ISSUE 3
2013

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SOPHIE SAYS...

4. The views of Sophie Matthews-Paul, Specialist Printing Worldwide's editorial consultant

PRE-PRESS

6. Photoemulsions for flag and banner printing
Dr-Ing Roland Studenroth details why printers in this sector should have a viable cooperation with an emulsion manufacturer

10. Exposing a screen v imaging a screen
Alan Buffington explains how to produce successful stencils

14. What should your RIP do for you?
Barney Cox assesses how the right software will support your business by becoming a silent ally

16. Accommodating the challenges in the printed electronics' industry
The demand for finer and sharper stencils has never been more in demand

20. An evaluation of the wear characteristics of squeegees
Chris Phillips determines how findings affect print quality and ink usage

ON PRESS

26. More than just T-shirt production
Matthew Rhome discusses how to decorate different items with a direct-to-garment printer

28. From T-shirts to medical trays
Mark Vasilantone explains how to match a conveyor dryer to a screen-printing application

32. Special opportunities for UV-curable printers
Michel Van Vliet describes three distinctive applications

34. Print is expected to be there, and so is the quality
Mike Horsten believes that print is something we don't think about any more

36. Creating textures and raised objects with UV LED ink-jet printers
Matt Sands outlines how to achieve special effects on a digital platform

OVERALL TECHNOLOGY

38. The future of mercury vapour UV curing
The Focus on LED feature in Issue 2, 2013 of Specialist Printing Worldwide prompted a high level of response from readers. Alan Shaw, Commercial Director, and Rick Mann, Technical Director, of Natgraph explain in this introduction why they strongly felt the need to respond

40. UV curing for sheet-fed screen-printing – are we being 'led' astray?
Alan Shaw compares LED UV systems with the latest developments in conventional UV technology

46. Spot cleaning tricks of the trade
Simon P Clifford runs through the essentials for removing soils

OVERALL TECHNOLOGY (continued)

50. The smart alternative to film lamination
Claudia Bauer looks at the benefits of liquid coatings

52. The four primary benefits of G7 to the screen-printer
Mike Ruff discusses the advantages of working to a standard

54. Achieve more with mixed media
Don Copeland describes how mixing two or more different apparel decorating techniques into one design can raise profits

58. What is industrial print?
A survey, analysis and quantification by sector of industrial print markets and the opportunity they represent for digital print technology

62. From research and development to production:
Lou Panico provides an update on why the printed electronics industry is coming of age

HEALTH : SAFETY : ENVIRONMENT

64. Harmonising information and notification requirements
Elaine Campling details the classification on hazardous industrial mixtures

COMPANY FOCUS

66. Advanced stencil technology
Alfred L Guercio explains the manufacture of advanced films, emulsions and screen chemicals

67. Realising sign-making potential with digital print finishing solutions
Janine Roberts outlines the benefits gained from a good routing system

IN BRIEF

68. A round-up of news and new technology

EVENTS

2-3. GlassPrint 2013
75. InPrint 2014
76. FESPA London 2013
77. SGIA '13
78. LabelExpo Europe 2013

FOCUS ON SGIA

80. Big data in the retail market benefits speciality imaging
Michael E Robertson reasons why this phenomenon is good news for graphics producers

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MESSAGE FROM BRYAN COLLINGS

The immediacy of 'sound bite' news presentation in business-to-business print magazines may have been affected by the emergence of internet-based platforms but the ability to delve further into a subject remains intact. For example, the Focus on LED feature in our last issue generated a very high level of feedback from readers and sparked healthy debate as to the future role of mercury. This is the largest ever issue of Specialist Printing Worldwide and in addition to the normal broad spectrum of high quality technical content, this issue offers some information on LED that contrasts from the last issue.

Specialist Printing Worldwide's role is to provide a neutral platform that presents printers throughout the world with balanced viewpoints and technical information that not only assists them with their current day-to-day activities but also helps them position their businesses for a prosperous future. With this in mind, we very much welcome responses to any of the articles in the following pages or in future issues.

To make sure you don't miss out on any of our content planned for the next 12 months, don't forget to order your subscription at www.specialistprinting.com to receive future copies. It was extremely evident from the many new developments on show at FESPA London 2013 that innovation is very much alive throughout the graphic, industrial and textile sectors and we remain committed to spreading the latest technical know-how through our pages.

There will no doubt be a similar level of innovation on show at SGIA '13 and we look forward to meeting readers and advertisers alike in Orlando. We also wish our advertisers great success at FESPA's events in China and Turkey, Labelexpo Europe, Screen Print India, K-Show and the Viscom series.

Finally, if you are involved in any area of glass decoration or thinking of diversifying into printing on glass, GlassPrint 2013 in Düsseldorf will be a 'must attend' event for you – see pages 2-3.

Bryan Collings, Publishing Director, Specialist Printing Worldwide

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FEEDBACK FROM GLASSPRINT 2011 DELEGATES THAT VISITED FROM 32 DIFFERENT COUNTRIES INDICATED THAT:

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TABLETOP EXHIBITION

In addition to the technical sessions, GlassPrint 2013 will feature a tabletop exhibition of specialist suppliers of equipment, consumables, technology and services. Confirmed exhibitors that will display the latest developments in inks, pre-press technology, printing equipment and supplies include: Dr Hönle, Durst, Fermac, FERRO, Global Inkjet Systems, Grünig-Interscreen, ISIMAT, KIWO, MacDermid Autotype, Machines Dubuit, Marabu, Natgraph, OMSO, Ormoprint, PPG, RUCO, Saati, SEFAR, SIAK Transfers, SignTronic, Sun Chemical, Tecno5, Tiflex, Till and Wifac.

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CONFERENCE PROGRAMME

With an even spread between flat and hollow glass coverage, GlassPrint 2013 will offer delegates ***more presentations*** than ever before. Keynote speakers and industry experts will present the latest information on advanced digital and screen technologies for glass decoration, including

TECHNICAL PRESENTATIONS

- 'UV curing on glass: UV-LED versus conventional UV Technology' by Dr Hönle
- 'UV-LED: a new opportunity for organic inks in the glass decoration industry' by Dubuit
- 'Digital glass decoration for indoor and outdoor applications' by Durst
- 'How to generate future market trends in hollow glass printing' by Fermac
- 'Organic inks for the direct and indirect decoration of glass hollowware" by FERRO
- 'Curved surface direct product decoration using inkjet – Challenges and solutions' by Global Inkjet Systems
- 'Managing the change from printing with ceramic enamels to UV inks' by ISIMAT
- 'Functional and visual glass decorating, including glass bonding' by KIWO / Kissel + Wolf
- 'Stencil options for hollow glass' by MacDermid Autotype
- 'New trends in touch screen ink developments' by Marabu
- 'New innovations and technology for drying and curing flat glass' by Natgraph
- 'The surface of glass and ways of its modification' by Ormoprint
- 'Opportunities for special effects to differentiate your products' by Printcolor
- 'Various flat glass decoration possibilities today and in the future' by SEFAR
- 'Digital screen making – the future in stencil making' by SignTronic
- 'Digital decoration of glass containers with variable decors at industrial high speed capacities' by TILL

> ***"Rather good overview of the glass print technologies."***
> **Arnaud Huignard, Saint Gobain**

> ***"GlassPrint event gives the real opportunity to get in a short time the latest updated information regarding printing on glass. Very valuable."***
> **Olivier Dangmann, O-I**

Programme subject to change – visit www.glassprint.org for latest updates.


Dr Johann Overath


Stefan Jaenecke


Bertrand Cazes


Birgit Horn

KEYNOTE PRESENTATIONS:

- 'German glass industry – Situation and trends' by Dr Johann Overath, Managing Director of BV Glas (Federal Association of the German glass industry)
- 'Container glass industry – Current and future challenges' by Stefan Jaenecke, CEO of Verallia Deutschland and President of FEVE (the European container glass federation)
- 'Sustainable buildings: the new 'big thing': what does it mean for building glass products?' by Bertrand Cazes, Secretary General of Glass for Europe (Europe's trade association for building, automotive and transport glass)
- 'glasstec 2014 – current status and future outlook' by Birgit Horn, director of glasstec / Messe Düsseldorf

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TOMORROW'S TECHNOLOGY

Sophie Matthews-Paul considers the importance of onward development

No matter what equipment we're using for business and residential use there is a certainty that, behind the scenes, research and development teams are already well ahead working on the technologies we're likely to be running in the future. Although this applies pretty much to anything, it is particularly evident in the hardware and software that is used in a production environment, often so seamlessly that end users aren't really aware of incremental changes that might be made to systems they've been employing for many years.

