitted with uniforms in preparation for baseball season in almost every city across the country. With same-day shipping available on numbers and letters from heat transfer manufacturers, new revenue streams can be found at your local campus or ballpark.

Using heat transfers as part of your business model creates new opportunities for growth with your existing customer base. Filling seasonal slowdowns, offering eco-friendly options and displaying flexible fulfilment can be achieved with the minimal investment of a heat press. ■

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THE INFLUENCE OF THE NOZZLEPLATE ON PRINT QUALITY

Dr Horst Scheiber details the parameters which can optimise drop appearance and printer performance

This article reports on the generation, ejection, flight and impact of a droplet in a piezo driven ink-jet printer. While it is therefore meant to cover the whole 'lifetime' of a drop, the main focus is set on the nozzleplate. This is the most crucial part of a print-head, since it ultimately determines the jetting accuracy and, subsequently, the overall print quality. Different nozzleplate designs, materials and fabrication methods will be explained with their respective advantages and drawbacks as well as the influence of ink parameters – such as viscosity and surface tension – on the appearance of the drops and the performance of a printer. In addition, it will be shown how Durst, as a printer manufacturer, can influence and optimise various parameters in order to achieve the highest possible quality with a given print-head design.

PRINT-HEAD DESIGN AND DROP GENERATION

In piezo driven print-heads, drops are ejected through nozzles by generating pressure waves in an ink channel utilising piezo active materials, which are materials that change their shape by applying a voltage. Although there are several different print-head designs in the field, one can differentiate between two principal architectures, these being face shooters and edge shooters. While the former has parallel actuation and drop axes, the latter exhibits orthogonal ones. Both designs can be single ended, with the ink entering the channel from one side and leaving only through the nozzle, or flow-through channels where the ink is in permanent circulation in the channel and only a fraction of it is ejected through the nozzles.

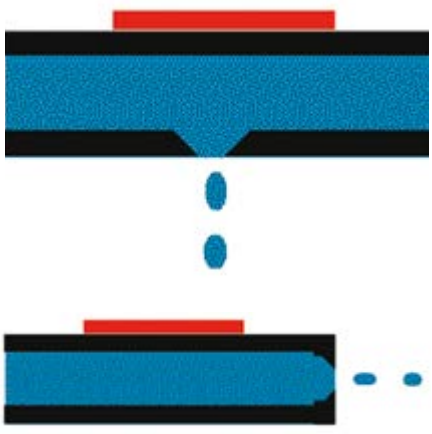

Figure 1: Two examples for different print-head designs. Left: flow-through face shooter. Right: single ended edge shooter.

A flow-through print-head is much less prone to nozzle clogging, but needs a more sophisticated ink supply system. Another distinctive mark is the displacement mechanism. In roof mode the piezo is attached to the roof or floor of the channel while, in moving wall heads, the walls themselves are piezo actuators. Two typical examples for print-head designs are given in Figure 1.

In order to eject a droplet, a negative pressure wave is generated in the ink channel by actuating the piezo element in a way that the channel volume is increased. This negative pressure wave travels through the channel and is reflected at the reservoir as a positive wave due to an open end condition. Releasing the applied voltage, thus relaxing the piezo at the right moment, reinforces the positive wave and leads to the ejection of a droplet from the nozzle.

An example of a voltage pulse – or waveform – that is applied to the piezo element is depicted in Figure 2. A single pulse usually consists of rise time to a certain amplitude, a keep time at this level and a fall time back to zero. Firing a combination of such pulses results in the formation of drops of various volume, which is known as grey-scaling (GS).

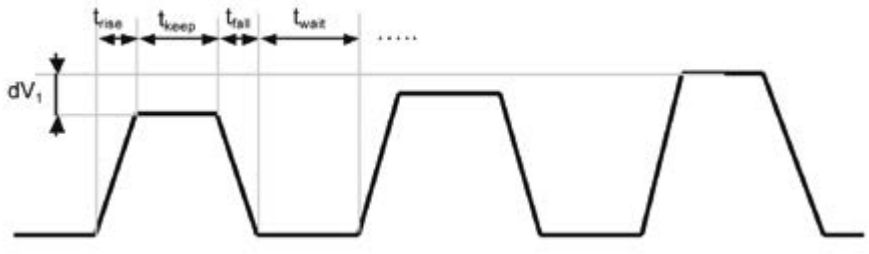

Figure 2: Typical waveform where the following parameters can be varied: number of pulses, pulse amplitudes as well as rise-, keep-, fall- and wait-time for each individual pulse.

Different print-heads have differing levels of access to waveforms either because of electronic limitations or business policies of the respective manufacturers. In order to optimise the printer performance for a wide variety of inks and applications, Durst therefore prefers to use print-heads that guarantee full access to the driving waveform. (Figure 2).

Each print-head has typical frequency response curves, which means that drop velocity varies with the used printing frequency (Figure 3). These curves are mainly determined by internal resonances due to the geometry and constituting materials of the print-head, butalso by the viscosity and speed of sound of the respective ink. Since these curves are used for waveform optimisation, every set of inks needs its own special waveform in order to achieve the desired print quality. Therefore, waveform optimisation is one of the most crucial steps where the printer manufacturer can influence the final image quality as well as the reliability of a printing system.

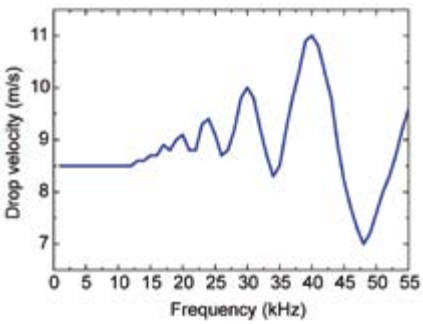

Figure 3: Typical frequency response curve of a piezo driven printhead, where the resonance frequencies are mainly determined by channel geometry and speed of sound in the ink.

NOZZLEPLATES

As mentioned above, the nozzleplate of a print-head determines the print quality to a very high extent. There exist several materials and fabrication methods for nozzleplates, and some of the most common are described in a little more detail in the following paragraphs. In general, print-heads can work in a wetting and a non-wetting regime, which is defined by the material of the nozzleplate; metals or silicon made plates with high surface energy

usually work in a wetting regime, where a thin layer of ink covers the plate. Non-wetting plates, on the other hand, are made of low surface energy plastics or metals with hydrophobic coatings.

Some of the most popular fabrication methods with their respective pros and cons are:

Laser ablation: This method uses pulsed UV lasers to drill holes into plastic nozzleplates. Though tight tolerances are possible in principle, theses materials are very vulnerable to mechanical scratching and require very careful maintenance (see Figure 4, top).

Mechanical punching: A punch is pushed through the nozzleplate material, which is mostly stainless steel, in order to form the nozzles. A plastic coating is often applied to get the head into a non-wetting regime and the mechanical robustness is then defined by the durability of the coating.

Electroforming: Dots of photoresist, that define the nozzles, are deposited on a mandrel and an electro-platable metal such as nickel or copper is grown up and around these dots by electroforming. In order to achieve narrow tolerances, the electroplating conditions have to be under tight control. The durability of such nozzleplates can be increased by applying a thin protective layer (such as gold) in order to prohibit corrosion and abrasion of the pure material.

Anisotropic wet etching: This method is restricted to single crystalline silicon, where the etching process is highly dependent on crystal orientation. While etching with KOH is very effective along 100 crystal planes, the closer packed 111 planes act as so-called etch-stop layers. Etching along 100 planes results, therefore, in well defined pyramidal structures, which allows the highest precision of all utilised methods. Another advantage is the high scratch resistiance of the material. Even thousands of maintenance cycles do not leave any kind of damage to the nozzleplate (see Figure 4). The only real drawback of these plates is their more complex fabrication and, consequently, a higher price per nozzle.

The distance between adjacent nozzles, or nozzle pitch, defines the natural resolution of a print-head. A distance of 254 µm, for example, yields a natural resolution of 100 dpi. In order to increase the resolution of the printer n-times, either n print-heads have to be mounted on a module with a displacement of nozzle pitch divided by n, or the print-heads have to be slanted by a certain angle to decrease the effective nozzle distance orthogonal to the print direction.

A problem that can appear in both cases are weak end nozzles, which means that the nozzles at the end of a print-head display different behaviour than in the centre of the head. This could be due to mechanical

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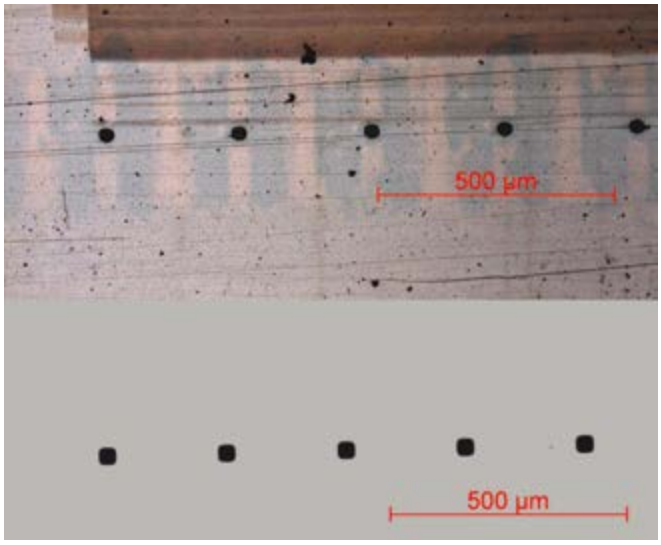

Examples of different nozzleplates. Top: Plastic nozzleplate with laser ablated nozzles. Bottom: Silicon nozzleplate with wet etched nozzles. Wiping tests (40.000 times with a wet clean room tissue) were performed on both samples and it is obvious that plastic nozzleplates are more prone to damage and, therefore, much more care has to be taken during maintenance. Silicon nozzleplates, on the other hand, cannot be scratched by applying standard maintenance procedures.

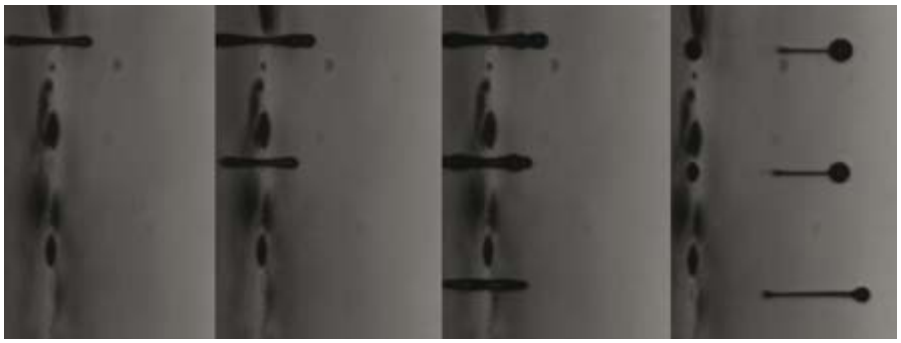

Figure 5: Generation of different drop volumes by applying a multi-pulse waveform

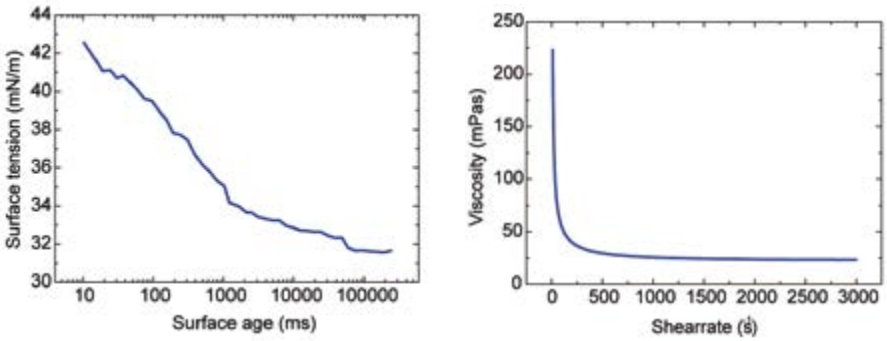

Figure 6: Dynamic surface tension (left) and shear rate dependent viscosity measurements (right) of an ink over the respective measureable ranges

or aerodynamic reasons (see below) and can be counteracted by the interleaving of several print-head rows in single pass mode or increasing the number of passes and, therefore, advancing the medium by only a fraction of a print-head width in scanning mode.

Another problem that mainly appears in single pass printers with slanted heads is the y-bow, also known as banana shape, of nozzleplates. This is a deviation of nozzle positions from a straight line between the first and last nozzle that is caused by mechanical stress during fabrication. It can be corrected by pairing print-heads with opposite y-bow and adjusting them accordingly.

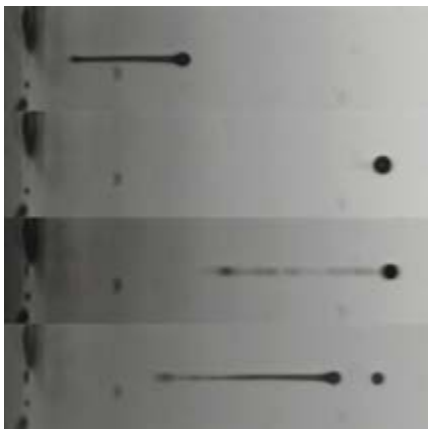

Figure 7:
a) Droplet with typical ligament (tail) shortly after leaving the nozzleplate
b) The tail has merged with the main drop which should yield satisfying print quality
c) Generation of mist which could cover the nozzleplate and result in nozzle failures
d) Formation of a satellite that will land on a wrong position and cause poor image quality

DROP FLIGHT AND IMPACT

As mentioned above, drops are generated and ejected from the nozzles by applying a suitable voltage pulse to the piezo element. Figure 5 shows the ejection of different drop sizes generated by a multi-pulse waveform. In each case a ligament – or tail – that is following the main drop, can be observed.

Beside, by the waveform, the length of this tail and its behaviour in flight is mainly determined by the ink's viscosity and surface tension. Therefore one of the main tasks to achieve high print quality is to optimise these parameters according to the print-head being used and application. The problem here is, that drop formation is a dynamic process and happens at very high shear rates (>105 s-1) and very short times (<100 µs). Unfortunately, both regimes are not accessible with any common measurement method. Figure 6 shows, that dynamic surface tension can be measured down to a millisecond regime and viscosity to shear rates of a few thousand s-1, which is in both cases at least one or two orders of magnitude away from the relevant values at the nozzleplate. This means that in many cases only estimations of the properties at high shear rate and low surface age are possible and ink optimisation becomes an empirical process which could demand many iteration loops. Thus, the ink specifications of print-head manufacturers tend to serve quality management purposes than be of practical use for ink formulation. (Figure 6).

As mentioned above, a droplet usually consists of a head and a tail after formation, where the length of the tail is defined by the viscosity and surface tension of the ink. In

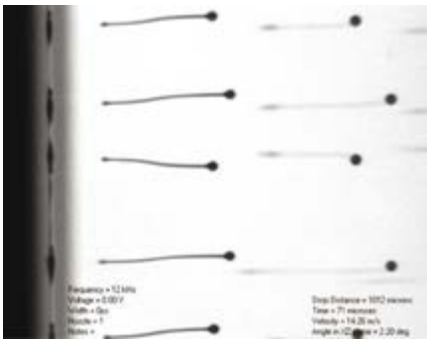

Figure 8: Straightness deviations induced by inhomogeneous nozzleplate wetting

principle, the tail length increases with viscosity and decreases with surface tension. Figure 7a shows a typical drop shortly after tail breakup from the nozzle plate. Figure 7b displays the ideal case where the tail is pulled into the main drop after a few 100 µm of flight by the surface tension of the ink. If the drop velocity exceeds a certain limit and surface tension is too low to pull the tail back into the head of the drop, either mist (Figure 7c) or satellites (Figure 7d) will be formed. While mist can settle on the nozzleplate and cause straightness deviations and nozzle clogging, satellites land apart from their main drop on the substrate hence causing image artefacts.

Another common problem, which can occur with every type of nozzleplate, is inhomogeneous wetting. This can happen due to damaged coatings on non-wetting nozzleplates, deposition of dust or cured ink on the nozzleplate or microscopic asymmetries caused by variations during print-head production. As shown in Figure 8, it results in an asymmetric tail break-up, which can yield straightness deviations of tens of degrees. Therefore it has to be strictly avoided by proper maintenance routines and a sophisticated quality management in print-head production.

A proper drop shape without mist or satellite formation is a necessary, but not satisfying, condition for high image quality; in order to achieve high productivity and quality both decreasing drop size and higher printing frequency and carriage speed are demanded, which leads more and more into aerodynamic limitations. Increasing the printing frequency results in an air stream dragged with the droplets in jetting direction from the nozzleplate to the substrate. This is one of the reasons for the earlier mentioned weak end nozzles, since the airstream becomes asymmetric at the end nozzles and results in a net force on droplets from there towards the centre of the print-head.

On the other hand this airstream can be superimposed with the streams from a moving carriage and, thus, cause turbulence and chaotic print patterns, like the one shown at the bottom of Figure 9.

Since these aerodynamic limitations are governed by basic physical properties of such small drops, they can hardly be overcome. It is only possible to push the whole system – printer,

Figure 9: While proper settings result in a homogeneous print pattern (top), overdriving the system in terms of printing frequency, substrate distance and carriage speed results in chaotic patterns due to aerodynamic limitations.

print-head, waveform and ink – to the limits given by the laws of nature in order to achieve highest possible productivity and quality.

A final factor determining the print quality is ink substrate interaction. When a drop impacts on a substrate, it spreads and contracts on a short timescale due to viscous forces, but its final appearance is defined by the surface tension of the ink and the surface energy of the substrate. It manifests itself in a certain contact angle, which is defined by the Young equation:

$$\gamma_s = \gamma_{sl} + \gamma_l \cdot \cos\theta$$

where ys is the surface energy of the substrate, yl the surface tension of the ink and ysl the interfacial energy between ink and substrate.

Figure 10: Contact angle θ on a solid-liquid interface.

For a substrate with a given surface energy the surface tension of the ink has to be adjusted in a way that proper spreading of a droplet is achieved. A contact angle too low would cause creeping of the ink resulting in low image sharpness, while a contact angle too high would cause incomplete coverage of a substrate. For many low energy substrates (such as plastic foils) a low surface energy is required, while on the other hand it cannot be too low to avoid satellite and mist formation. Therefore, ink formulation is in many cases a trade-off between printability and substrate interaction and both have to be fulfilled in order to achieve the desired quality. (Figure 10).

CONCLUSION

The final image quality of an ink-jet printing system is determined by a wide variety of parameters. While Durst as a printer manufacturer can influence and optimise many of these, like ink properties, driving waveforms or print-head arrangement, there are others which are constituted by basic physical properties and can only be pushed to their natural limits.

One of the key factors is the nozzleplate of the used print-head. There exist many different materials and fabrication processes, each with their respective advantages and drawbacks and the most suitable of them has to be selected for each and every application.

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THE COLOUR IS BACK

It is now possible to use digital technology to print direct to textile, with the same colour results on both sides of the fabric. Enrico Grasselli outlines how this can be achieved

The colour results in double-sided printing have always represented a large challenge for printers, in the past with screen-printing and, today, with digital printing.

Formerly, this challenge was solved brilliantly through the formulation of screen-printing inks using technique and colour combinations. Today, with digital printing, the challenge seems still to be open. We say "seems" because J-Teck3 now has a solution for this technical problem which still exists in modern digital printing. This is called EPS, which means Equalizing Printing System.

This development has been possible because J-Teck's technical team has succeeded in combining the characteristics of digital printing together with those of conventional screen-printing. The result is a system which allows users to print fabrics through a direct-to textile digital printing process.

Patented by J-Teck3, EPS (Equalizing Printing System) is designed to allow homogeneous colour penetration into the fabric using two elements. EPS Clear is a non-pigmented ink which performs the function of 'driving' the other colours through the fabric. EPS Software is a special application program which estimates the correct quantity of EPS Clear necessary to equalise the ink penetration, thus making double-sided printing possible.

The digital printing technique, in fact, is based on the concept of controlling the quantity of ink to obtain different shades and saturations. This concept implies varying volumes according to each colour intensity and saturation. In fact, it prevents the fabric from being soaked in the same way with colours having different saturation. Also it prevents penetration effects conditional on the quantity of ink volume applied on the fabric.

Without EPS, dark colours go deep into the fabric while the light ones stay on the surface.

This feature affects applications where the image needs to be visible on both sides. A common example is on a flag and banner or, more significantly, within the fashion sector when printing scarves, ties and silk fabrics.

HOW EPS WORKS

The system requires the use of a six-colour digital ink-jet printer because EPS Clear replaces one or more colour ink slots in addition to CMYK, usually one of the light shades. With EPS Clear the chromatic characteristics of each colour are maintained, the dithering effect is absent, and the jetted ink is more uniform thus improving the print quality of both light and dark shades.

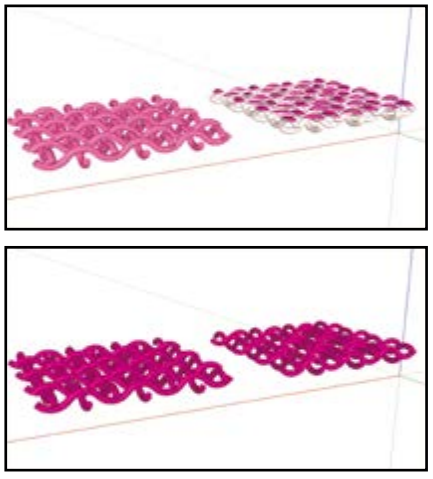
The EPS Software can be used with any type of RIP. It helps the operator to set the print files as it calculates the maximum ink limit the fabric can accept when direct printing is carried out. This ink limit can vary from one fabric to another and mostly depends on the material's pre-treatment. The thicker the fabric, the higher the ink limit is required to allow sufficient ink penetration in order to produce successful double-sided printing.

If we take, for instance, a six-colour graphic, the choice we can make is to have one or two EPS positions, thus eliminating half-tones or additional colours. This operation can raise some objections, such as a reduction of colour gamut or the possibility of dithering in the prints. However, this is not the case. In fact, the EPS System brings utmost printing uniformity by cancelling the dithering effect and improving the colour shades, even the lighter ones.

In summary, EPS is an universal system which can be used, together with disperse dyes for polyester, acid dyes for wool, nylon and silk, reactive dyes for cotton and cellulose

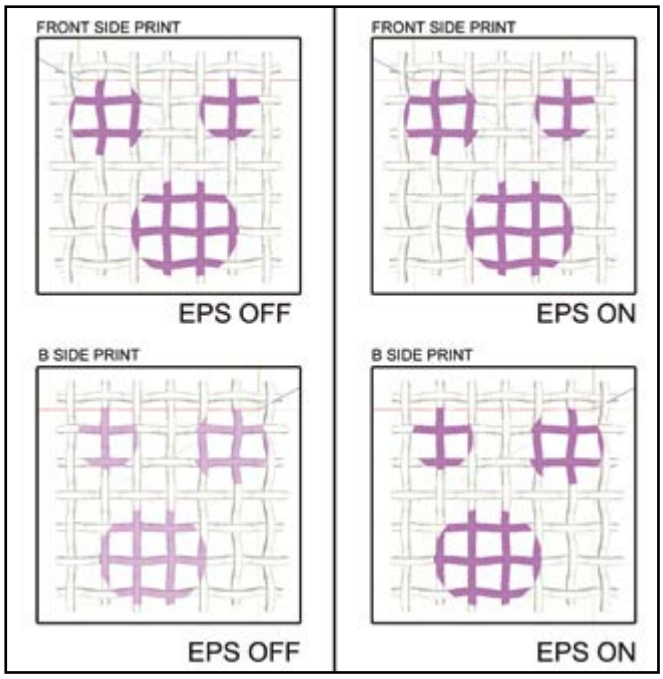
EPS Clear bottles for the feed unit

The difference between prints with and without EPS

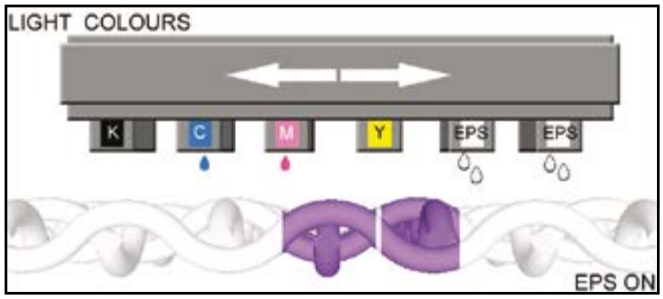


This illustration shows how EPS penetrates the fibres in light colour printing (top: left with and right without) and dark colour printing (below: left with and right without)

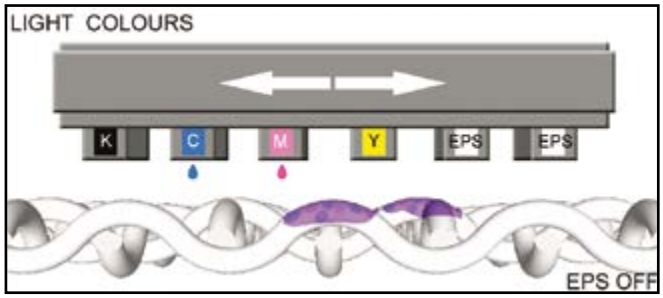
EPS Clear with J-Eco Subly Nano CMYK installed on J-Feeder



With and without EPS, showing how the colours penetrate fibres on the front and the back of the fabric



Light colours printed with EPS



Light colours printed without EPS

fibres. It can be used with many fixing systems such as a heat press, calender, oven or steamer. The EPS Software can be used with all RIPs already working with the printers.

Overall, the advantages of the system bring double-sided printing using digital technology due to uniform colour penetration. EPS is easy-to-use, solves unwanted dithering effects, and enables users to develop new application sectors in digital direct-to-textile printing, particularly with industrial applications where this type of production is growing rapidly.■

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Advanced Functional Printing 2011
Membrane Switch Symposium 2011

Advanced Functional Printing and Membrane Switch Symposium both follow on from previous highly successful events staged by ESMA and sponsored by Specialist Printing Worldwide.

Taking place on 10 and 11 March 2011 in Düsseldorf, Germany, Advanced Functional Printing 2011 and Membrane Switch Symposium 2011 are a joint two-day conference. An international audience will be able to take advantage of attending both sets of papers, which will be presented in dual English and German.

Advanced Functional Printing will offer printers a series of presentations from industry experts covering the best practices, as well as offering an invaluable insight into the latest technologies available. Applications to be covered will include automotive, film insert moulding, nameplate, fascia, printed electronics, circuit, label and solar cell technologies.

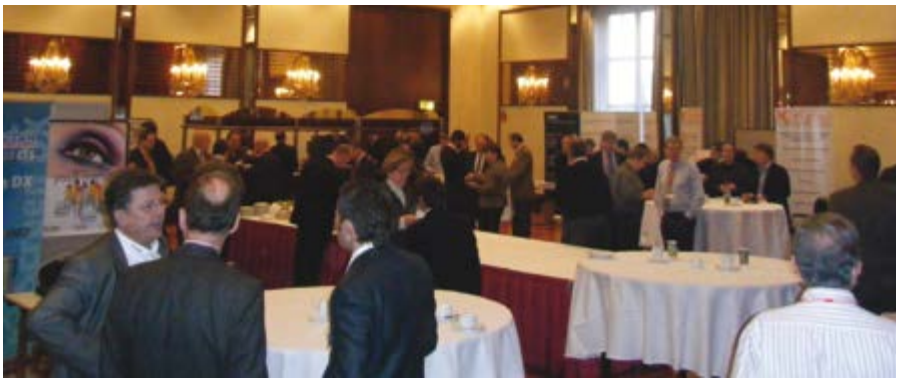
At the same time, Membrane Switch Symposium 2011 will provide printers and manufacturers in this important industry niche with the latest advanced technologies for membrane switch and industrial graphics manufacture.

Expert speakers will recognise the functional, aesthetic and integration advantages of membrane switches by offering a series of educational presentations covering market trends, current technologies and future opportunities. Printers, managers, owners, designers, OEMs and suppliers from throughout the world will also be given advice on best practice in operating and production for lean manufacturing.

Membrane Switch Symposium 2011 follows on from the first event in 2009, which was deemed an outstanding success by an international audience of more than 130 attendees.

The conference programmes will be supported by regular intervals dedicated to an accompanying tabletop exhibition of leading manufacturers of machinery and consumables.

For a limited time, attendees can take advantage of a reduced early bird delegate fee of only €495 total, including access to all presentations at both events, exhibition displays, refreshments, lunch and dinner. Discounts are available for multiple delegate bookings – please call +32 16 894 353 for more details.



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THE FUTURE FOR CURING

In part one of their article, Laura Maybaum and Bea Purcell examine the potential for using LED technology with screen-printing inks

Advances in the last year in LED lamp technology and UV screen-printing ink formulations have proven LED curing as a viable alternative to medium-pressure mercury lamps. In this first part of a two-part series, we outline the differences between mercury lamps and LED lamps and the benefits to LED curing. The second part of this series provides a guideline as to the expected return on investment with implementing the conversion to LED lamps.