Although we know that development is a never-ending process, there is also good reason to accept that what works for us today should continue to be productive into the foreseeable future. In terms of the printing industry, and those associated with it, although components might be common to other manufacturing scenarios, we have been privy to an immense number of technological changes during the past two decades. Some are obvious, and others less so, but all are intended to provide improvements whether these are legislative or merely designed to offer greater quality and convenience both to the end user and original supplier.

Developers and manufacturers of anything to do with technology might come across as being somewhat insular about their advances or, dare I say it, inventions. Nonetheless, having the opportunity to read and inwardly digest what these companies are doing in the art of promoting their products and processes can only be healthy. It doesn't mean that we have to adopt now what these folk are beavering away at and it is, perhaps, fortunate that we've ended up with remarkably few crazy ideas which would appear to be based on potty ideology with no thought to overall cost or practical capability.

THE QUEST TO ADVANCE

Different driving forces lead to different quests to advance and improve our production equipment, and these drivers tend to be governed by the economy and surrounding issues, such as the environment and health and safety. Alternatives to existing processes and methodology are always being sought and a rummage through the patent applications posted on the Internet tends to reveal some pretty extraordinary inventions nestling amongst those which make up logical and common-sense ideas.

Print continues to be a prime target of innovation, particularly now that ink-jet has established itself and joined the accepted line-up of associated processes for this and other forms of deposition. One of the advantages of Specialist Printing Worldwide is that it gives space to authors who are involved in the onward development of the different technologies that act as the building blocks for the finished equipment and processes that might well become mainstream tomorrow. In some instances there's every chance that you read it here first.

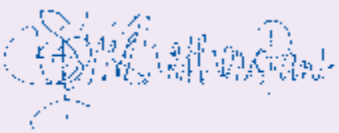
It can be interesting to learn about the onward development of the different technologies that act as the building blocks for the finished equipment and processes that might well become mainstream tomorrow. Increasingly print is becoming reliant upon independent component parts that play a major role in the integration that is an incumbent part of a successful overall solution. Often a veritable cornucopia of manufacturers is involved in the design and construction of a single piece of equipment, each specialising in a specific element in a machine's make-up.

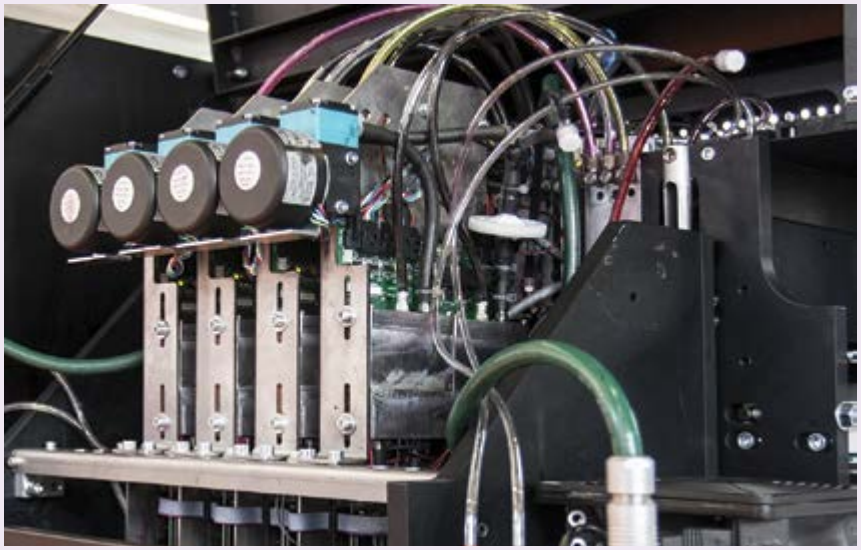
EARLY DEVELOPMENT

For example, when Thales started rubbing together his amber rods back in 600BC to generate static, no-one ever would have imagined that the later invention of the voltaic pile would lead to the use of electric current that, today, we can't live without. Similarly, when the first basic ink-jet technology came to the fore in 1984, even though it was originally discovered back in the 19th century, few of use would have thought that it would be developed onwards to become a key component of today's printing industry.

Manual presses that, nowadays, have integrated various degrees of processor power with the aim of simplifying operator use and levels of accuracy will likely have used a third-party manufacturer for the inclusion of specific components. With ink-jet machines, there is every chance that various different producers have had a part of play, in terms of processing core, print-heads, drying and, of course, software.

Alternative elements that, today, might seem little short of folly could become tomorrow's essential pre-requisite in machine efficacy. Development doesn't stand still, but that is not to say that tried and tested systems will suddenly become obsolete. It is the combination of established technologies with more innovative production elements that keeps our industry and the systems we use moving in a forward direction.





Print is becoming reliant upon independent component parts

Sophie Matthews-Paul is an independent analyst and editorial consultant to Specialist Printing Worldwide

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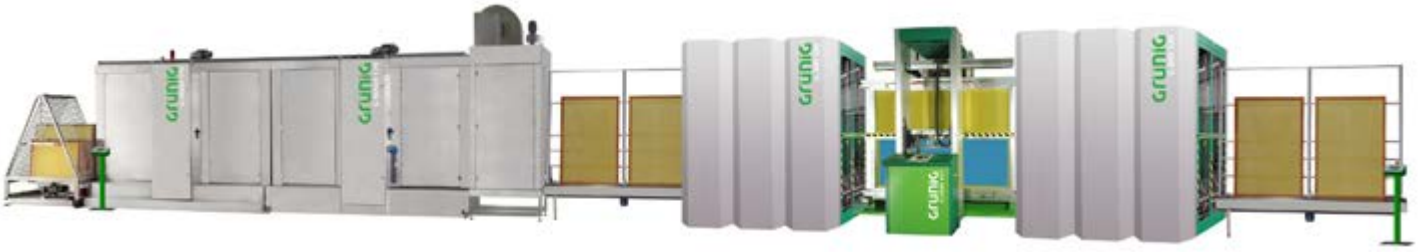

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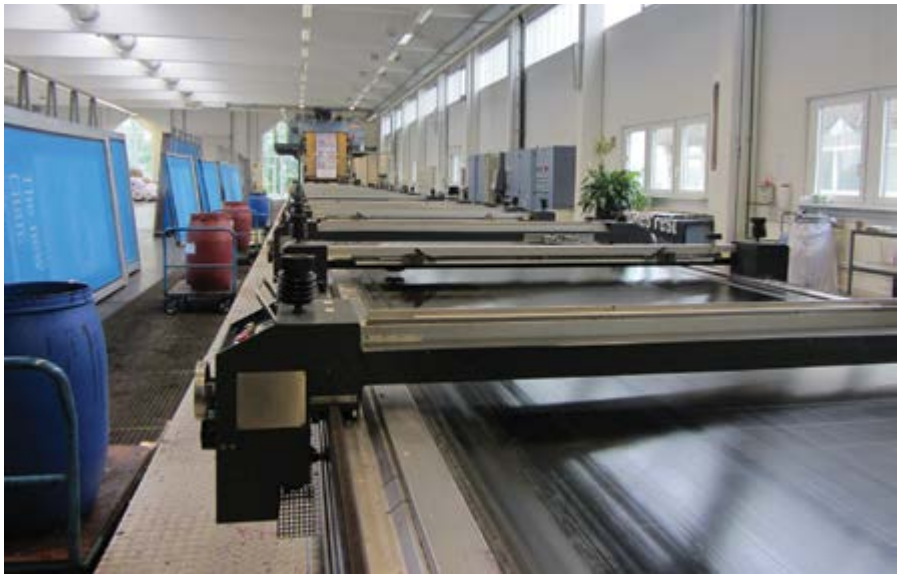
PHOTOEMULSIONS FOR FLAG AND BANNER PRINTING

Dr-Ing Roland Studenroth details why printers in this sector should have a viable co-operation with an emulsion manufacturer



A flat printing machine courtesy of Fahnen Herold GmbH

It would be hard to imagine a world today without flags, banners and pennants. Flags deck out buildings and roads whenever national holidays, sporting, cultural, commercial, historic and political events take place. Crowds often wave miniature flags, so that there is a kaleidoscope of fluttering colour everywhere. Flags are important symbols of national sovereignty in all political systems. They serve as identification and were already in use during the Crusades and early wars, so that opposing sides could tell each other apart and serve as rallying points. In countries with sea coasts, sailors marked their ships with flags and, towards the end of the 13th century, there were strict rules for the use of flags by ships of the Hanseatic League. The flag's importance as a national symbol was heralded from the time of the French Revolution, when the people rose up against the king under a blue-white-red flag.