CURING UV INKS

Photoinitiators used in UV inks typically react to specific wavelengths within the 200 to 400 nanometer range. UV light triggers photoinitiators creating 'free radicals'. The free radicals connect with the molecules of the resins and monomers and they, in turn, cross-link with each other, forming chains of molecules we recognize as the 'cured' ink film. Although photoinitiators are most reactive at specific wavelengths, the overall curing reaction or polymerisation is achieved by the broad absorption range.

The most commonly used UV curing lamps are medium-pressure mercury, which supply intense UV output at the specific wavelength to activate the photoinitiators and provide a good broad spectrum of output. LED UV lamps, on the other hand, output at a narrow spectral output, mostly commonly at 365 or 395 nanometers with a +/- 20nm at the peak wavelength. While the photoinitiators in screen inks can be adjusted to react at these wavelengths, the curing lacks the reaction to the broad range of UV output. The challenge is a LED lamp head with an extremely high level of output at a single nanometer and screen ink fine-tuned to react to the specific wavelength. The diagram illustrates the relative intensity of a mercury lamp verses a 395 nanometer LED lamp through the UV spectrum.

Other than that, chemical reaction of curing the ink with mercury lamps versus LED lamps is the same. Keep in mind, this type of chemical reaction can be improved by introducing heat into the system. Mercury lamps have all sorts of heat associated with use (which will be covered later), while LED lamps exhibit little to no heat.

INTENSITY AND DOSE

For UV inks to cure properly, they must not only be exposed to the correct wavelengths, but a sufficient amount of energy needs to be directed to the surface of the printed substrate. The amount of energy is called the dose and is measured in millijoules (mJ/sq cm). The dose of energy a print receives is affected by the conveyor/belt speed as well as the number of times that it is exposed to the UV lamps.

The intensity of energy emitted by curing lamps is known as irradiance and is measured in watts (or milliwatts/sq cm). Irradiance is directly related to electrical power, lamp condition, and the geometry of the reflector that directs and focuses the lamp output. Irradiance does not vary with exposure time.

The depth of cure achieved in the ink film is directly influenced by the irradiance level of the lamp. Delivering higher, more intense energy at the surface of the ink will allow energy to penetrate the thickness of the ink film more thoroughly. Both mercury and LED lamps need to have sufficient dose and intensity in UV output to fully cure the ink.

Recent improvements in LED technology have made available LED UV curing lamps which output UV energy at the 395 nanometer wavelength. In addition, both 4-watt and 8-watt power/intensity are options, with the 8-watt version allowing the printer more flexibility for better ink curing, lamp to substrate variability, and faster production speeds.

Mercury lamps typically output at 200, 300, up to 400 watts. In comparison, LED lamps use up and generate a lot more energy to cause the photoinitiators to react quickly.

SCREEN INKS AVAILABLE

Until recently, the available UV screen inks have not been able to be used with LED curing. They did not have the processing latitude to overcome the restrictions of using LED lamps: lower wattage and single nanometer output. Nazdar has adopted new ink technologies to formulate viable inks that cure exceptionally well with 4 watt and 8 watt

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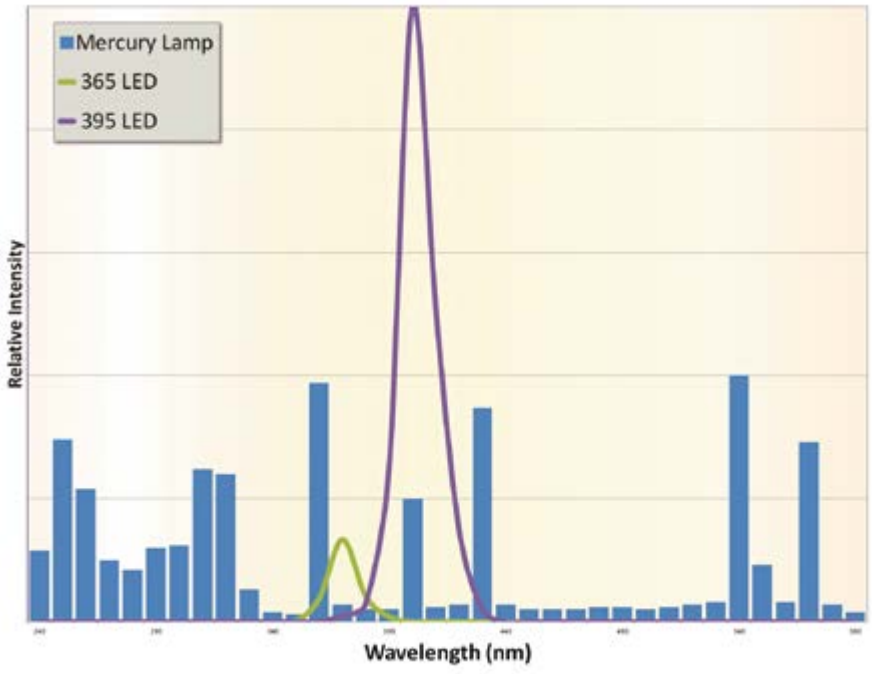
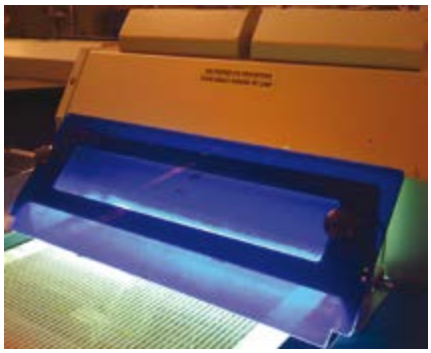
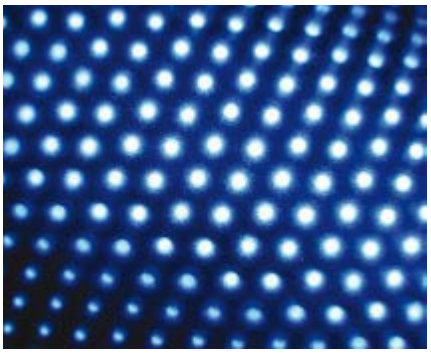


The relative intensity for mercury, 365 LED, and 395 LED curing

An LED curing unit



A medium pressure mercury curing unit



An LED light head array

LED 395 nanometer lamps at belt speeds of 30 to 120 ft/min. This curing speed range is directly related to the ink's colour, the ink deposit, and the substrate colour.

With a heavier ink deposit, more intense energy is needed to penetrate the thickness of the ink film. Previous attempts at formulating UV screen inks for LED curing could not overcome the variances in ink colour and deposit. Nazdar LED inks available today for both the membrane overlay and graphics markets have been market tested and cure extremely well.

BENEFITS OF LED

Despite the potential issues with utilising LED lamps, the market is starting to see practical lamps and inks coming into the market. The benefits to converting to LED curing are many, including reducing operating cost, reducing emissions, reducing the use of mercury containing bulbs, and increased safety. The most significant savings is the reduction of energy usage.

Most of the energy consumed by the printing press is to feed the mercury bulbs and cooling systems. High temperatures created by the IR energy that mercury lamps emit are an unfortunate by-product of this type of curing process. Preventing the heat from building up and damaging the lamp housing and sensitive substrates is a critical concern in UV curing. Systems for heat management in modern curing units pull from water cooling systems and fans to dichroic mirrors (which reflect UV but absorb IR energy) and automatic shutter systems.

LED lamps pull significantly less energy and in most cases can be plugged into standard wall outlets. In addition, the system is instant on/off; there is no need to keep the lamps running when not in use. There is little to no heat in the use of LED lamps, so the only cooling system required is an air fan or water cooling system readily available on the market. The total energy consumed by LED lamps is a fraction of the costs for mercury lamps.

Mercury lamps also emit ozone that needs to be removed from the printing area. Ozone is generated when an electric discharge passes through air or when oxygen is exposed to high-intensity UV energy; it can lead to respiratory problems for those who work near the curing units, so it is important to make sure that curing units are well vented to evacuate ozone from the work area. Ventilation pulls air from the printing area and expels it out of the building. The cost of displacing large amounts of air contributes to higher energy consumption and higher overhead costs.

LED does not emit ozone, so ventilation is not a requirement. In addition, venting ozone typically entails environmental emissions' tracking and control. Eliminating these emissions could reclassify a printer environmentally, further reducing cost.

Further environmental savings can be realised with LED lamps in two respects. First, mercury bulbs are no longer needed. Mercury is considered hazardous in most areas. Use and disposal of these bulbs containing mercury carries additional regulatory costs that will continue to be more and more significant. Most UV curing units use two bulbs per print station with a usable life of 2,000 hours. For average working conditions, bulbs would need to be replaced every eight to 12 months. LED lamps have a life in excess of ten years running continuously. With instant on/off and eight to 12 hours of use per day, the expected life of an LED lamp is well over ten years.

Because of the heat associated with mercury lamps, the reflectors in the lamp housing are susceptible to heat damage or fire damage and typically need to be replaced every two years for effective curing. LED lamps do not need reflectors replaced; at most, the protective glass cover to the bulb would need to be replaced at minimal cost. LED lamps provide a significant savings in both bulb and reflector maintenance with no to minimal cost for ten plus years.

Additional benefits to converting to LED lamps include:

- Safer worker conditions
- Consistent UV output over the life of the lamp
- Less substrate distortion and elimination of potential fires related to heat
- Less space required due to the elimination of ventilation and reduction in electrical supply

A cooling system with an LED curing unit

The two significant obstacles remaining in converting to LED are that press manufacturers and lamp manufacturers do not have readily available product; rather, partnering has just begun in earnest. Second, the current cost structure to implement in new machines or retrofit into existing machines has a significant up-front cost.

In Part Two of this series, the ROI (return on investment) for implementing LED Curing will be outlined. ■

Laura Maybaum is Nazdar's Graphics Market Segment Manager and Bea Purcell is Nazdar's Market Segment Manager for the membrane-switch overlay, in-mold decorating, industrial and container markets

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UV FOR THE THIRD DIMENSION

Walter Stumpe explains how to overcome the intricacies of curing non-uniform surfaces

Curing of containers and moulded parts is one of the most difficult UV drying applications and requires that printed surfaces be irradiated and cured as uniformly as possible. This theoretical wish cannot be realised in practice due to the very different shapes of the material to be processed. That's easy to understand if we think of the partially absolutely uniform surface exposure of sunlight and that we nevertheless often sunburn our noses. This happens because the UV radiation of the sun strikes our noses almost vertically. That explains why a reflector system cannot be designed that is suited, under practical conditions, for all common shapes of moulded parts.

However, as practical experience has shown, it is definitely possible to design and produce suitable reflectors at an acceptable cost that are able to cover a wide range of UV curing applications. But before we get into the details, let's briefly revisit the field of physics as many people may not have the physical relationships currently in mind.

According to the Photometric Inverse-Square Law, the radiation intensity of a radiation source is inversely proportional to the square of the distance from the radiation source. However, this law applies only in the case of a lamp radiating without any kind of reflector or other restriction.

In contrast to this, with a reflector system, the half quadratic radiation angle of the reflector is the decisive parameter. Suitable reflector design is based on this law of physics that also determines, for example, the resulting distance to the surface to be cured, the radiation distribution, and the other corresponding variables. If, however, satisfactory results are achieved in a different way, then this is accomplished at the cost of efficiency, energy consumption and also the thermal load of the printed parts. Considering the above, the space requirements, energy and production costs and safety features of a practically usable UV dryer for containers and moulded parts are of crucial importance.

ADJUSTABLE OUTPUT

Our new Aktiprint B UV container dryer has a variable, continuously adjustable output of up to a maximum of 200 W/cm. This means that you have a substantial UV output reserve, even at high transport speeds, and that you can operate the UV lamps longer than their normal, specified service life. The pre-selected UV lamp output remains constant and is automatically readjusted in case of line voltage fluctuations.

The European-wide line voltage adjustment systems have not yet been implemented in all countries. You can still experience significant differences in line voltages, even within a country and its regions, at different times of day. To avoid producing defective material, printers often use the maximum available UV lamp output if material thermal loads permit. Our newly-designed Aktiprint B UV dryer helps you to improve the stability and robustness of your production process while significantly reducing energy costs as the normal UV lamp output safety margins can be drastically reduced.

Our complex and sophisticated reflector geometry is the key feature of this unit. Compared with curing the cover surfaces of containers, this unit also provides very good radiation intensity and curing performance even on almost vertical lateral surfaces of materials. If required, the reflector system can be readjusted, within certain limits, to deal better with differing requirements. So-called doped lamps have demonstrated improved performance compared with standard Hg lamps in curing pigmented inks. You can replace the Hg (mercury) lamps with Fe (iron), Ga (gallium) or low ozone lamps at any time without equipment modifications. You only have to readjust the selected curing parameters accordingly. The automatically self-adjusting air-cooling system of the UV lamps to compensate for different lamp output settings provides long UV lamp service life. This feature ensures that UV lamps are always operated within their optimum temperature range of 900-1,000 degrees C even up to their maximum output level.

Although today's UV inks and coatings can be cured over a wide lamp output range, the material surface, the ink itself, its adhesion, the surface tension and the requirements of the printed parts to be processed also influence the curing process. You should always carefully select and test the processing parameters used and completely document this parameter data for future production runs. That's the only way to guarantee reliable repeatability of your production process.

UV for 3D with the Aktiprint B UV container dryer

KEY FEATURES

A key innovative feature of our new Aktiprint B UV container dryer is its rotating transport system that replaces the commonly used

transport conveyor belts. Conventional transport conveyor belts are subject to wear and tear and must be routinely replaced as frequently protruding retaining tangs on injected moulded parts get caught in the mesh of these belts. Our new rotating transport system offers the unique benefit of a smooth, stainless steel surface on which moulded parts are transported through the UV drying zone. It also enables material feeding and output from one position. That way, a single operator can handle printing and UV curing work tasks without continuously running back and forth between equipment systems. We can also deliver a corresponding add-on device to permit fully automatic operation that is primarily configured to comply with the specifications of the printing station.

In contrast to the situation with printed flat materials, UV light protection is of major importance in processing bulky and freshly printed moulded parts as this material requires a very large material feeding window. In particular, linear, continuous throughput UV dryers unnecessarily expose your employees to UV radiation. Every responsible safety engineer would not accept this radiation exposure over a longer period of time. The Aktiprint B UV container dryer completely and permanently eliminates this hazard with its double-sided, redirected transport design.

In summary, Technigraf's Aktiprint B UV container dryer offers users the following key features and benefits:

- Power supply stabilised and continuously adjustable UV lamp output
- UV lamps can be replaced with lamps of different spectral output (such as Ga, Fe) without equipment modifications
- Redundant air cooling system to handle the normal maximum permissible thermal load of moulded parts
- Lower exhaust air volume to minimise air exhaust noise
- Smaller, differently shaped moulded parts can be processed as well as material of maximum permissible sizes
- Complete elimination of UV radiation exposure for the printer and his working environment
- Robust design and construction for use in a continuous operation production facility

The Aktiprint B UV container dryer is available in various sizes from 14 x 14cm up to 54 x 54cm. Of course, upon request, we can also manufacture other sizes based on the same design principle. ■

Walter Stumpe is General Manager of Technigraf

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THE CURING OF PRINTING INKS BY UV

Jim Raymont uses an acronym of the word 'cure' to discuss the key points associated with ultraviolet energy and its benefits

The use of ultraviolet (UV) energy is what differentiates UV-cured inks from water- or solvent-based inks. While a UV ink is 'dry' to the touch after it has been properly exposed to UV, the actual 'drying' mechanism is one of polymerisation and not the evaporation of water or a solvent. A more detailed description of the actual cure mechanism(s) and a comparison between UV inks and other technologies will need to be left to chemists and formulators. This article intends to cover some of the key points associated with the curing of printing inks by UV and will not go into a UV versus other types of ink formulations. Using the word 'CURE', we can identify key points for each of the four letters in the word.

For the letter 'C':
1. Consistency
2. Communication and Cooperation
3. Chemical Reaction

For the letter 'U':
1. Ultraviolet
2. Understand Terminology and Process Requirements
3. Understand Your UV Measurement Instrument

For the letter 'R':
1. Radiometer Readings and Measurement Strategies
2. Regulate Requirements
3. Record

For the letter 'E':
1. Enabling, Environment, Efficient, Economical, Energy Saving
2. Education
3. Emerging Technologies

CURE

1. Consistency

The goal of successful companies is to produce good quality items that can be sold at a profit. Successful companies also minimise scrap or product that cannot be sold. To achieve and maintain quality and profit, production costs, time, throughput and materials all need to be established, measured, monitored and maintained at certain levels. A thorough understanding of your equipment and process is essential. Operating your UV process in a 'zone' or 'window' where it works best will optimise production and reduce waste, saving your company time and money. Different variables, almost all of which can be tracked, measured and controlled, have to line up for the UV process to work consistently at levels that produce quality products and profits.

2. Communication and cooperation

Involve all of your suppliers (formulator, substrate, UV source, application equipment, UV measurement, end user or your customer if applicable) early in the process and not just when you have a problem. When was the last time you showed your ink supplier a little love and thanked them for their support? Communication and cooperation between all parties involved is preferred to finger pointing and shoulder shrugging that can happen over time when something changes in your UV process. The majority of the time it is not a 'bad batch of ink' or a 'bad bulb' for why you are not curing but, instead, something has changed internally at your facility with the process.

This communication and cooperation should start before you are in production – while you are testing, qualifying and establishing your process and process targets. Your formulator should be able to supply you with some general 'starting' targets for the curing of a particular ink. These numbers, more than likely, will have to be adjusted for your equipment and process. To maintain process control once you have your target numbers, there are several variables that you need to monitor, maintain and document.

Decide as a company on how you will communicate within your building, with other company facilities and with your suppliers. Make sure that everyone communicates in the same language and clearly identifies units on radiometer values and the instrument which made the reading.

Examples of communication and specifying radiometer numbers

- Specify units in measurement to avoid confusion
- 300 mJ/cm^2 Start
- 300 mJ/cm^2 UVA (Specify Bandwidth) Improvement
- 300 mJ/cm^2 -UVA EIT 320-390nm (Specify bandwidth both letter and nanometer range and manufacturer of instrument) Best

3. Chemical reaction

UV curing uses chemicals. Work with your suppliers to understand the requirements for the safe handling, storage and proper disposal of any used/unused products. Examples include the return of used UV bulbs to the manufacturer and/or the disposal of inks that you may not need any more. Incorporate these requirements into your procedures and training.

cURE

1. Ultraviolet (UV)

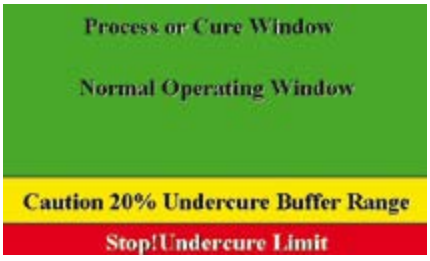
As with chemicals, users of UV need to understand the requirements for safely working around a UV source. This includes leaving manufacturers' safety guards in place and using eye and skin protection as required. Care should also be exercised before working on your equipment to make sure the electrical power has been tagged and locked off so that it can not be accidently turned back on while someone is working on the equipment.

The UV portion of the electromagnetic spectrum includes wavelengths from approximately 100 to 400 nanometers (nm). The spectral output of the UV system must be matched to the process and the chemistry. There are many types of bulbs available. The type of bulb used will depend on the formulation, equipment, type of process and desired results. Visible light uses with colour names (red, orange, yellow, etc) to identify spectral ranges. UV also has spectral ranges and these are identified by letters (A, B, C).

UVA: 315-400nm The UVA bandwidth contains the long UV wavelengths. Mercury type UV bulbs contain a major band of UV energy at 365nm. Most inks are formulated to respond to UVA. UVA provides adhesion of the ink to the substrate.

UVB: 280-315nm The UVB bandwidth assists with the curing of ink and provides toughness to the ink.

UVC: 200-280nm The UVC bandwidth



A diagram of a process window

contains the short UV wavelengths. The majority of UVC energy in this bandwidth is located in the 220-260nm regions. UVC is important for surface cure and determining the texture, stain, chemical and scratch resistance of an ink.

UVV 400-450nm The UVV (UV-visible) bandwidth contains the ultra long UV wavelengths. There is no precisely defined boundary between UV and visible light, and the boundary is considered between 400-450nm. UVV is an important bandwidth because, on a relative basis, it has the ability to penetrate better through inks, especially those that contain titanium dioxide. Additive (mercury-gallium or mercury-iron) bulbs, which are rich in longer wavelengths, are often used for opaque inks where adhesion or depth of cure to the substrate is a problem. The additive bulbs must be matched to the formulation and UV system.

System manufacturers can tell you what types of bulbs your UV equipment can use. Bulb types are not always interchangeable. Have a system in place at your facility to make sure that you have the correct bulb for your process. Buy your UV bulbs on value (stability, consistency, effective useful UV output over time) instead of the lowest dollar cost per unit.

2. Understand terminology and process requirements

RadTech International North America has produced a Glossary of Terms for UV Curing Process Design and Measurement. The glossary is posted on the RadTech website: www.radtech.org This can help all users and suppliers communicate in a common language when it comes to UV measurement and process control.

Irradiance is the radiant power arriving at a surface per unit area. With UV curing, the surface is most often the substrate and a square centimeter is the unit area. Irradiance is expressed in units of watts or milliwatts per square centimeter (W/cm^2 or mW/cm^2). Irradiance better describes the concept of UV arriving at a two-dimensional substrate than the word intensity which is sometimes also used. UV irradiance is important in your process because it provides the power or 'punch' to:

- Penetrate through opaque and pigmented coatings
- Give depth of cure and adhesion to the substrate

Radiant energy density is the energy arriving at a surface per unit area (cm^2) with joules or millijoules per square centimeter (J/cm^2 or mJ/cm^2) used as the units. The radiant energy density is the time integration of the irradiance with one watt for one second equaling one joule. In an exposure where the irradiance value is constant over time (square profile exposure), the radiant energy density could be estimated from this relationship. Most exposures in UV curing have the product move into an intense UV area and then out as it exits the UV system. The profiles with moving exposures are not 'square profiles'. To determine the radiant energy density in a moving exposure, the radiometer calculates the 'area' under the irradiance curve. In UV curing, the term 'dose' has commonly been used to describe radiant energy density. The radiant energy density is important for total and complete UV cure.

Establishing and documenting process control takes work. The best time to do it is when you are defining the process and working with your suppliers. The next best time is when the process is up and running. The worst time to document your process is when it is not working and curing is not taking place.

If you are trying to find minimum UV values, run tests in which you gradually increase the line speed until you produce an under cure situation. Document this failure point by recording the parameters – irradiance, radiant energy density, power applied to the system, line speed. I suggest building a cushion or caution zone of approximately 20% on your process window that allows for slight changes during a production run.

3. Understand your UV measurement instrument

Expectations of UV measurement instruments often exceed their actual performance. Users expect overall performance to be within a small fraction of a percent. Errors introduced with collection techniques can also lead to perceived problems with the instrument. It is

Continued over

important to understand and use your instrument properly and also use data collection techniques consistent with the instrument and instrument design. Work with the manufacturer of the instrument. Why do readings differ between instruments? What are some of the things to keep in mind when making and comparing readings from different UV measurement instruments?

Bandwidth variation: Manufacturers have different spectral bandwidths and spectral responses in their instruments. It is often hard to directly compare instruments because of these differences. Some instruments are classified as narrow band while others are broadband instruments. R W Stowe of Fusion UV Systems advocates adding identifying information to numbers, instead of just reporting 900 J/cm^2, report 900 mJ/cm^2 (EIT UVA) or 900 mJ/cm^2 (320-390nm) to avoid misunderstandings.

Data collection speeds: For repeatable, reliable results, a UV instrument needs to collect an adequate number of samples. Newer radiometers sample much faster than previous radiometers. If you see fluctuations in the irradiance values, try collecting your data at either a slower speed or increase the sampling rate on the instrument if this is possible.

Temperature: Long slow repetitive measurements with an instrument on high power UV sources can cause the readings to vary slightly. A good common sense rule if that if the instrument is too hot to touch, it is probably too hot to take an accurate measurement.

Calibration sources: Calibrating an instrument to one type of spectral source (mercury) and then using it under a second source (mercury-additive bulb) can lead to small differences in the readings. If you will consistently use the radiometer under a specific lamp source, ask the manufacturer to calibrate the instrument under that type of source.

Instrument ranges: What kind of results would you expect to get weighing a baby on a scale designed to weigh trucks? Probably not too good because the truck scale has a dynamic range set up for large objects. Make sure the dynamic range of your UV instrument matches the irradiance levels of your system. Too often, people try to measure very small amounts of UV with an instrument designed to measure high power sources. The instrument may register a reading but it may be out of the ideal range that it was designed for.

Spatial response: The spatial response of an instrument describes how the instrument handles light coming from different angles and is measured by the optics in the unit. Most instruments try to approximate a cosine response in their optics.

Electronics: Differences in the electronics between instruments can cause one instrument to reach threshold and start counting UV while another instrument needs a higher irradiance value to reach threshold and count.

CURE

1. Radiometer readings and measurement strategies

In order to measure UV, an instrument or sensor has to be exposed to the UV in your system. Instruments and sensors can be passed through, inserted into or mounted permanently into the UV system. Instruments and sensors can provide either absolute or relative numbers.

Absolute instruments: Instruments calibrated against a standard. For UV curing applications, absolute instruments most often report Watts/cm^2 or Joules/cm^2 for the spectral bandwidth(s) of the instrument. A radiometer can report the highest irradiance measured (peak irradiance) and/or a profile of the irradiance over time (irradiance profile). Absolute reading instruments allow comparison between different UV systems, different locations and between suppliers and customers; for example, a coating formulator and user of the material.

Relative instruments: Relative instruments provide feedback to the user on the 'relative' intensity of UV reaching the sensor. A display, monitor or output signal is adjusted (often to 100%) when conditions are ideal (clean

Three absolute instruments' examples

reflector, new bulb). The display will change as the relative intensity of the UV changes. Relative monitors are good for measuring UV on systems where the process window is small, where an absolute radiometer cannot be passed through or inserted into the system or where continuous feedback of the process is needed.

2. Regulate requirements

There are 'other' variables beyond the irradiance and radiant energy density values (Watts/cm^2/Joules/cm^2) that you need to document, monitor and measure in your process and equipment. Consider tracking the following:

Line speed/dwell time: The line speed/dwell time is important because it controls the amount of time that your product is exposed to UV. Faster speeds mean less exposure time to UV and slower speeds mean more exposure to UV. The relationship between line speed and the amount of UV (radiant energy density-Joules/cm^2) reaching your substrate is inversely proportional. Doubling the line speed will cut in half the radiant energy density. Check and confirm your line speed.

Hour meter: Many UV systems have an hour meter that allows you to track (with a little subtraction) the number of hours on the current bulb in the lamp housing. This number is worth tracking over time but keep in mind that the information it provides will only give you an estimate of bulb life. The hour meter does not indicate the number of UV system starts and stops, which can be hard on a bulb. The hour meter does not indicate if the bulb has been running hot or cool or if there is contamination deposited on the bulb's surface.

Amp meter: Many UV systems have an amp meter that allows you to track incoming electrical power. Keep an eye on the amp meter, especially if you are in an area prone to power fluctuations or if you find that you are close to the minimum amount of UV to cure your product.

Lamp power: The numbers associated with lamp power are often confused with the amount of UV reaching the surface being cured. Lamp power is the electrical power applied to the UV system. Watts per inch (WPI) or Watts per centimeter (WPCM) are the units with values typically between 200-600 WPI or 80-240 WPCM. The numerical value is calculated by:

$$\frac{\text{Voltage x Amperage (Watts)}}{\text{Arc length of the bulb (inch or cm)}}$$

The WPI/WPCM power applied to the system is not the effective amount of UV generated nor is it the effective amount of UV reaching the cure surface. Effective UV is the UV matched to your chemistry and process and delivered to the cure surface. The UV energy that reaches the cure surface is usually very small compared to the power applied to the system. A typical 300 WPI (120 WPCM) system may only have 0.5-4 watts per square centimeter (W/cm^2) of effective UV reach the cure surface. The value can vary tremendously between different manufacturers and system types. Do not use the applied power as a measure of effective UV reaching the cure

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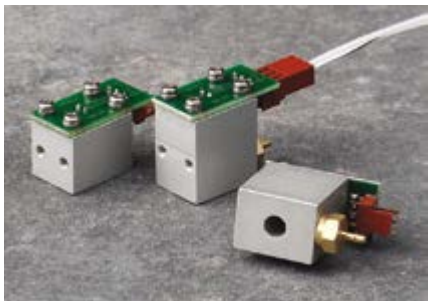
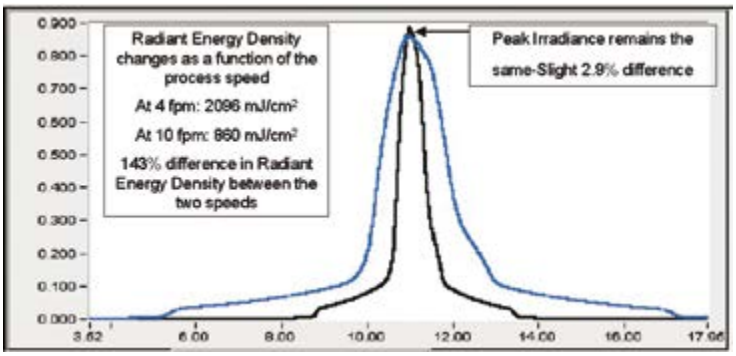
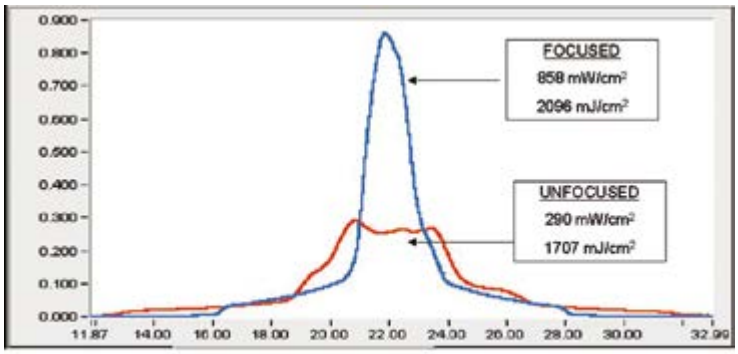


Two examples of relative sensors



Line speed variations: changes in the UV output when the process speed is changed



Reflector position: the same lamp and resulting UV in both focused and unfocused positions

The effect of moving the UV housing away from the cure surface

surface. Work with equipment suppliers and measure UV with a radiometer to compare different systems or power settings.