Over the years, flags and banners have become extremely popular as textile advertising media so that, especially in Central Europe, some textile factories have specialised in flag printing and manufacturing. Based usually in coastal areas, rope-makers and ships' chandlers also saw good business opportunities and went into flag manufacturing. Today, the range of flag production encompasses a broad spectrum; from national to state flags, city and municipal flags, company representation, advertising flags and banners, interior decoration, umbrellas, club flags, down to the smallest pennants and miniature table flags.

FLAG PRINTING TECHNOLOGY

For years, thin lightweight polyester fabric has proved to be the preferred material for flags. Printing is predominantly carried out with flat screens on this material and a special type of squeegee is employed to give good printing paste penetration. This then ensures that the print is visible from both sides of the flag. The bigger flag printers are equipped with fully automatic flat printing machines. The medium-size and smaller flag printers print

Continued over

Large format coating at Fahnen Herold GmbH

Computer-to-screen exposure courtesy of Fahnen Herold GmbH

Manual cleaning at Fahnen Herold GmbH

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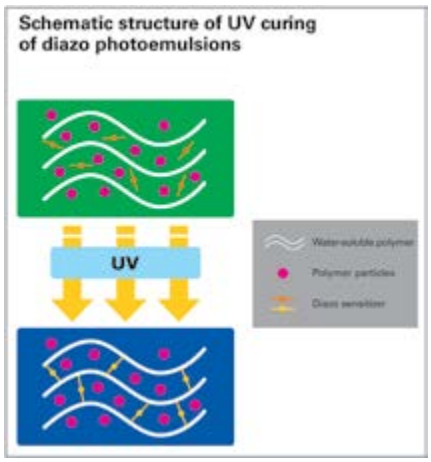
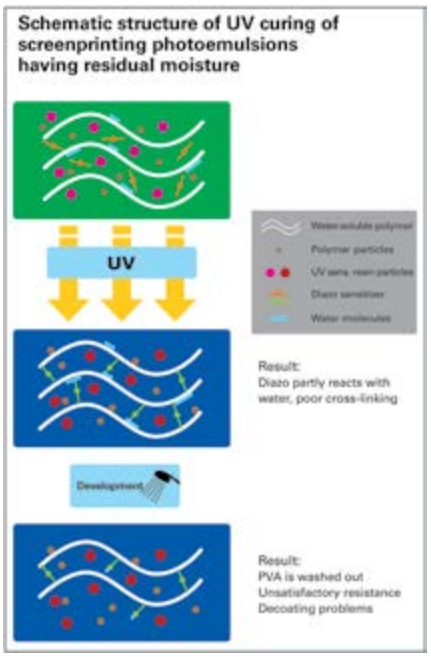
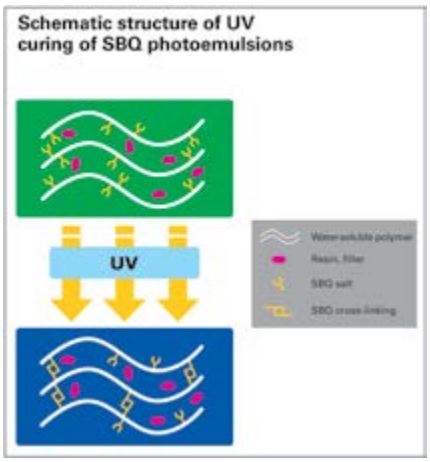


Schematic structure of diazo emulsion



Schematic structure of emulsion with residual moisture



Schematic structure of SBQ emulsion

manually on printing tables or semi-automatically on printing tables with screen carriages. In Europe, about 40 fully automatic flat printing machines are used solely for flag printing.

Apart from flat screens, rotary printing technology is used in certain rare cases by flag printers, especially for printing stripes of, for example, national flags. In recent years, in addition to flat-screen printing, printers have begun to use digital ink-jet machines, especially for stretch materials and short runs.

As already mentioned, flags, banners and pennants come in all different shapes and sizes – from mini to XXL. This variety of sizes means that a correspondingly wide range of different screen frame formats is required. These can cover up to sizes of about 3,000 x 7000mm and, in some cases, even bigger!

The bigger flag printers usually image their screens with digital imaging systems and, to a lesser extent, with projection exposure technology. Digital imaging today is dominated by exposure with the help of DMD (digital mirror device) chips and occasionally UV laser systems can also be found. All other screens are usually made by direct contact exposure with full-size positives. In some cases, wax or digital inkjet technology is used for the exposure mask.

In flag printing, as well, quality and design requirements are nowadays becoming more sophisticated; in addition to simple line and blotch patterns, photo prints in fine half-tone technology are increasingly in demand, which then increases the requirements made on the emulsions used for flags.

PHOTOEMULSIONS FOR FLAG PRINTING

In general, a number of specific requirements are made on emulsions for flag printing, rarely found in this combination in traditional screen-printing and stemming in particular from the large formats being used:

- Coating and flow properties of the emulsion must be 'robust', that is independent of the selected coating technique (manual or machine) and the condition of the mesh, so that as few defects (pinholes) as possible – preferably none at all – should occur.
- The emulsions for flag printing should be dried as soon as possible after coating, often combined with the requirement of being able to dry at room temperature. It is almost impossible for these large format screens during daily production output for them to be dried in drying cabinets, which are usual in screen-printing. However, it is necessary for good quality screens and robustness that adequate ventilation is provided at a possibly somewhat higher temperature, so that the evaporating water is removed from the drying area.
- The exposure time of flag emulsions has to be relatively short or the UV-reactivity has to be high. This is true for projection exposure from a distance as well as CtS exposure because, with CtS exposure, the exposure unit must operate over a very large area. But, even with conventional UV exposure, the distance between the light source from the screen is so big that high UV sensitivity is important. In most cases, therefore, highly reactive SBQ emulsions are used.
- High mechanical stability of the emulsion during the development process is required. During exposure, the emulsion must be so well cured that it can also withstand higher washout pressures during development. Due to the large screen format, it is not possible to develop a screen with a hand shower. Either an automatic developing unit or gentle high-pressure is used.
- The screens for flag printing must be easily decoatable after the printing process. This is because the mesh cost factor plays a special role in the large sizes, especially as print yardage is generally low.
- The emulsions have to be economically priced, for what applies to large formats regarding mesh, is applicable in the same way for the emulsion used.

TYPES OF PHOTOEMULSIONS

Photoemulsions for screen or textile printing can be divided into the following groups:

a) 'Simple' diazo emulsions
b) Dual-cure diazo emulsions
c) 'Simple' SBQ emulsions
d) Dual-cure SBQ emulsions
e) Chemically curable emulsions (diazo or SBQ sensitised)

Due to the above-mentioned special circumstances in flag printing, of all the possible emulsion types, essentially groups a) and c) are used – so-called simple diazo and SBQ emulsions.

The term 'simple', however, refers solely to the absence of expensive UV reactive resins and photoinitiators. This does not mean that it is an easily formulated, simple product. The requirements posed above must be achieved without the technology of UV reactive resins, as usually happens in classic screen-printing. Because the products are developed with water and no other curing steps are envisaged, these products maintain their stability (against aqueous media) only with a small amount of UV light (projection, CtS units or large distance with conventional exposure).

In individual cases chemically curable emulsions, listed under e), are also used. Here you have the advantage for low print yardages without applying a curing agent and the emulsion remains decoatable. For high print yardages, the curing agent can be applied, and you can easily make tens of thousands of prints, but such screens are no

longer decoatable.

The basic structure (as it is also used in flag printing) of a diazo emulsion is shown schematically in Figure 5. In the upper part of the figure you can see the unconnected main components of the emulsion: water-soluble polymer (PVA), emulsified or dispersed polymer and the added diazo molecules. After UV exposure (lower part of Figure 5) the water-soluble polymer and the diazo molecules form a more or less dense network. The denser the network, the more resistant the screen and subsequent stripping is easier, since in a dense network less printing paste can penetrate, which delays the decoating process. A dense network is obtained in particular by exposing for as long as possible – you should expose long enough, so that the smallest details to be printed are only just resolved. A denser network is obtained by increasing the quantity of diazo, but this has the disadvantage in that it extends the exposure time; here a compromise always has to be made.