Reflectors: The reflector is one of the workhorses in any UV system. It is estimated that 60-80% of the energy that reaches the substrate is reflected energy. In order to maximize the amount of UV reaching the cure surface, the reflector has to be properly maintained and kept clean. Dirty reflectors can reduce the irradiance value by over 50%.

Spectral output: The spectral output of your UV system must be matched to your process and chemistry. There are many types of bulbs available. The type of bulb that you use will depend on your formulation, equipment, type of process and desired results.

Unique variables: Evaluate if your process has any unique variables which need additional monitoring.

For each variable above, decide how it is going to be monitored or checked, the frequency and who will be responsible

3. Record

Job, performance or process control logs should be used to track each of your UV systems. It is a central place to keep performance information on the system that can be referred to if things stop working. It can be as simple as a clipboard and log generated with a word processing or spreadsheet program. Track the items (both measurable and non-measurable) that are important for your process.

When things stop working, examine your log.

- Was it a gradual change over time towards the identified caution area or was it a sudden change?
- Any changes to the process?
- Equipment?
- Suppliers?

When things stop curing:

- Confirm key equipment settings and measure the UV
- Perform UV system maintenance and clean the reflectors, rotate the bulbs if possible, check cooling and air flow on the housing
- Measure the UV again, looking for improvement and movement back within the process window
- Replace UV bulbs or adjust key equipment variables until you are back in your process window

How often should you monitor and take UV readings? There is no easy answer and you will have to let the information that you collect and your process dictate the frequency of readings.

Remember that: UV measurement can't help you unless you document and record the readings!

CURE

1. Enabling, environmentally friendly, efficient, economical, energy saving

The five "E's" listed above were generated by RadTech International North America to describe the advantages of both ultraviolet (UV) and electron beam (EB) processes. The two other 'Es' that I like to include are:

2. Education

To be successful with UV, you need to understand the basic concepts about UV and your process. Documenting and maintaining your process is much easier than hoping that things work out. By reading this article, you are working to increase your knowledge about UV. Look to your suppliers, trade shows, conferences, web sites, trade organizations and webinars to further increase your UV and process knowledge.

3. Emerging technologies

The curing of inks with UV continues to evolve. New formulations and equipment make new applications with UV possible. One area of great interest is UV LED's, that continue to evolve and can be used applications including digital printing. Pay attention to changes and evaluate if they are right for you.

CONCLUSIONS

Three key points to remember from this article:

1. Understand your UV equipment and process and operate in the 'zone' where your process will allow you to optimise production, reduce waste and save your company time and money.
2. Measure and track both the UV conditions (irradiance and energy density) as well as the 'other' variables in your process
3. Work and communicate with all suppliers.

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THE BENEFITS OF IMD/ FIM TECHNOLOGY FOR PRODUCT DECORATION

The processes involved with film insert moulding are discussed by Dr Hans-Peter Erfurt and Stefan Zaeh

The film insert moulding technology was developed by Bayer MaterialScience, with the technology containing four processing steps of screen-printing, forming, trimming and injection moulding (back moulding). For this technology, Bayer MaterialScience supplies various PC and PBT blend films such as Makrofol and Bayfol, and hard-coated films, as well as a wide range of PC resins for injection moulding.

Pröll is a German manufacturer of screen and pad printing inks as well as specialised ink systems and adhesion promoters for IMD/ FIM technology. Precise high pressure forming machines are manufactured by Niebling (HDVF Kunststoffmaschinen).

WHAT IS IMD-FIM-IML-IMI...?

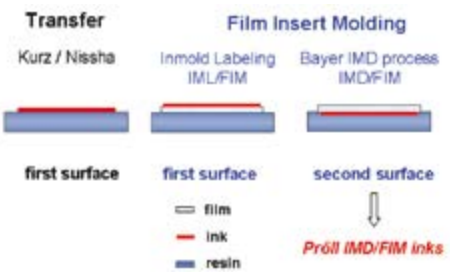
There is confusion of this definition in the industry. The Bayer IMD/FIM technology means that a second surface screen-printed film is formed, trimmed, then the film is inserted into the cavity of the tool and back moulded onto the ink directly. The final product is a kind of sandwich. The first surface is the film, the intermediate the ink and, then, the injection resin. The decorating ink is perfectly protected by the film material.

The transfer of lacquer and ink layers (mainly printed by gravure printing) from a carrier film onto the plastic surface during injection moulding is called Kurz IMD. The decorating ink is protected by a layer of clear lacquer.

In the packaging sector, the technology is called in-mould labelling. Offset printed PP labels are positioned in the moulding tool and then back moulded on the film side with PP. The decoration is on the first surface.

During the past 20 years new types of films, inks, primers, resins, machines, processing steps and applications have broadened the IMD/FIM spectrum. The technology has been developed for automotive interior applications. The VW Golf III light switch was the first part manufactured with IMD/FIM technology, however as a two film construction.

Besides automotive applications, IMD/FIM technology is nowadays used as well for the production of parts for smart and mobile phones, A/B covers, displays, keypads, as well as for the housing and keypads of laptops, in cosmetic packaging and for medical devices, amongst other products.



IMD process options

INK DEVELOPMENTS

Mainly high temperature resistant, formable solvent-based screen-printing inks are used for IMD/FIM technology. UV-curing screen inks are in development, but still have some disadvantages in comparison with conventional IMD/FIM inks. These include fewer opaque colour shades and a limited range of metallic colours. UV curing embrittles PC films, and UV-curable ink layers are difficult to overprint when completely cured. There is also limited formability and lower adhesion in the compound to the back moulding resin.

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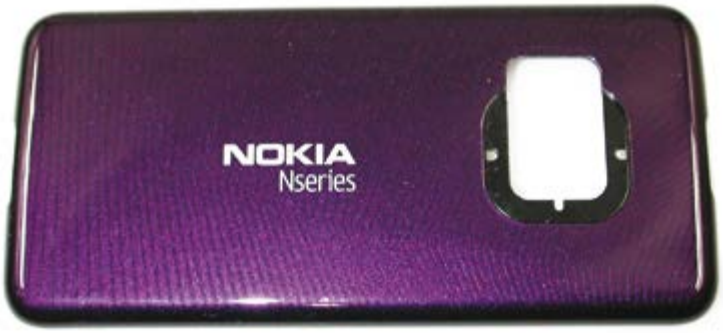
IMD/FIM process steps: Climate control panel of the Mercedes S-Class;



IMD/FIM cell phone cover, printed 3D depth effect in combination with mirror ink

IMD/FIM process colours and 3D effect printing

SCREEN-PRINTING TECHNOLOGY, INKS AND FILMS

Screen printing is the most versatile printing process. Fine details, large areas, transparent and opaque colours, lacquers and special pigments can be applied easily.

The outstanding brilliance and durability of screen-printed colours, compared with other printing techniques, are of the greatest interest for the decoration of design oriented IMD/FIM parts.

Night design applications, which are particularly important for climate control panels, keypads and switches, can be realised with screen-printing technology by processing transparent, semi-transparent and highly opaque colour shades.

Mirror, rainbow, chameleon, pearlescent, metallic, 3D effect and magnetisable inks can also be processed by screen-printing and utilised for IMD/FIM applications.

IMD/FIM ink systems must fulfill extreme requirements, such as adhesion to the film material, formability, resistance to thermal stress, and shearing during the injection moulding process.

PROCESSING IMD/FIM INKS

IMD/FIM inks are industrial ink systems and therefore not as easy to process as graphic screen inks. The inks are free of silicone and cyclohexanone and the latest formulations are free of halogen containing ingredients.

Before further processing (forming and back moulding), the screen-printed films have to be dried in a well ventilated box oven. For decorated PC films a tempering period of 3-5 h at 75-90 degrees C is necessary. Any solvent residues in the decorated films have to be removed to avoid pinholes, wash-out effects and delamination during further processing steps.

MATERIALS SUITABLE FOR IMD/FIM

Material diversity utilised in IMD/FIM process is getting wider and in progressing development. Here are some examples:

- Chemically resistant PA films decorated with halogen free Noriphan XWR, overprinted with a new PA adhesion promoter and then back moulded with a PA resin permit new exterior applications.
- Even thin aluminium films can be coated with NoriPress® SMK and then back moulded with PA resin.

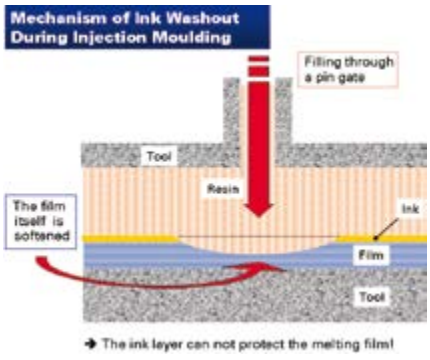
Traditionally, various substrates with high gloss or matt surfaces have been used in IMD/FIM technology. At present, new grades of film surfaces, such as anti-finger print, moth eye, anti-microbial, scratch resistant and hard-coated materials, are available.

FORMING AND MOULDING PARAMETERS

Any process, such as matched metal forming, thermoforming, hydroforming and high pressure forming, can be used to shape the

FILM	INK	ADHESION PROMOTER	INJECTION MOULDING RESIN
PC	NORIPHAN® HTR/HF	–	PC, PC/ABS, PMMA, TPU, Silicone rubber
	NORIPHAN® PCI		
	NORIPHAN® N2K	NoriPress® SMK	ABS, PA 6, PA 11, PA 12, PC
	NORIPHAN® XWR	NORIPHAN® HTR	PC, PC/ABS, PMMA, TPU,
		NORIPHAN® N2K	Silicone rubber
		NoriPress® SMK	ABS, PA 6, PA 11, PA 12, PC
PMMA	Noricryl®	–	PMMA, ABS, SAN
PET	NORIPHAN® N2K	–	PC, PC/ABS
	NoriPET®	–	ABS, SAN
	NORIPHAN® XWR	NORIPHAN® HTR NORIPHAN® N2K	PC, PC/ABS, PMMA, TPU, Silicone rubber
		NoriPress® SMK	ABS, PA 6, PA 11, PA 12, PC
PP corona pre-treated	NORIPHAN® XWR NoriPET®	PP-Adhesion Promoter in development	PP
PA	PA-IMD-Ink NORIPHAN® XWR	PA-Adhesion Promoter	ABS, PA 6, PA 11, PA 12, PC

Range of Pröll IMD/FIM ink systems



Mechanism of wash-out

decorated films. PC films, printed with IMD/FIM inks can be formed or stretched by 200 to 300 percent depending on the thickness of ink layers, without ink cracking and a change in colour or opacity.

High pressure forming machines have to be used if printed symbols or signs are part of the product design, and accuracy is a must. The decorated films are heated below their glass transition temperature and compressed air (up to 300 bars) is pressurised on the film surface.

Repeat accuracy is around +/- 0.2 mm, and the film surface remains unmodified after forming.

Otherwise, conventional injection moulding presses can be used for IMD/FIM technology.

The formed and trimmed films can be inserted manually into the cavity tool. To increase output and reproducibility, most IMD/FIM parts are manufactured in highly automated processes using handling units and vacuum exhaust cavities.

In the back moulding process, so called wash-out effects, are still a major issue for IMD/FIM one-film constructions. Wash-out occurs due to the heating of ink and film, and is strongly dependent on the friction of the melted resin. Temperatures up to 320ºC impact on ink layers and film material when pure polycarbonate is back moulded.

Cross-sections of gate areas indicate that the friction of the plastic melt heats the decoration ink and the film above their melting points and causes wash-out effects. Therefore, IMD/FIM parts are more successfully produced if indirect gate designs (film gates) or hot runner nozzles are chosen together with optimised mould flows. Mould cooling, especially on the tool side where the films are positioned, reduces wash-out as well.

In particular, the gating of the mould should be designed for the IMD/FIM one-film technique.

WASH-OUT BARRIER

Producing IMD/FIM optimised moulds is a technologically and economically challenging task. New ink developments, designed as wash-out barriers, protect the decorating inks and permit optimal adhesion to the injection moulding resin. The new flexible Noriphan XWR ink is such a barrier layer, but can also be used as decorating ink for various substrates.

Noriphan XWR is extremely wash-out resistant and peel tests show excellent values in cohesion in compound. Back moulding trials with conventional moulding tools showed good results concerning wash-out prevention using Noriphan XWR.

It is of the greatest importance to achieve durable laminate peel strength in the final IMD/FIM product.

The individual adhesion levels strongly depend on both the material combination and the process parameters. Application trials show that bonding is dependent on the decoration ink as well. Most of the decoration inks, especially metallic inks, strongly reduce the peel strength values compared with the adhesion to undecorated laminates. But, in most cases, peel strength of IMD/FIM parts is significantly higher compared with double sided adhesive tapes used for membrane switches. IMD/FIM constructions with Noriphan HTR lacquer or transparent colour shades and Noriphan XWR inks show excellent cohesion in compound and are practically not strippable.

CONCLUSION

IMD/FIM technology is an excellent and innovative method for the decoration of plastic parts. The versatile screen-printing process allows quick design changes and processing of fascinating effect pigment colours. Developments in films, inks, primers, resins and machines allow new impressive applications. Film insert moulding is an established technology; numerous products have been manufactured using this technique. But there are still a lot of plastic products, which could be improved and upgraded by IMD/FIM technology. ■

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ANTI-COUNTERFEITING IS BIG BUSINESS

Ralf Hipp discusses how to tackle the problems generated by grey markets and pirated products

Ralf Hipp

Creating long-term business-building customer relationships with brand owners is no longer simply about keeping a printing operation out of the red and in the black. With sophisticated fraudsters eating into brand market share, actively tackling and preventing widespread abuse in what is referred to as the 'grey market', is going to become an increasingly important way for printers to provide a value-added service.

A 2009 study by the Organisation for Economic Co-operation and Development (OECD) estimated that pirate products worldwide cost companies €184 billion – a 53% rise on 2007's figure. Research in 2008 by Alliance for Gray Market and Counterfeit Abatement and KPMG LLP, found the technology industry annually loses as much as $10 billion in profits while $58 billion of technology products pass through the grey market.

BATTLING THE GREY

The grey market transcends all product categories but it is in the pharmaceutical and cosmetics' industries that a particularly high risk is posed and brand owners incur huge losses because of pirate products. The knock-on effect in these industries is a big area of concern because they often use ineffective filling agents instead of genuine, more expensive medical substances, and cheap ingredients instead of high-quality cosmetic agents.

A widespread, copycat approach also takes place inside groups that produce globally. This grey market problem operates as follows: the same products are produced and marketed in different countries subject to different conditions. The manufacturers incur losses if the same product is re-imported and sold by dealers in a high-price area from a cheap production region. This disrupts the price structure and unfortunately maximises traders' profits. However, in the interim, the producer has to struggle with losses of brand value, quality and market shares as well as its own authenticity as a manufacturer of high quality in expensive production countries.

One way to tackle this is with seamless product tracking, allowing brand owners to fight back against the counterfeiters and protect their revenue and hard-earned brand reputations. This is why printing systems innovator Atlantic Zeiser Group, a leading supplier of technology, modules and system solutions for industrial digital printing, has created its Track & Trace Module.

This module first easily integrates into a new or existing print packaging production line and enables users to include all standard product tracking codes on the packaging. The codes include GS1 (Global Standards 1), all types of numeric codes, and 1D (multi-position barcode) or 2D barcodes ('pixel images'), which are used to check the legitimacy of the packaging and product online. Track & Trace also includes an optical checking system. In just one step cameras automatically read and verify the selected layout and check the digits. The solution affords users maximum flexibility when it comes to late-stage customisation. If the check code does not match the reference data, the module rejects the packaging following the check. The assigned Track & Trace code can then be added to the packaging in a subsequent print run.

CREATIVE NUMBERING MAXIMISES PERFORMANCE

Barcode use has developed significantly during the last five decades with hundreds of different types of barcodes used globally. Some companies have their own structures for different sectors. For example, Post AG, German Post and parent company of DHL worldwide (in the post and logistics' sector) uses both a datamatrix code and a special yellow-orange 1D barcode with the most important address information for letter postage worldwide. The exceptional selection of colours enables Post AG alone to read this barcode with special reading devices. The pharmaceutical sector also uses general valid standards based on the stipulations of GS1 (Global Standards 1) for its specially created datamatrix code.

2D barcodes are understood, for example, as meaning the QR code, datamatrix and others. These 2D barcodes can have error-correction data so that incorrect readings can be corrected independently. Datamatrix codes can display more information and data by a factor of 100 than a 1D barcode. As a result, durability and expiry data, series and product numbers as well as comprehensive manufacturing information can be represented and read on the smallest space. The versatile

bar and pixel code is distinguished from the outset by its machine readability and the compression of large quantities of data within a small space on packaging and labels. Machine identification and assignment of products based on low production costs are the order of the day.

However, these identification characteristics also come up against limits. Open access for everyone conceals a security risk. The codes are easy to copy and read. The barcode has to be printed on a contrast-rich, reflection-free surface so that it is easily readable. This is compounded by the fact that contamination and poor printing quality can make the features unusable. Encryption options exist in order to guarantee security.

READABLE FINISH FOR QUALITY RESULTS

Industrial digital printing offers the required quality on the most divergent substrates in order to make the data and information legible on a product, label or packaging. A range of advantages emerges with digital printing for printing barcodes. Today, ink-jet printers achieve high levels of quality and can achieve significantly smaller readable fonts of 2 points and height contrast. In addition, the latest ink developments allow for printing of packaging, product or label on almost any surface.

Atlantic Zeiser has developed inks which reliably adhere to cardboard, plastic, artificial surfaces, metals and even glass. Digital printing offers the possibility of achieving a 100% test quality through re-legibility within the process, with the help of camera test systems. Finally, digital printing with late-stage customisation offers the greatest possible cost efficiencies through direct data and information adaptations in the printing process. Long waiting and preparation times are completely eliminated. Therefore, industrial digital printing is the benchmark of cost efficiency during the application of test characteristics, just as the barcode itself is the least expensive solution for machine product identification.

ALTERNATIVE RFID CHIPS

One important and developing alternative is product identification with RFID chips (Radio Frequency Identification Device). RFID is the technology of the future with regard to security and data volume. The barcode is, and remains, the least expensive method in the area of cost efficiency. RFID chips are not only used extensively today in goods' logistics, but also in the passport sector. For example, biometric data in passports is saved on these chips. Atlantic Zeiser recognised this future-orientated technology early and has already integrated the programming and description of RFID chips in its end-to-end system solutions within its card-system skills' area. Its technology uses multiple read/write heads that rotate on a drum together with the products to be programmed, enabling the encoding of several chips simultaneously without the need to stop the product flow.

The code is stored on a chip integrated into the product. A transmitter-receiver system then allows the code to be read back without the need for direct visual contact between the scanning device and the product label. This enables Atlantic Zeiser to combine traditional identification with future-oriented personalisation technologies.

As the RFID market is growing disproportionately due to the drop in its chip prices, this technology is able to extend its scope of activities to a larger number of applications such as Smart RFID Labels and Smart RFID Tickets.

For printers looking to differentiate their offerings and provide end users with real-time solutions to their security needs there are a number of options to meet any requirement and any budget. At the same time, investment in these solutions help combat a very real profit damaging threat faced day-in day-out by brand owners. ■

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SATISFYING THE FABRIC OF THE FUTURE

Monica Cingolani outlines the influences of digital textile printing in line with consumer demands

All the most important studies of the branch are clear: digital printing will continue growing in the next few years thanks to its versatility and the evident reduction of lead-time on the market. This is a winning combination since it represents one of the critical success factors for every company.

CONSUMER TRENDS: "B2C REQUEST SHINES ON THE PRINTING FUTURE"

The request rules! Trendwatching – one of the most influencing voices USA market research – has published a report concerning the ten basic trends that will guide the world's consumers in 2010-2011 and, surely, influence the request of consumer goods and their manufacturing. It is easy to discover the reason why digital printing has a brilliant future if we examine some of the trends indicated in Trendwatching…

Urbanisation The world's population transfer from country to towns implies a consumers' evolution, since they are becoming more sophisticated, studied and demanding in front of a wider and multiple range of offerings.

Luxury A new concept of luxury has been born. Far from being an expansive image, it is built on the concept of uniqueness and exclusivity.

Eco-choice Ecology is becoming a factor of choice. This a decision based on awareness of reducing polluting packages, of using recycled components and favouring brands that are traditionally focused on carrying out eco-compatible politics.

DIGITAL PRINTING: "A VARIABLE WHICH SATISFIES THE REQUEST"

This is a conscious request based on an equation that digital technology has solved and can be applied to all printing sectors, especially to the textile area where a 5% global increase of year on year volumes is forecast. This encompasses signage, interior decoration, and technical textile applications for clothing. If the trend-settling growth of signage, which is a consolidated digital printing segment for textile, is less relevant according to the forecast, the other textile fields can expect more than 10% growth.

In the next three years, digital printing is bound to bring down the competitive technologies of these traditional textile sectors:

Clothing Today digital direct printing allows the reduction of 'lead-time' of the traditional manufacturing line, encompassing bathing costumes, sportswear, fashion and haute couture, underwear…

Digital printing fulfils fashion time since it enhances the offering, being wide and sophisticated, and transforms 'couturier' creativeness into an item of a unique cult.

Interior decoration The conversion of dyes – traditionally used in textile printing – into a 'digital version' has allowed a reduction of process costs while maintaining high performance. This new front line lets the production of curtains, carpets, home décor and wallpaper overcome the limit of printing runs. Thanks to digital printing, the consumer can today become the designer of his or her own life-Style and an incredible luxury experience becomes as well practical and realisable.

Industrial technical fabric Until now, printing on industrial technical fabric was unthinkable for market segments such as automotive, sails, medical instruments and working clothes since they require high standard general fastness to satisfy highly restrictive rules and specifications. Digital printing makes it possible and even offers customised solutions within these fields.

THE CONQUEST OF NEW MARKETS: "IT DEPENDS ON TECHNOLOGICAL PARTNER AS WELL"

To conquer textile growing segments, a versatile and complete proposal is necessary to give a direct, credible and quality answer to consumers' demands. An offer shaped on actual trends anticipates the future ones and this goal makes it indispensable to have a technological partner who can:

- give a complete range of inks designed for direct printing: reliable and based on a deep knowledge of the traditional printing process
- offer 'avant garde' products for the consolidated display market which can be from an ecological point of view profitable: today ecology becomes a factor of choice
- give a wide tested and recognised product for sportswear attesting its brand awareness
- include a product range with high level specifications expressly designed for industrial textile market

KIIAN GROUP: "THE TECHNOLOGICAL PARTNER"

As a trustworthy technological partner, Kiian's proposal includes water based inks with reactive, disperse and acid [Digistar SK, Digistar CT, Digistar DYS] designed for direct printing. Sublimation products are Digistar PES HD-ONE, Digistar PES DUAL and eco-solvent options, totally risk labelling and phthalate free, come under the Digistar Signy name. These solutions are the proof that we believe in – guiding values which, as always, move with tradition, innovation and environmental respect. ■

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TAKING THE ROUGH WITH THE SMOOTH

Tobias Krämer describes how temporary floor graphics can be used in exterior locations

Another example of front of stair graphics by Visucom for Oakley

Floor graphics have become quite important in advertising during the past decade – they get very high attention.

Until recently digitally printed output for short term advertising could only be applied on smooth surfaces indoors. Outdoor solutions meant, usually, that you needed to paint the information onto the tarmac which, thus, was not easily removable. There was no good option for your digitally printed graphics to be used as temporary advertising on rough exterior surfaces.

Parking lots, roads, sidewalks and the fronts of stairs provide the perfect advertising space if you are able to meet the challenges which are obvious – different surfaces, temperatures, mechanical wear and people's safety. And last, but not least, you want your printed advertisement to look good no matter the type of surface to which it has been applied.

First of all, of course, you need a digitally printable film that can be applied on rough surfaces and can easily be removed again without residues. For this purpose Aslan, an internationally operating manufacturer of self-adhesive films, has developed a special film which can be printed digitally. This glossy white PVC film allows printing with virtually all major inks so that solvent, eco-solvent, UV-curable and latex formulations can be used without any problem.

ADHESIVE SECRETS

The secret of the vinyl lies in the adhesive. Aslan's special formula allows the adhesive to creep into the cavities of the rough surface of tarmac or stone. Treated with heat, the vinyl adapts perfectly to the surface. Streets and parking lots are never clean but this film even sticks to dirty surfaces because of its adhesive.

In order to protect the print from soil and abrasion, and also to make it safe for people stepping onto it, the digital print film always has to be used in combination with a corresponding laminating film. This laminate has an embossed anti-slip texture and an insurance warranty is available against possible damage caused by slipping.

This outdoor floor combination is specifically developed for rough surfaces. To make an advertisement last for at least six months, care must be taken to apply both films flush at the edges. A heat gun should be used for application of the whole composite.

On rough surfaces the film can be heated with the heat gun and then pressed into hollows using a moist cloth. This will enable it to adhere perfectly to the surface.

For the best application, the surface should have an adherence temperature of at least 10-15ºC. It should be dry, firm and if possible free of grease; the temperature shouldn't drop much within the next 72 hours.

It is also helpful to degrease oily surfaces with a little benzine, which should be dried off. The surface onto which the film is to be applied must be swept free of dust and dirt, as well as being free from grease. To prevent the film from coming apart at the edges it is recommended to give the advertisement rounded corners.

This application opens manifold possibilities. An advertisement for a customer retention programme with a current promotion will work well in a supermarket's parking lot.

A great option, which is relatively new, is the so-called stage branding. The advertisement is formed on the fronts of steps which is both very eye-catching and allows for striking effects to be produced. If the steps have a smooth surface Aslan offers another digital print film for this purpose. This film has a special adhesive which allows the same application to be used on the fronts of stairs and on walls, if they are smooth.

Last but not least – in order always to be up to date with your advertisements you'll want to change them according to the season, or timed for events and promotions. The vinyl can be cleared away without any residue after several months if you treat it with a heat gun during this process, and then remove it carefully. ■

Digitally printed advertisements being applied to rough surfaces

Stage branding by German company Visucom, Berlin, for Adidas

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IMPORTING CHEMICALS FROM OUTSIDE EUROPE

Elaine Campling explains the compliance and responsibilities fast approaching with the REACH and CLP Regulation deadlines

The 1 December deadline for the first wave of REACH substance registrations is fast approaching and will be upon us some three weeks before Christmas! Higher hazard and larger volume (to the European market) substances must be REACH registered in this first wave, with tiered volume registration deadlines following in 2013 and 2018. Also, ahead of Christmas is the requirement for substances to be classified, labelled and packaged to the CLP Regulation from 1 December 2010.

It is often perceived to be manufacturers of chemical substances that have the primary REACH registration and CLP responsibilities. However, many importers (from outside the EU) will have REACH registration responsibilities and additional CLP duties. Failure to comply could disrupt supply and lead to prosecution. The coinciding timing of the REACH and CLP requirements is reported to be burdensome for larger organisations. The compliance capabilities at the SME (small, medium enterprise) level is, therefore, likely to be troublesome, especially given that the scale of imports may be quite small, but nonetheless significant, such as that of a printer importing a range of printing inks, or chemicals for cleaning equipment from outside of the EU. The measure of success of the various campaigns to inform organisations of their duties on all levels, and consequently in judging the level of understanding from actual compliance, will undoubtedly become more evident as we progress through the REACH process.

It is not just manufacturers and larger organisations that have REACH and CLP duties, importers of chemical products, such as printing inks from outside the EU must comply with the requirements.

The following is an overview of importer duties, without intended jargon or reference to complex legal text. For the purposes of this review, an importer will be considered an importer from outside of the EU. The focus will be chemical substances and the products that contain them; for example, the requirements for articles will not be addressed. For a complete understanding of the legal duties, the legal text of the regulations must be consulted.