As mentioned above, when the network is disrupted, it will affect both resistance and decoatability, if the coated printing screen has been insufficiently dried. This problem is illustrated schematically in Fig. 6. It can be seen that water molecules are deposited in the water-soluble polymer (PVA) and, when activated by UV light, the diazo sensitiser can only partially react with the polymer and a large proportion is deactivated by the residual water. Depending on the proportion of residual moisture, the network is more or less weakened, with the result that the print yardage resistance decreases and the decoatability is worse, because printing paste has penetrated into the emulsion, which cannot be dislodged by decoating agents.

So the drying process stage of the coated printing screens is of paramount importance. Only when the residual moisture content is below a threshold of about 3 to 4%, can a dense network be formed during exposure. Unfortunately, the measurement of the screen moisture content is not very easy, because it is a combination of emulsion and mesh, so locally proven and reproducible drying conditions should be ensured.

SBQ sensitised emulsions are somewhat less sensitive to residual moisture. They are one-component, since the photosensitive SBQ grouping (SBQ = StilBeniumQuarternized) has already been connected to the water-soluble polymer and two adjacent groups, on exposure to UV light, form a network bridge (see Figure 3). While the diazo group cannot chemically distinguish between water and water-soluble PVA polymer and is therefore deactivated in water by exposure to UV light, this is not the case in SBQ products. Here, the residual water is essentially integrated into the network and reduces the net density. Again, this ultimately leads to lower print runs and poorer decoatability, but not to the extent as is the case with diazo emulsions.

Due to their lower sensitivity to moisture, but also because of their high UV sensitivity and being one-component, SBQ emulsions nowadays play by far the biggest role during flag printing. Newer requirements with resolutions of 15 lines/cm and above lead to new product discussions. Only extreme demands for half-tone fineness will make you resort to diazo or dual-cure diazo emulsions. As a rule, you can increase image resolution sufficiently by adding diazo sensitiser to SBQ emulsions.

Many site-specific factors play a major part in flag printing and that is why it is strongly recommended that flag printers seek and develop a viable cooperation with a manufacturer of photoemulsions. ■

Before retirement in May 2013, Roland Studenroth was Director of Research and Development and an Executive Board Member at KIWO

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EXPOSING A SCREEN VERSUS IMAGING A SCREEN

Alan Buffington explains how to produce successful stencils

Complete emulsion exposure versus obtaining an image on the screen through underexposure provides very different results during production. Let's start at the beginning to see how this is often the difference between achieving optimum press performance and struggling to achieve hourly production goals.

Screen exposure is often the most misunderstood area in the screen room. This is simple, right? Just expose and develop the screen, dry it, block it out and print it, right? First an analogy – let's say you need to drive 500 miles today to make it to an important sales meeting. Do you go to the gas station and put only 20 dollars in the tank? The car will run, it will travel quite a distance on 20 dollars, but will it make it the full 500 miles?

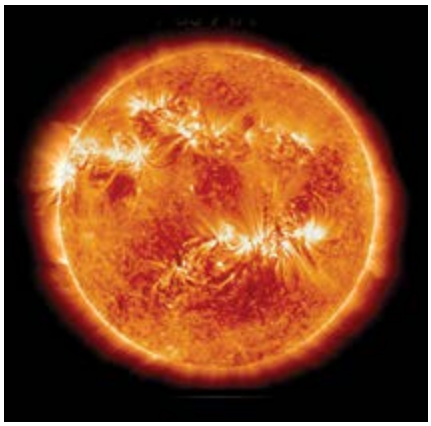
Typically, almost every screen room exposes a screen using the 20 dollar example. Give it enough light to create an image that doesn't wash off in development, dry it, and send it on to production where the production manager expects it to last through a long discharge or high solids acrylic print run. The problem is the production manager is unaware the screen-maker never filled up the emulsion 'tank' with enough light to make through the entire print run.

Owners will buy brand new screen exposure lamps without considering if the model they choose will expose screens well for all ink systems, then try out every emulsion possible, and suffer through countless screen failures during production. Why? The screen-maker simply cuts corners based on past experience that underexposing the emulsion will help develop fine details better. In today's screen-printing rooms the variety of artwork that a shop produces can range from solid athletic style art to very detailed index and simulated process prints that test the limits of your screen room and the resolution capabilities of your emulsion.

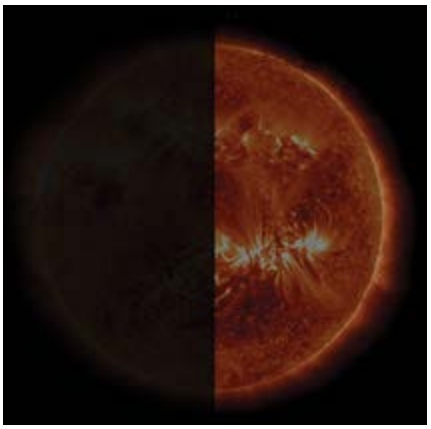
The art department is prone to try the impossible. While it often sees the end results of its work it pushes the limits of the screen room to get better prints with softer tones, finer details, and well more of what drives the screen room crazy. Film output is robotic; drop the art file in the print queue folder and go on to another job while film is printed. Ask them what d-max is? "Is that a new band?" could be the reply. Film output should have black dense images with a d-max of 3.0 to 3.5. Strong opaque film or computer-to-screen imagery allows for maximum exposure times that produce strong screens.

The media you use to expose your screens can play an important role in how strong your exposure time can be. Again, completely exposing the emulsion to strong multi spectral light yields the strongest stencils and the d-max of the black area of the image determines how close you can get to achieving complete exposures.

A screen exposure unit



Original image



The left side of the image is high d-max, and the right side is marginal d-max

IMAGE MEDIA

1. Vellum: this method has the lowest d-max of any image. You can spray with toner enhancers to improve the d-max or you can layer two images together, or experiment with the print process to bring up d-max. This may be okay for short plastisol runs by hand. For water-based and discharge hand printing increasing the media d-max, post exposing in the sun or on the exposure unit blocking out with the original emulsion and post exposing the block-out is recommended. Vellum is not recommended for long print runs on an automatic press.

2. Ink-jet: this d-max can vary significantly depending on the type of film used, RIP software, inks, printer type and RIP image configuration. This is a subject that deserves

Simulation of vellum

an entire newsletter written about it. The goal is to achieve strong d-max with your system using the tools you have. With RIP software the better programs will have more control of d-max, better linearisation tools, variable dot shapes, and picolitre dot adjustments to fine-tune edge quality and opacity.

However there is one area that is problematic for ink-jet films. The quality of the half-tone dot edge is nowhere near the quality of a true imagesetter. Half-tones formed by an ink-jet printer are a series of small picolitre dots and the lower the half-tone value the fewer picolitre dots it uses to create the dots.

Lower tonal percentages like this 5% tonal on ink-jet film can have little d-max and be difficult to image on screen. Imagesetters are far better at imaging very fine tonal values as well as copyright and trademark notices. Controlling the image configuration within a quality RIP software program improves the d-max of lower tonal percentages.

3. Imagesetters: due to the high cost of film supplies and chemistry they have been replaced by ink-jet imaging. Yet the best half-tones and edge quality are obtained using an imagesetter.

This close-up of an image-setter halftone dot is the same tonal value as the ink-jet image in the previous picture at a higher magnification. An imagesetter's high d-max reading and crisp half-tone dot can help the emulsion to be completely exposed and still image lower tonal values well.

4. CtS imaging: another emerging trend is computer to screen (CtS) imaging that uses no film. There are several types ranging from ink-jet imaging, to thermal wax imaging, to direct light exposure using blue laser or LED lamps. The thermal wax system creates a very high d-max image that can be exposed completely without a vacuum blanket. Extra care needs to be taken to prevent the thermal heads on these CtS devices from touching the mesh threads to extend the life of the print-head.

CtS imaging with ink-jet has many more brands to choose from and is gaining popularity due to less maintenance and ease of use. Without the glass and film in a vacuum table that weakens the exposure light, the production screens can be exposed directly to light and achieve stronger stencils.

Direct light exposure systems have shown remarkable improvements recently but have a substantial price difference compared to an ink-jet CtS device. While the image quality and resolution have improved, the strength of the exposure may still require post exposure and emulsion hardeners for aggressive ink systems like discharge and high solids acrylic. This method uses no inks, wax or film consumables.

Underexposure is the beginning of a long downward production spiral of weak screens that will break down on press causing more screens to be shot for screen replacement, more emulsion and block-out to be purchased, more press labour wasted while waiting for a replacement screen, missed deadlines, more overtime and a general lowering of the overall print quality of the shop.

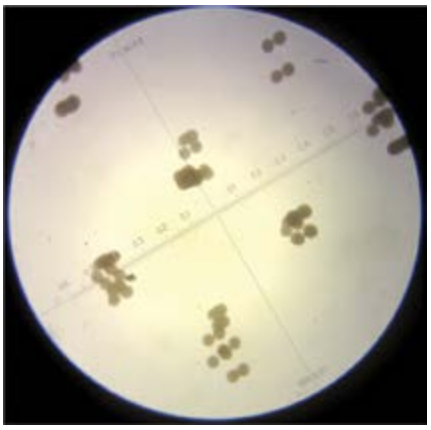
RESULT OF UNDEREXPOSED SCREENS

Underexposing emulsion is the worst fix you can make to get the painstaking hours of artwork to print well and reach hourly production goals. Yet all screen rooms underexpose screens and they pass the problem on to the production floor. Too often the press personnel deal with all of the shortcuts taken in the screen room enduring many interruptions to fix screens. This problem is compounded with aggressive ink systems which are becoming required by many major apparel brands and mass merchandisers.

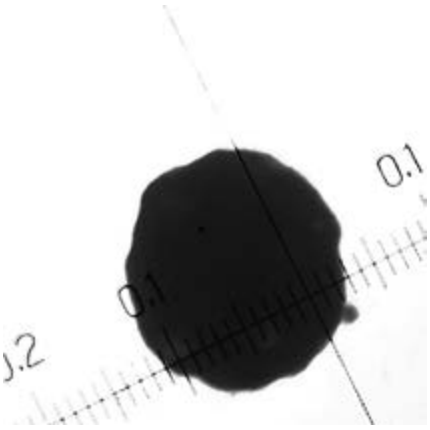
Underexposed screens coming from the screen room may look fine; they are blocked out, the image looks good, but at 300 prints using discharge or high solids acrylic inks the screen breaks down. Press personnel are back in the screen room for a new screen due to the underexposure short-cut. A screen is rushed through the exposure process, and yet after 300 or less prints it blows out again with other screens close to screen failure as well. At the end of the day production yields on this press are struggling to break 1,000 pieces in

Continued over

Money up in smoke



Close-up of an ink-jet half-tone



Close-up of an imagesetter half-tone

eight hours. The screen room manager calls up the emulsion manufacturer to get technical support. I have a list of items to check off with the manager to prevent underexposure and to make their stencils a success. Here is a brief overview:

1. What emulsion are you using?
So I can determine if they are using the right emulsion for the ink set and suggest one if their current emulsion is failing.

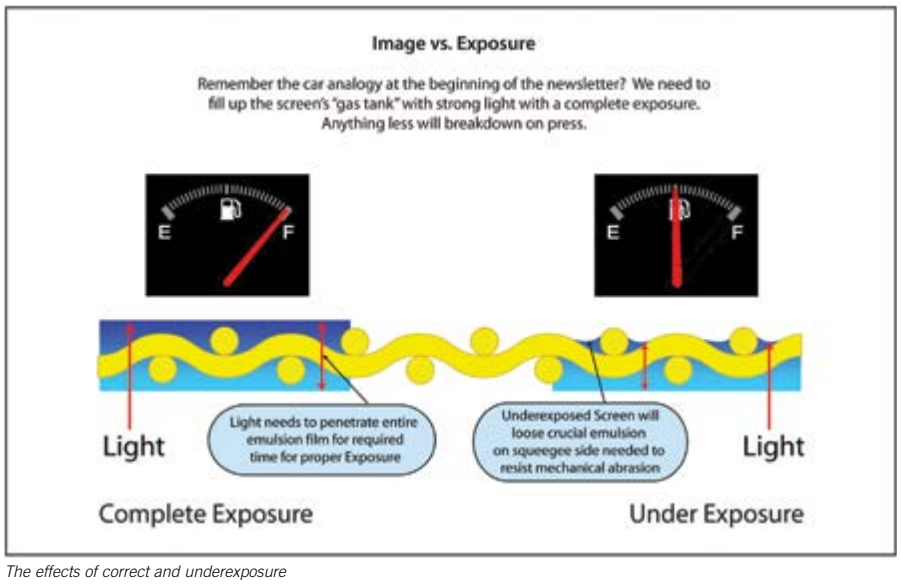
2. What exposure unit are you using?
This helps me determine if the answer to the next question is correct.

3. How long are you exposing it for?
We know the times for 5kW or higher, 1kW, and fluorescent bulbs for our emulsions. However, two similar units at different shops may have different times due to bulb age which brings up the next question.

4. How old is the bulb in your exposure lamp?
Bulbs age as soon as you start to use them. That's why we recommend using an integrator rather than using time for the exposure. Still, at some point age and use will diminish the UV power of the bulb; even though it can image a screen, it has lost its ability to expose a screen well.

5. What are your screen drying conditions? What is the humidity in the screen room, the temperature?
Humidity is an unseen force that affects your exposure time. Simply put, the more ambient humidity in the atmosphere or screen room the longer the exposure will take. Clients in Phoenix Arizona in the USA enjoy a humidity reading of 8% and 100 degree F temperatures and can expose a pure photopolymer in half the time compared to companies in the tropics or along the ocean where humidity is high due to fog or on-shore flow. Humidity slows down the exposure process and, if not controlled with dehumidifiers, can limit the exposure strength of the stencil.

6. How do you coat your screens?
The goal of coating your screens is to achieve consistent emulsion over mesh (EOM) – not too much, not too little. Graphics screen-printing uses a thinner EOM of 4 to 6% while a long discharge print run would benefit with a 10 to 12% EOM. These percentages can be obtained with a thickness gauge by measuring the difference in mesh v coated mesh where this difference between the two is expressed as a percentage of the coated mesh thickness.



The effects of correct and underexposure

Sometimes the underexposure issue is caused by coating too fast and leaving a thick coat in the centre of the screen that underexposes and falls off during printing. If more than one person coats screens in your shop they need to mirror each other's technique so that emulsion over mesh stencil thickness is consistent which, in turn, will yield a consistently well exposed stencil. A slow firm coating speed improves emulsion thickness consistency across the face of the screen.

7. How long do you dry your screens?
Too often screens are rushed through the drying process. It may feel dry to the touch but the inside can be the consistency of jello. Controlling the humidity and temperature in the drying area yields predictable screen drying times after coating. If the screen room has no control over humidity, drying times can vary greatly due to weather or the addition of wet reclaimed or coated screens that will increase humidity in the drying area until they are completely dry.

IMAGE V EXPOSURE

Remember the car analogy at the beginning of this article? We need to fill up the screen's 'gas tank' with strong light with a complete exposure; anything less will break down on press.

A strong stencil is the easiest fix you can make for your shop. No matter what automatic you own, or plan on buying, a well-exposed quality emulsion yields dividends in production. There is more information about creating an exposure step test at http://murakamiscreen.com/wp-content/uploads/2012/07/Step-Test-Instructions.pdf ■

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WHAT SHOULD YOUR RIP DO FOR YOU?

Barney Cox assesses how the right software will support your business by becoming a silent ally

While it might be the printing machinery itself that receives the most attention in the wide-format world, it should be considered in the context of a broader set-up that encompasses the whole production process – from the submission of clients' artwork and order all the way to the delivery and installation of their job. An essential component within that series of processes, or work-flow, is the RIP. This is the software that turns a supplied graphics file into instructions that tell the printer how to apply ink to the media. Going right back to basics, RIP stands for Raster Image Processor. A raster is the grid of pixels that is used to break up an image in a way that can drive the printer with electrical impulses, telling it to apply ink or toner to a particular location.

Just as there are different vendors of printers, each offering a range of ink types, number of colours, architectures, sizes and speeds, there is also a vast range of different RIPs available. Their differences lie in the computing platforms they support, the features they include, their operating speeds and the core technology that carries out the calculations necessary to turn a graphics file into something that the printer can use.