REACH REGULATION (EC) 1907/2006 – REGISTRATION

An importer of a chemical substance(s) in quantities of 1 tonne or more per annum will generally have registration duties. Registration is not required in the following (non exhaustive) circumstances:

- **The substance in exempt**
  There are a few exemptions to the registration requirements for substances used within industry, e.g. polymers meeting the REACH polymer definition are exempt from registration, but monomers and other substances that make up the polymer are not.
- **The manufacturer from outside of Europe has engaged the services of an 'only representative' in Europe to conduct registration duties**
  Manufacturers from outside of Europe cannot themselves register, as registration can only be completed by legal entities located within Europe.
- **The substance has previously been registered and exported from Europe and is therefore being re-imported and is in the same supply chain.**
  The re-importer must be able to demonstrate that the re-imported substance is the same as the one that was originally exported if required.

Substances in mixtures, such as printing inks and cleaning products are also subject to registration if the one tonne/year 'per substance to the organisation' limit is exceeded. In order to properly take stock of substance volumes, such as an individual substance in a range of printing inks, it may be necessary to ask the supplier from outside of Europe to provide formulation details, unless it is certain that the imported volume of each individual substance is below one tonne per annum limit. A system will need to be put in place to keep an accurate record of volume for each potentially qualifying substance that could be in a range of imported products and timely action taken if necessary to avoid disruption to supply.

An organisation, such as a printer that imports a non exempt substance, on its own, or in a mixture, in quantities of one tonne or more per annum has REACH registration duties.

Organisations that imported qualifying substances before 1 December 2008 were required to pre-register them with the European Chemicals Agency (ECHA) in order to continue to market and use them legally. Organisations that import for the first time (after the pre-registration deadline) are permitted to undertake late pre-registration and still take advantage of the registration phase in transitional periods, for lower volumes and less hazardous substances.

Importers must also familiarise themselves with the article definition, since many imported products are perceived to be articles, but are actually regarded as 'special containers', since the substance or product contained within, is more important than the means of containment itself e.g. a filled toner cartridge.

CLP REGULATION, (EC) NO 1272/2008

Classification, Labelling & Packaging:
Importing is defined by the REACH and CLP Regulations as placing on the market, even if the imported chemical is for your own use. Importers are also therefore required to classify, label and package imported substances to the CLP criteria from 1 December 2010. It will therefore be necessary to understand the principles of classification and/or have software solutions in place. New label stock, i.e. with the red bordered pictograms, will be required and any necessary packaging changes made.

Importing = Placing on the market. Importers must classify, label and package to the CLP criteria from 1 December 2010.

The Classification and Labelling Inventory – Notification:
For the purposes of establishing a classification and labelling inventory, importers of hazardous chemical substances from outside of Europe must notify ECHA of the following, regardless of the quantity imported i.e. without tonnage limit:

- Identify of the notifier (or notifiers, in the case of group notification)
- The identity of the substance
- The CLP classification of the substance
- Specific concentration limits, or M-factors where applicable
- Specific labelling elements for the substance, including hazard pictograms, signal words, hazard statements and supplementary hazard statements

- Supporting information as required

The requirement to notify ECHA includes hazardous substances in mixtures, e.g. printing inks, if the substance is present in the mixture above concentration limits that trigger classification of the mixture as hazardous (according to the classification criteria of the CLP Regulation, or the Dangerous Preparations Directive).

Notification is also required for substances imported in quantities of one tonne or more, whether hazardous or not, on its own or in a mixture that will not have already been registered by the end of 2010, i.e. substances with 2013 or 2018 registration deadlines.

An only representative cannot submit a notification, unless included as part of a registration dossier. Therefore substances that are subject to registration by an only representative after 2010 must also be notified.

The notification must be in the format specified by ECHA and is to be submitted on-line via REACH-IT. The CLP Regulation requires notifiers and registrants to make every effort to agree a classification in the case of differences. Differences in classification are permitted when justified, e.g. differences in purity. However, when a harmonised classification has already been agreed, the classification must be in accordance with that listed in Part 3 of Annex VI to the CLP Regulation. Changes in classification must also be notified; i.e. notification is not necessarily a one off event.

Since it is only EU based manufacturers of substances and importers of substances or mixtures that have are obligated to notify, it is only the importer who has to notify a substance contained in a mixture, when the substance is hazardous (triggering classification) or subject to registration.

Qualifying substances imported on or after 1 December 2010 must be notified within one month of being placed on the market – due to the timing of the holiday period, the first deadline for notification is 3 January 2011.

Importers of hazardous substances/ substances in mixtures triggering classification are required to submit a notification to ECHA.

Notifiers must inform ECHA if the classification and labelling of the substance changes.

Substances with 2013 or 2018 registration deadlines imported in quantities of one tonne or more must also be notified, regardless of whether the substance is hazardous or not.

CONCLUDING REMARKS

Member states have enforcement regimes in place with appointed Competent Authorities (CA) to manage enforcement arrangements. Co-ordinated efforts between member states on enforcement projects and joint inspections are proposed. Enforcement bodies will also be supported by additional resource, such as customs authorities.

Downstream users, i.e. manufacturers of mixtures using substances purchased from within Europe and users of their products, though not without REACH duties, do not generally have REACH registration duties, or CLP notification responsibilities, regardless of whether the one tonne limit is exceeded.

Downstream users do not generally have REACH registration duties, or CLP notification responsibilities, regardless of whether the one tonne limit is exceeded.

BE PREPARED

It is extremely important for importers to be fully aware of their duties. Transitional arrangements should be checked, along with any exemptions that may apply. Keeping stock of volumes will be very important to some organisations, which may also be required to instigate early warning systems. Guidance is available from member states, ECHA, trade organisations and other interested parties. It is ever more important to 'know your supplier'.

ESMA

Driving Print Excellence

Contact suppliers to verify REACH status; check labels and safety data sheets for compliance to both REACH and the CLP Regulation. New label stock may be required, as well as software solutions.

ESMA Member Companies are on hand to offer help and advice. If in doubt, ask your ESMA Member Company for assistance or contact ESMA directly. ■

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GLOBAL INK SPECIALIST MOVES WITH INKJET TECHNOLOGY

INX International Ink Co is the third largest producer of specialist printing inks in North America and the world's leading supplier of water-based flexographic inks. Manufacturing formulations for offset, gravure, flexographic, metal decorating and UV, INX is the only major ink supplier to produce its own coatings.

A global supplier of raw materials purchase, manufacturing, logistics and collaborative research and development as part of Sakata INX worldwide operations, INX International Ink Co was formed in 1992 but has origins dating back to 1896, when the company was founded as Sakata Ink Seizouho. North American corporate headquarters are based in Schaumburg, Illinois, a suburb of Chicago. A state-of-the-art research facility is located nearby.

"In 2006, INX purchased a majority interest in Triangle Digital" explained Bryce Kristo, CFO and Senior VP, General Affairs. "A year later, we acquired a 100% interest in Innovative Solutions and in 2008, our acquisition strategy was completed with a majority interest deal in Megaink and Anteprima."

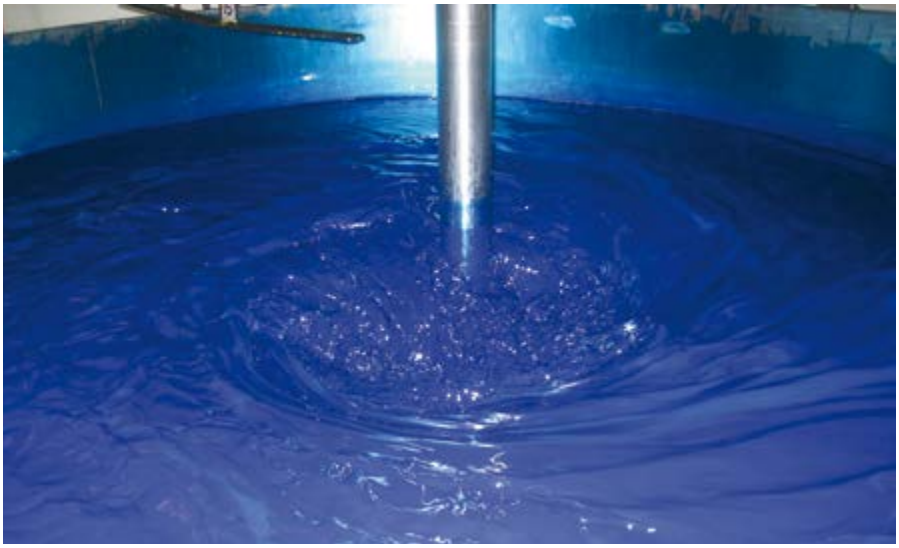
According to Mr Kristo, each step provided growth and together with organic initiatives, this complete network provides INX with a global company that is integrating among the partners including Sakata INX. "Last year, we legally restructured all of the joint venture elements under INX Digital International, so now every minority interest has common ownership in the group" he confirmed.

"The growth has been organic from the aftermarket approach" suggests Bryce Kristo. "The consolidation of the group and the presence of Sakata INX have given INX Digital International credibility as a serious OEM ink provider as well."

CONSTANTLY EVOLVING MARKET

INX Digital Americas President, Ken Kisner has witnessed the continued evolution of digital printing in many industrial markets, from wallpaper and ID card printing to printing on glass. "Digital printing has allowed mass customisation, so companies can target specific demographics for their customers" he observed. "As the speed and quality of ink jet technology continues to increase, it will allow companies to afford short-to-mid size runs with variable information."

Bryce Kristo added that the economic downturn has reduced the number of machines being purchased. "That has impacted the steady rising growth that was evident before the second half of 2008".



Production of cyan ink

EXPERIENCED MANAGEMENT TEAM

INX International operates more than 30 facilities in the USA and Canada. A $1.1 billion company with a worldwide presence, it has more than 3000 employees.

Key members of staff include Hirotsugu Takamaru (President, Sakata INX), Dr Kotaro Morita (Director, Sakata's International Operations Division and Chairman of the Board of INX International), Yuichi Kataura (Sakata's Chief Technical Officer, Director of Research & Development for INX International and Senior VP on the INX Board of Directors), Rick Clendenning (President and CEO of INX International) and Ken Kisner (INX Digital Americas President).

Each of the founding members of the various acquisitions has remained with the organisation, many being pioneers in ink jet applications going back 10 years. The only exception is the untimely and sad passing of Brad Kisner, who was President of Triangle Digital INX when he died last July.

"Group synergies include relationships with numerous print head manufacturers, printer manufacturers and distributors that were at the core of their original success and are now leveraged across our global group" Bryce Kristo confirmed. "All of the partners among the original acquisition members have seen the consolidation of the group form together as a strong, global company with over a century in colour chemistry as a positive move."

"When we began in the ink jet industry in 1994, we focused on the customer" added Ken Kisner. "We listened to what they needed, made significant alliances at that time and we helped one another to succeed."

MARKET DEVELOPMENTS

The company's core product line includes traditional solvent-based chemistries. Through recent collaborative efforts, however, a new line of UV and bio inks has also been created that is more suitable for the environmentally focused aspects of the market.

"Since Triangle Coatings (the original company) began making paint in 1932, we have maintained a strong foundation in coatings and paints" explained Ken Kisner. "We manufactured Bulletin Enamels for hand painted signs and understand what it takes for outdoor durability so that's why we grind our own pigments from scratch." The company has 80 years of combined knowledge of pigments and formulation. "Our understanding of the outdoor advertising market is what has allowed us to succeed in developing inkjet ink demand for this same market."

Bryce Kristo reports that 2010 represents

Continued over

the company's best year to date, having restructured the group in 2009 to act as a global unit. "Now, we can serve the market in a number of ways including OEM chemistry, software and electronic development components for inkjet print engines, the integration of digital applications in traditional analogue lines and alternative chemistry and service to the OEM."

Late 2009 and early 2010 saw a surge in demand for the organisation's UV curable inkjet product line, which allows customers to print directly onto many plastics and cardboard substrates. These printers are rapidly taking over the billboard marketplace but also allow users to print specialty items.

"Making reliable inks means having the technology and knowledge in many fields, including print heads, chemicals, media, manufacturing and inkjet hardware" commented INX Digital's Paulo Capano. "The competition in any industry for consumables is hard. Our industry is evolving very fast and in between the big inkjet players, we see an opportunity in the third party ink market. INX Digital can express the potential of a structured company with the proper resources in order to be aligned and ready to meet the market's needs and demands."

In North America and Europe, INX Digital is seeing growth in the UV printer business but in price-sensitive markets like much of Asia, South America, Eastern Europe and parts of the Middle East, solvent-based products continue to dominate.

"The 30 year old man is evolving in many directions" remarked Paulo Capano. "All traditional industries are looking for some digital equipment but the display graphic market is growing very fast. The market is dedicated to flags and decoration and the textile market, which includes fashion textiles, was one of the first to evolve to digital 10 years ago. There is some geographic expansion, particularly in India, Africa and South America."

When considering the keys to good customer relationships, Ken Kisner believes products will always speak for themselves. "We have found that how you react to your customers' needs is the key to customer relations. Every department at INX Digital is focused on our customers… we know who puts dinner on our tables… our job is to understand the customer's business and help them succeed."

Paulo Capano confirmed that a combination of professionalism, a high level of technical support, loyalty, consistency and a high quality product all contribute to good customer relationships. "Together, these elements produce a high level of trust" he suggested. "Any company that can achieve a high level of trust will be relevant to the customer. A relationship built only on price won't have the durability to last!"

DEVELOPMENT INITIATIVES

INX Digital continues to invest strongly in technology, its modern application laboratories in Europe and the USA allowing the company to finetune formulations, which optimise the long-term jettability of its products. "We've hired electrical engineers, mechanical engineers and colour experts to ensure that whatever product we make will not only perform optimally but also gives our customers maximum uptime with a carefree product to help them compete strongly in their markets" suggested Ken Kisner. "We are focused on new markets and helping our parent companies 'evolve' to digital. We have assembled a strong team that understands inkjet and will help this large customer base make the right decisions to succeed in inkjet technology."

In particular, the 'Evolve' programme represents an important strategy for the next five years to help traditional printers move to inkjet technology. "Our field service tech group, internal technical staff and R&D group are all working towards helping this customer base succeed" Ken Kisner explained. "We are also developing specialised UV inks that will meet certain food packaging regulations, as well as water-based inks that are durable for outdoor signage."

INX Digital has defined the words BIO and ECO and established its own standards, so customers know exactly what they are getting with the organisation's products. "This is in line with our environmental stewardship programme and green certification" Mr Kisner confirmed. The certification was backed by the Environmental Protective Agency (EPA) and the Department of Toxic Substance Control and assures that INX Digital facilities are not only run in compliance with all environmental regulations but further requires the company to achieve much higher standards on energy consumption, recycling and controlling waste from the start of production.

"Our BIO standard rates each of our products as a percentage of renewable resource" Ken Kisner continued. "For example, we are finishing formulations of BIO50 (which contains 50% renewable resource) and BIO25 (25% renewable resource)." The task has been to increase the use of renewable resource, while continuing to focus on products that exceed customers' expectations.

"Our ECO standards will grade products on the environmental and human safety effects of the formulation" Mr Kisner suggested. "We have developed 10 criteria to determine the ECO rating to determine whether or not the product has hazardous air pollutants, toxic air pollutants, the odour level and other items that affect the overall friendliness of the product. We are working closely with NAPIM (National Association of Printing Ink Manufacturers) to give this either a national or global acceptance as a standard."

DRAMATIC INDUSTRY CHANGES

According to the INX Digital Americas President, the specialist printing industry has changed dramatically in recent years. "In 1995, companies buying digital printers were regarded as renegades. They were generally entrepreneurs who were taking a risk but today, the industry is dominated by multi-national companies, focused on volume and quality. And from a technology standpoint, the printers have also evolved dramatically. Our first ink set was for airbrush machines that were printing at 9 dpi. Now, with the advent of new print heads like Kyocera that prints at 600 dpi in a single pass at 150 metres per minute, we are approaching a new industry."

Mr Kisner maintains that the growth of digital printing has affected so many areas, allowing users to print one-offs, for example. He believes inkjet printing is efficient as there is very little waste when compared to traditional printing. Furthermore, printing on demand reduces global inventories and gives customers products when needed.

The print head cleaning operation.

INX Digital's R&D facilities

The sales and administration office at INX Digital Italy Srl in Fagnano Olona

The European operation facilities at INX Digital Czech as in Prague

In the opinion of the INX Digital Americas President, every market is different and the challenging part of a global business is to understand cultures and communicate clearly. "When a new technology reaches the market, for example, Asian customers adopt it very quickly, while Europeans are currently pushing inventions to develop faster machines for new markets."

In addition, Paolo Capano believes that thanks to innovation and competition, the digital industry is becoming more industrial. "The 'quality' factor helps protect western market products (Europe and the USA) against Chinese exports" he suggested. "The Chinese are attractive for their low prices and that is good enough for some markets."

FUTURE OPPORTUNITIES

Ken Kisner suggests that reduced inventories, customisation for test marketing and advertising are allowing inkjet to dive into packaging, textile and other markets, where the technology is beginning to emerge. "We predict a huge growth in these markets over the next 5-10 years" he confirmed.

"Digital is all about possibilities and creativity" said Paulo Capano. "With digital, it is possible to do many things that aren't possible or are problematic in the traditional industry. Speed is an issue. Technology is growing very fast in the digital industry and in many ways, certain applications can only be made with digital."

Growing market opportunities for inkjet anticipated for specialist printing in general and for the company in particular include corrugated, packaging, ID cards, textiles and glass. Fashion is cited as a good example where digital technology is opening up a new era for textile image creativity. "In Como, Italy, the capital of WW silk quality" suggested Paulo Capano, "there are more than 700 digital printers running on many kinds of fabric, so digital is a trend of the market. What once was impossible on the traditional side is completed in just hours with digital printing. You name it – how many colours you want, how fast, what quantity and dimension and in high resolution. All of this is possible because of the digital industry."

Dominant strategies at INX Digital involve helping customers to prosper, while also identifying different market opportunities and continuing to innovate. "Understanding the needs of the market and applying proper technology products will go a long way" Paulo Capano concluded. ■

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SGIA 2010 PROVES TO BE A RECORD BREAKER

According to the show's organisers, this year's SGIA Expo broke all records, with nearly 22,000 registrations and a strong list of exhibitors comprised from 487 companies. This event took place in Las Vegas in the middle of October and it's interesting to note that, also recorded, the percentage of first-time attendees was almost 40%.

Industry sponsors of the event reflect the influence of wide-format ink-jet print on the SGIA Expo, with those at a platinum level being Agfa Graphics, Durst Image Technology, EFI and HP, and the two gold level sponsors being INX Digital and Roland DGA Corporation. These companies are all strong representatives within the digital arena. But this shouldn't detract from the relevance of the exhibition to all those involved in the area for specialist print, including the screen process.

"The SGIA Expo is the rallying point for the speciality imaging community," states Selecto-Flash's Joe Shondel, SGIA's outgoing board chairman. "It is only at the 2010 SGIA Expo that you'll see the latest technologies to support new business opportunities, new markets and total solutions for your customers."

Visitors were also able to discover new business strategies at SGIA's first-ever Pre-Expo Business Development Conference. This took place the day before the show's doors opened for the first time. Here there was ample opportunity for attendees to connect with industry peers at more than twenty educational sessions, expert advice zones and industry networking events.

Certainly, at the event itself, there was rich representation from all of the major names within the specialist printing arena. Although 2010 has been a year where major exhibitions have been dominant on the worldwide calendar, the main powers were all out in force. New printing machines joined existing equipment, with the emphasis on opportunity and, of course, the drive for greener and more sustainable output.

Busy aisles show the popularity of this year's SGIA Expo

SGIA has already confirmed that all its sponsors from this year's event will return next year as partners of the 2011 SGIA Expo which moves back to New Orleans, and runs from 19 to 21 October. Through continued sponsorship of the SGIA Expo and the greater SGIA community, these sponsors are committed to strengthening and expanding the imaging marketplace and the industry's leading exposition.

"SGIA does a great deal of beneficial work for the industry as a whole," comments Chris Howard, senior vice president of sales and marketing at Durst Image Technology. "This extends far beyond the Expo and presents itself in many other areas that the association works on for its members. SGIA is very focused on innovation within the industry."

"With the continued year-round support of industry-leading companies, SGIA consistently offers access to the widest range of imaging technologies, educational programs and networking opportunities to an ever-expanding specialty imaging marketplace," says Michael Robertson, SGIA's president and CEO. "The SGIA Expo – the community's exposition – is the strongest North American trade show serving the global imaging marketplace." ■

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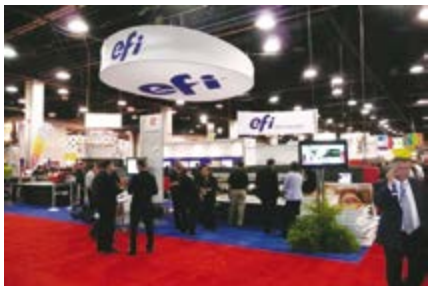

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This selection of exhibitors ordered their booth photos in this gallery. For a full list of exhibitors, visit www.sgia.org

AN INTERVIEW WITH STEPHEN KAHANE

During SGIA '10, *Specialist Printing Worldwide* took the opportunity to have a chat with the NASMA Chairman.

Bryan Collings: As reported in the last issue, please could you explain further the recent changes to the NASMA organisation?
Stephen Kahane: This year, we moved away from being a formal association to being an executive forum and, as such, we made several changes. We decided that we no longer needed an overhead structure that included a director and administrative infrastructure. With this change, we eliminated membership dues. I, as chair, together with other executive committee members handle the administrative functions. And for meetings, a member acts as an event chair who, together with their company, handle the logistics of the meeting. So, basically, we have reduced the administrative burden and have taken on our own shoulders the few remaining responsibilities. Now, rather than annual dues, we are able to charge a nominal meeting fee just to cover any expenses of running the meeting. This has worked very well and we now focus much more on the quality of the membership – largely CEOs/decision makers of leading players in the market place – and our meetings. It is a model that is working very well for us right now.

BC: Does the new structure help provide a stable platform for you to achieve the goals set by members?
SK: I'd like to think so, but we just made the change this year. Feedback from our spring meeting was very positive and our fall meeting is coming up. We are seeing more attendee interest in the fall meeting and we already have new member inquiries for our meeting next spring. So it appears that the formula is working. To help refocus our group, we have streamlined our previous data collection initiatives. We have put aside some of our earlier initiatives until we gain more momentum. What we are doing is progressing just one step at a time from the shallow end of the pool.

BC: How are NASMA members finding the market now?
SK: Well, that's a question which is always relevant. We will be discussing this in a very general (and non-competitive) way at our upcoming fall meeting. I could give you a better answer after the meeting. However, from my indirect contacts with some of the membership, the feeling is pretty much the same as it was several months ago. We are finding some strength in the market, but it can only be described as measured. The feeling is that it is still going to take some time for the economy and our markets to work their way back. But the good news is that the trends are positive.

BC: Is that across the board because obviously you know your particular industry segment best?
SK: Yes, but there are still some segments which are more challenging than other segments.

Stephen Kahane, Chairman of NASMA, with Specialist Printing Worldwide's Frazer Campbell (left) and Bryan Collings (right).

BC: Would that be the machinery and equipment side?
SK: Not necessarily. I have heard from colleagues on that side of the business that they are seeing pick-up after what has been for them a prolonged slump.

BC: Will your surveys provide statistics which we would be useful for our readers?
SK: Well, we initiated an informal survey at the spring meeting which we will repeat again at the fall meeting. The survey is brief, general and qualitative rather than quantitative. It's premature to consider publishing the results but they are available to members at the NASMA Executive Forum on LinkedIn.

BC: How do you see the relationship between screen and digital printing developing? Is screen declining as a result of digital growth?
SK: There's no doubt that digital is growing and will continue to grow. But the reports of screen-printing's demise are premature. I believe that digital is opening up new opportunities and expanding the boundaries of the market overall more than eating away at the screen market. Is there some erosion due to digital? Yes, but screen-printing is still a large and core business, particularly for high volume runs.

BC: Have there been any further developments in the relationship between NASMA and SGIA?
SK: NASMA members are members of SGIA and we enjoy a very close collaborative relationship. We have decided that, at least for now, we are going to remain an independent organisation. With the change in our structure to an executive forum, we no longer have the need for an administrative structure. We will continue to work closely with and support SGIA. I believe this works in everybody's favour. ■

Stephen W Kahane is Chairman of NASMA

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MADE IN THE USA

Michael E Robertson looks at the connection between innovation and manufacturing

Michael Robertson is President & CEO of the SGIA

The USA is a global leader in innovation. From coast to coast, across the business landscape, innovation and creativity are valued assets. US companies have excelled at problem-solving and developing new products that influence consumer opinion. However, in today's dynamic global marketplace, US innovation is being challenged.

I've heard it said many times: "Although manufacturing is being outsourced around the globe, the US will continue to excel at innovation." I believe this statement to be shortsighted. Innovation is closely tied to manufacturing. Much of innovation comes from responding to manufacturing challenges, problem solving or taking advantage of experience gained through the process. Without manufacturing, the ability to innovate would be diminished.

I'm pleased to see signs of renewed interest in US manufacturing. The global economic challenges have had a major effect on manufacturers. As the economy shuddered, the move toward off-shore manufacturing slowed, especially for products to be sold in the US. Companies such as Whirlpool Corporation and Caterpillar are making substantial investments in US manufacturing in addition to their strong off-shore operations. Effective planning and cutting-edge automation will allow these companies to manufacture competitively priced products in the US while driving innovative development for the future.

There are important benefits for manufacturers to find the right 'balance' between off-shore and domestic manufacturing. As the global marketplace evolves, manufacturers need to respond efficiently to a rapidly changing environment. Regional manufacturing reduces time-to-market and it also helps manufacturers address their core sustainability values.

As the off-shore manufacturing pendulum swings back toward centre, we're seeing an increase in US-based graphic production, including point-of-sale materials, coating applications, OEM markings and other print related support. Close-tolerance imaging, such as printed electronics, has seen a substantial return to US production in the last few years. It's a great benefit that the high-quality, short-run friendly, customisable technologies used by the SGIA community are such a perfect fit for the changing demands of the customer.

For many in the US, globalisation has been a one-way street with work and opportunity going off-shore as manufacturers sought out low-cost labour. But the story doesn't end there. In time, globalisation will become a two-way street with more give and take.

It appears that a growing number of manufacturers are adjusting their business model to find the right balance between off-shore and US-based manufacturing as they evaluate their options. I'm optimistic that their efforts will help developing countries participate in the global marketplace, while driving innovation and creativity for new products and opportunities. ■

Michael E Robertson is President & CEO of the Specialty Graphic Imaging Association (SGIA)

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A SNEAK PREVIEW INTO THE FUTURE

Peter Buttiens comments on the success of pavilions and their place at future events

Peter Buttiens

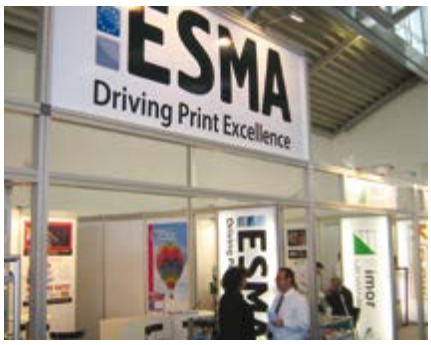
After the success of the pavilions at FESPA 2010 and glasstec 2010, ESMA's focus is now on next year's events. We start with a double theme event – Membrane Switch and Advanced Functional Printing 2011 which will be held on 10 and 11 March in Düsseldorf, Germany. Further details are available through the websites, and on-line booking is also possible for delegates. You can visit the website via www.membrane-switch.org or www.advancedfunctionalprinting.org This is a unique event in Europe for specialist printers and is a growing event because the topics are related to niche markets where special knowledge and expertise are essential.

Together with Chameleon Business Media, we are also preparing the next Glassprint, being held on 24 and 25 November 2011. This event will take place at the same venue in Düsseldorf. More information is available at www.glassprint.org

As previously mentioned, ESMA members discovered many benefits by joining the pavilions. Not only is this definitely raising the visibility of printing during non-traditional printing shows but it's also indicative of the spirit of a collective approach from ESMA and its members. A whole list of potential new shows which use pavilions has been created and these will be announced on the ESMA website. Current pavilions that are already in action are planned for SGIA 2011 and Drupa 2012.

The Drupa story has additional significance! In conjunction with the organisers, ESMA is working on a plan to raise the awareness of screen-printing at this show and to make visitors aware of the special applications. The bigger picture is to push screen-printing technology through functional printing and printed electronics, and the goal is to create a large pavilion of some 800m². At the same time, we want to concentrate all screen-print related manufacturers in one hall near or around the pavilion with their own booth. The pavilion is also open for participation by non-ESMA members, making this a great way to get your ticket into such an important show because of its long waiting list. This initiative will also motivate screen-printing manufacturers to join the surrounding areas of the pavilion to create even greater impact!

More information can be found on the ESMA website, www.esma.com where an online survey is available for all interested companies to join this collective idea. ■



ESMA participating at this year's FESPA event in Münich

Kissel + Wolf joined the ESMA pavilion at glasstec

Specialist screen-printing manufacturer, RKS, in the ESMA pavilion at glasstec

Sun Chemical's glasstec presence was prominent in the ESMA pavilion

Peter Buttiens is CEO of ESMA

ESMA
Driving Print Excellence

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