THE RIGHT RIP

Picking the right RIP for your business comes down to understanding the issues that it raises and how best to address them for your particular mix of customer, application and printer. The right RIP will support your business by becoming a silent ally, sitting in the background and doing its job without causing any problems. Ensuring that you have peace of mind further down the line does mean paying attention when selecting your RIP software. Accepting whatever your printer vendor chooses to sell with their machinery could spell operational issues later on.

Even if you're a start-up business it is worth ensuring the RIP you choose is scalable. Will it allow you to add more processing power to support higher throughput from a faster printer or more machines, or both? Productivity and efficiency are not just about raw power; it is also worth considering what work-flow tools are included and how easily the RIP can be integrated with other software and hardware, such as web-to-print, ERP or MIS, work-flow and finishing. Some packages include enough functionality to cover all bases for a smaller shop while also being extendable to meet the needs of a larger operation – either via additional products and modules from the same vendor or integration with third-party packages.

PREFERRED RIP SUPPORT

Some of the most advanced wide-format printing companies see the RIP as such an important part of their operation that they have invested as much, if not more, time investigating and selecting it as they have for the printers themselves. In fact, they may even demand that any printer that they are going to use has to be supported by their preferred RIP.

The integration between a RIP and a printer is the function of a piece of software called a printer driver. Much in the same way that personal computers might require drivers to run auxiliary equipment, such as monitors or scanners, this driver is what makes sure that the RIP and the printer are talking to one another. Based on data about different print resolutions, droplet sizes, print modes and the numbers and colours of inks that a given printer uses, the RIP can create the right information to drive it.

It's not just the printers that have their own specific technical underpinnings and potential idiosyncrasies; so too can both RIPs and the software used to create artwork files, such as PDF, PostScript, EPS and even TIFFs and JPEGs. At its heart PostScript is really a programming language, so your file is more than words and pictures; it is code. PDF was developed to reduce the permutations and improve the interoperability of those files.

However, while now based on an ISO standard, it is still possible for irregularities to slip in along the way between the graphics' application creating the file and the RIP interpreting it. That's one reason to standardise with one RIP driving all machines throughout your factory – it ensures consistency and removes the chance for surprises. Some printer manufacturers supply a RIP with their printers. For a smaller operation with one or two machines from the same vendor, that can be a perfectly acceptable solution, especially if the RIP is included within the total cost of the printer. Others may offer a choice of third party RIP to drive their engine, or leave it up to the buyer to choose which system to implement.

MULTIPLE VENDORS AND PRINTERS

If you already have, or are likely to run, printers from multiple vendors or of differing technological make-up – a combination of aqueous- and solvent-based roll-to-roll machines, for example, plus a UV-curable flat-bed and maybe a dye-sublimation textile printer – then it's best to pick your RIP yourself rather than being beholden to several suppliers. Ensuring colour consistency when working across different machines, print processes and substrates is a big stretch on its own. Throwing different RIPs into the mix adds additional variables and complexity. There's also the headache of training staff across different software packages – which in itself lends time and room for errors to creep in.

Fundamentally, a RIP needs to be quick enough to keep up with your fastest printer. A new generation of machine based on Memjet technology is coming to market and can produce hundreds or even thousands of square m/hour at high resolution. This makes it imperative to have high-speed RIP capability. If the RIP can't keep up with your output device then, at worst, it can lead to wasted media as a job has to be aborted half-way through; alternatively a pause may leave a visible artefact in the image, which means you've wasted not just labour hours but ink and paper, too.

Even if the print system is robust and versatile enough to pause and wait for the RIP to catch up before printing, a mismatch will reduce your productive capacity. The knock-on effects include lengthening the time it takes to return on the investment you made in your print engine, plus the cost of running extra shifts or paying staff for any overtime. These represent unnecessary additional expense to turn work around that is well within the physical capability of your equipment.

As a proportion of the cost of the printing equipment itself, the RIP software and the hardware to run it on costs very little – from a few thousand euro to the low tens of thousands, even for a very highly specified system. Compare this with the tens or, even, hundreds of thousands you'll have spent on the printer itself. When you stack up the relative up-front price of getting the right RIP compared with the rolling expense of a sub-par system, it really is a no brainer.

This article originally appeared in Caldera's in-house magazine, Gamut. ■

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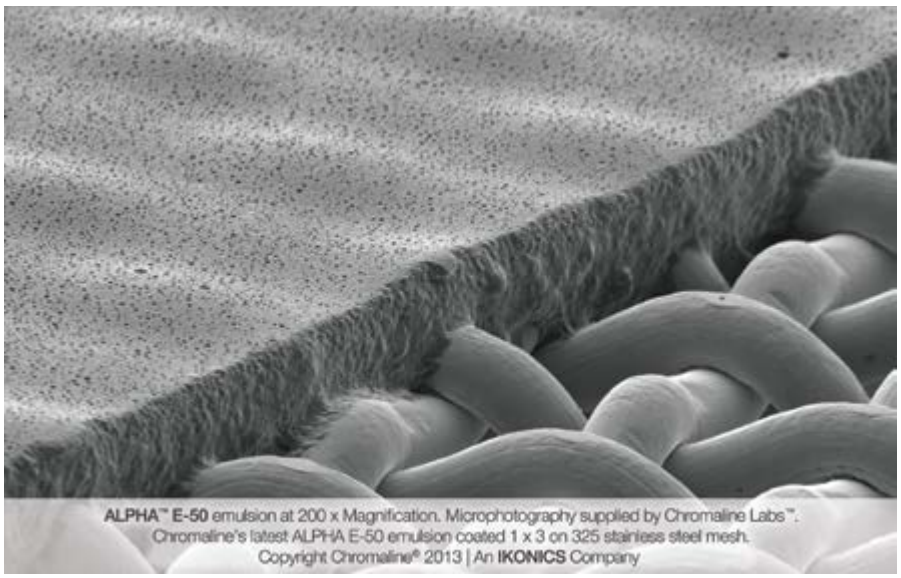
ACCOMMODATING THE CHALLENGES IN THE PRINTED ELECTRONICS' INDUSTRY

The demand for finer and sharper stencils has never been more in demand

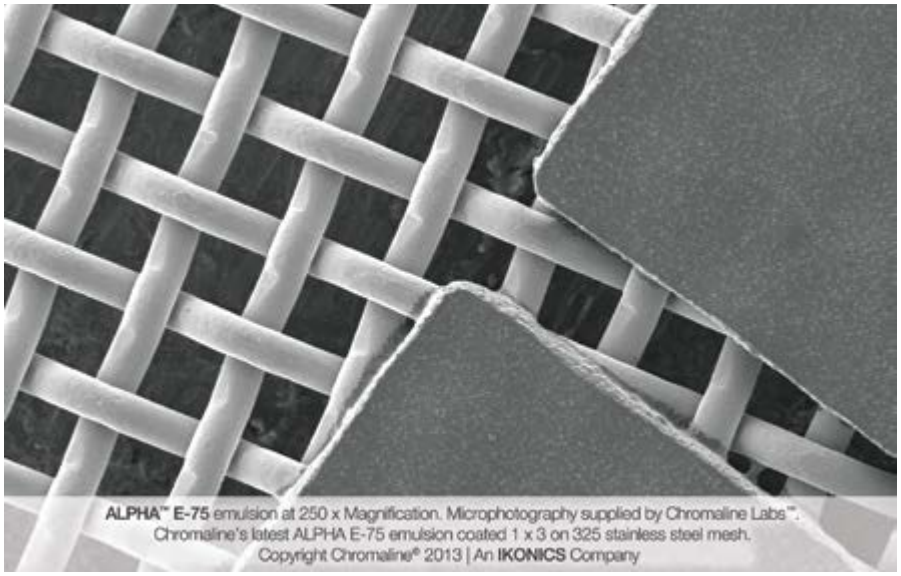
Size matters. A lot. In the world of high-tech, high-volume printed circuitry, miniaturisation is the coin of the realm. In short, increasingly small printed circuits translate to increasingly small finished electronics for consumers and industry. This, in turn, results in better, faster, more reliable and more functional products. Those producing functional devices in the printed electronics industry are on the cutting edge, striving daily for ways to give themselves a competitive advantage in this fast-paced, ever-evolving, increasingly competitive field.

Jonah Bilotta, General Manager at UTZ Technologies, Little Falls, New Jersey, USA, feels this pressure and the push toward small every day. "The common thread winding through all of printed electronics is a perpetual call for smaller and smaller lines, to allow for smaller circuitry and smaller products," he explains. "The challenge is that not only do the lines have to be small, but they have to be incredibly high quality and consistent over longer and longer print runs."

On the other side of the continent, in San Marcos, California, Elias Malfavon, echoes Bilotta's challenge. His business, Metal Etch Services, Inc, manufactures finished screens for the printed electronics' industry (as opposed to actually printing the circuitry).



The small particle size and adhesion to the mesh will yield sharp details and exceptional print runs



A flat hard stencil surface will yield a high quality print

"… not only do the lines have to be small, but they have to be incredibly high quality"

Malfavon is intimately aware of the demand for screens to accommodate small features. "Without a doubt, the single biggest question asked of us pertains to the ability to produce screens with lines and spaces down to 25µ. That's small."

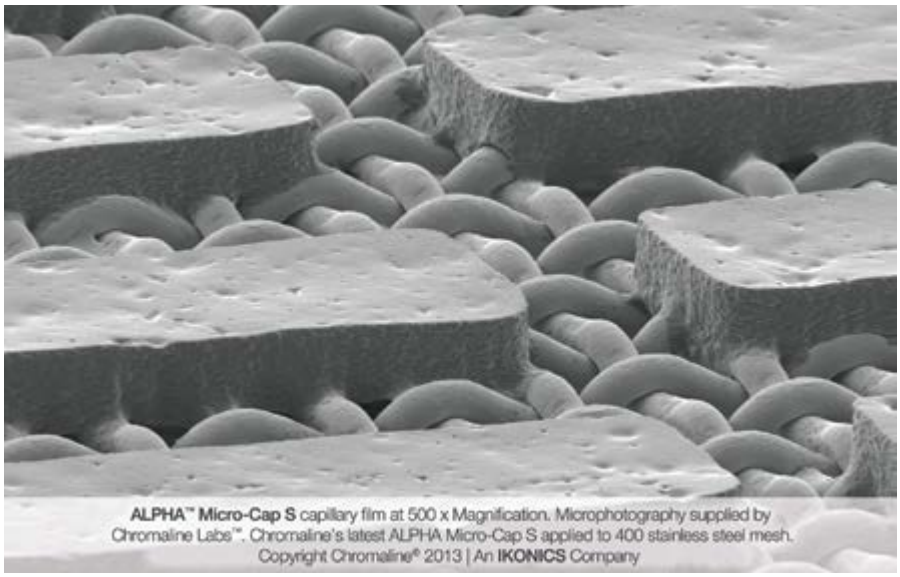
INTERDEPENDENT MARRIAGE

The technical challenge manifests in a complex, interdependent marriage of mesh, emulsion, ink, and a host of speciality equipment, used in artful unison, often in a clean-room environment. There is very little tolerance for error. The recent trend toward larger format screens, coupled with the challenge of finer lines is an additional challenge, leaving many production managers scratching their heads.

"Without a doubt, the single biggest question asked of us pertains to the ability to produce screens with lines and spaces down to25µ. That's small."

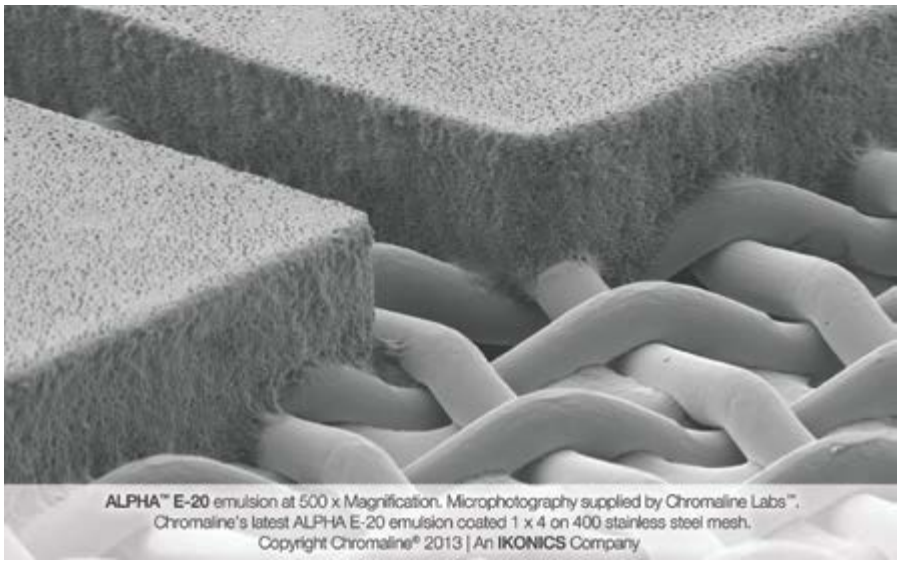
The IKONICS Corporation, Duluth, Minnesota, through its Chromaline Screen Print Products division, recently launched its Alpha line of stencil-producing emulsions and capillary films. The Alpha line, specifically engineered to accommodate the challenges voiced by those working in the printed electronics' industry, is allowing for printed lines as small as 20µ and, in the controlled environment of Chromaline Labs, applications specialist Mick Orr – a 40 year veteran in the industry – has managed to produce a 10µ line.

Continued over



Smooth sharp walls aid in the transfer of ink to the substrate, resulting in improved conductivity

"The demand for finer and sharper stencils has never been more in demand," Orr says. "I've been in printed electronics operations all over the world and have never seen anything quite like this. Printing a 20µ line in a production setting is an exceptionally challenging proposition – and, as challenging as it is for those working in the printed electronics field, it's incredibly attractive to those who manufacture the electronics. And then, finally, to consumers of electronics, like you and me, we're quite thrilled – expectant, actually – about having our devices get smaller and more functional and just plain cooler."



Notice the straight shoulders and flat surface. This combination enables the printer to achieve fine line prints down to 20µ

Back at UTZ Technologies, Jonah Bilotta and Alpha specialist Marty Medvetz of the IKONICS Corporation discuss ways to optimise an upcoming print run, considering a host of variables. Bilotta pauses to make a point about the nature of the market itself.

PRESSURE FOR SMALLER AND BETTER

"As everyone is very well aware, this is a global industry. As such, Asian and European product developers have been working to come up with ways to accommodate the demand for smaller print sizes for years. To the extent they've been successful, we've seen a lot of the US market compromised. Regardless of where the actual work gets done, however, the pressure for smaller and better isn't going away."

For his part, Medvetz concurs, adding: "Notwithstanding the macro-economic realities of cheap labour markets and incumbent production manufacturing, the bottom line is that consumers are increasingly intolerant of expensive, clunky, obsolete electronics. So, no matter where a player is along the printed electronics supply chain, anyone that can add value to the process in the context of shrinking and improving the end product is increasingly critical."

Back at Chromaline Labs, in Duluth, Minnesota, Mick Orr draws attention to a Scanning Electron Microscope (SEM) and several images projected on a bank of flat panel displays. "What you're looking at is Alpha E-20 emulsion coated 1 x 4 on 400 stainless steel mesh, magnified 500 times." Compared to similar images of screens coated with other emulsion products, the Alpha images are crisp, the edges smooth and the adherence to the mesh, consistent.

"What you're seeing," Orr concludes, pointing to the edge where the emulsion meets the mesh, "is an opportunity for better electronics." ■

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AN EVALUATION OF THE WEAR CHARACTERISTICS OF SQUEEGEES

Chris Phillips determines how findings affect print quality and ink usage

Squeegee wear will have an effect on the quality of the screen-printed product as well as the ink usage. There are cost implications from replacement of squeegees, increased ink consumption and rejection of printed product. This article details the development of a controlled accelerated wear procedure for squeegees and accurate measurement of wear using a microscope and image analysis techniques. It then describes how squeegees were then used to print in both worn and unworn states using a conductive silver ink, with the resulting printed samples analysed to compare the effect of wear on line geometry (and, hence, ink consumption) and electrical resistance for printed silver lines. Six different squeegee materials were used and obtained from commercial sources (Table 1).

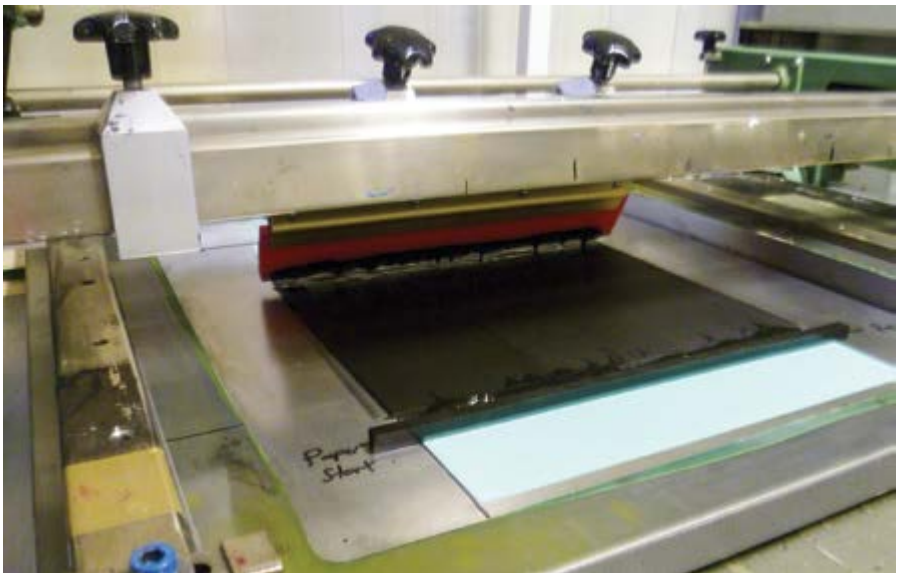

Figure 1: controlled wearing of a squeegee using silicon carbide paper

ACCELERATED SQUEEGEE WEAR METHODOLOGY

For an experimental investigation, it is not feasible to wear squeegees by printing due to the time it would take, wastage of both ink and substrate and the uneven and unpredictable wear that would result. Such a method might lead to lines and blemishes in the print which would not be evenly manifested. This necessitated the development of an accelerated wear technique. In order for the wear to be representative of that achieved through printing, wear was performed using a screen-printing press. However, rather than using printing to wear the squeegees, the trial used silicon carbide ('wet and dry') abrasive paper. This product was selected as it enabled a controlled and consistent means of wearing the squeegees and it was readily available in a range of carefully controlled grades.

The wear apparatus was designed specifically for this experiment (Figure 1). A stainless steel plate was attached to an aluminium screen-printing frame. Three different grades of silicon carbide abrasives were used; in order of declining roughness these were 1200, 2000 and 2500 grits (with 15.3, 10.3 and 8.4µm average particle sizes respectively). The silicon carbide sheets were cut into strips and placed side by side on the steel plate using a cushioned double sided tape. The full length of the sheets (280mm) was used and they were cut into strips so that all three abrasives could be used simultaneously. The worn squeegees could then be used to print three identical test images from the same screen in the ensuing print tests. The printing machine was a SveciaMatic SM.

In order to help lubricate the contact between the screen and squeegee and transport abraded particles away from contact area, a carbon paste screen ink was spread over the abrasive sheet prior to wear. Dry abrasion, or use of a low volatility solvent alone, was found to be much more damaging to the squeegee in preliminary tests. A flow coat was not used as it would most likely damage the abrasive and would suffer abrasion itself. A 10mm strip of squeegee material was attached to the adhesive tape at the end of the abrasive strips, where the squeegee lifted off after wear. The ink pooled at this point, as it was scraped along the abrasive sheet by the squeegee, and the strip allowed a reservoir of ink to form that would recoat the squeegee at the end of each wear cycle. This ensured that a covering of ink remained on the squeegee; rather than having dry contact.

The squeegee was then reciprocated over the abrasives to cause it to wear, with bands of different levels of wear across the width of the squeegee as a result of the different abrasive types. Fifty reciprocations of the squeegee were performed for each squeegee. Both abrasives and ink were discarded after each cycle of 50 reciprocations to ensure consistency between squeegees. Following wearing, the squeegees were cleaned and left for a minimum of 48 hours before wear measurement to allow any absorbed solvent to escape and swelling to subside.

Continued over

Squeegee number	Full details	Measured Shore A hardness \ (standard deviation)
1	Unitex Ulon HP 500/4, Trelleborg Applied Technology, UK	74.2 (0.6)
2	Minoplain 9 x 50 x 1500 Blue (03MN-PLN-H-A09-50-1500)	76.0 (0.0)
3	Lumina L754/T G1 2000 Series G1 Medium blade	75.8 (0.4)
4	Serilor SR1 (50/09/75/SR1), 50 mm x 09 PO 75 SH. Fimor, France.	76.9 (1.2)
5	TG950:Printmor TS 9x50mm 75Sh GRN, BMP Worldwide.	78.7 (0.8)
6	Huayo, China	70.0 (0.8)

Table 1: squeegee types used in the experiments

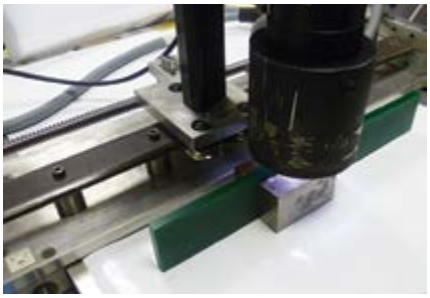

Figure 2: measurement of squeegee wear and resulting microscope images

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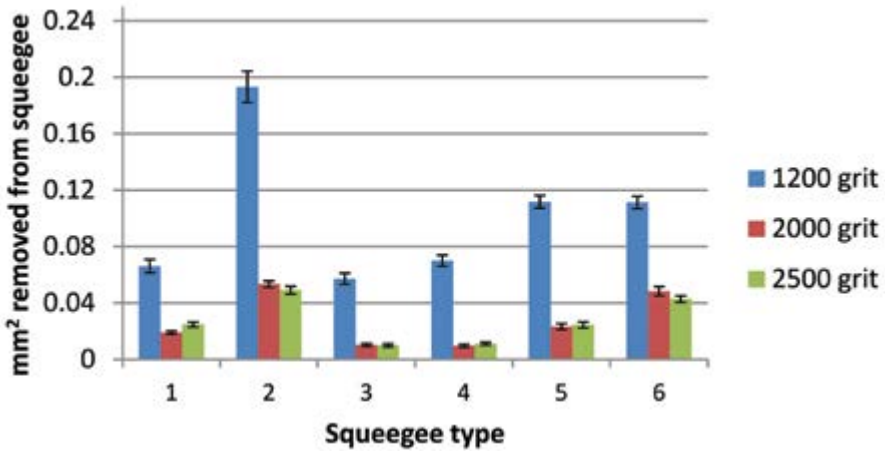

Figure 3: squeegee cross-sectional area removed after 50 wear cycles with different silicon carbide abrasives – error bars show standard deviations

MEASUREMENT OF SQUEEGEE WEAR

Images of squeegee wear were captured using a Leica stereo microscope with a three chip CCD camera. The squeegees were measured from both the side and bottom of the squeegee. Wear was clearly visible as a band in the images and was evaluated using image analysis software (Image J 1.46r, U S National Institutes of Health). Rather than expressing two numbers to quantify wear, the cross-sectional area removed was calculated as a triangle from the worn width of the squeegee from both orientations as ½ a x b.

SQUEEGEE WEAR FINDINGS

The amount of wear, in terms of cross-sectional area removed from the squeegee, is shown for the three wear bands (1200, 2000 and 2500) and for each squeegee in Figure 3. The roughest abrasive (1200 grit) gave the highest amount of wear, while the less rough abrasives (2000 and 2500 grit) gave less wear but were fairly similar to each other. For the roughest abrasive (1200 grit), the lowest amount of wear was observed in squeegee 3, followed by 1 and 4, though all three were broadly similar. Squeegees 6 and 5 gave more wear and performed similarly to each other. Finally, squeegee 2 showed significantly more wear than any of the other squeegees. For the 2000 grit abrasive, squeegees 3 and 4 gave the least wear, followed by 1, 5, 6 and finally 2. For the 2500 grit abrasive, squeegee 3 gave the least wear, followed by 4 , 5, 1, 6 and finally 2. For both 2000 and 2500 abrasives, squeegees 2 and 6 gave substantially more wear than squeegees 1, 3, 4 and 5. Overall, across all the abrasive types, the least wear was observed in squeegee 3.

PRINTING USING WORN AND UNWORN SQUEEGEES

Unworn and worn edges of the same squeegee were printed sequentially, before moving on to the next squeegee. To alternate between unworn and worn edges, the squeegee holder was removed, rotated by 180 degrees and replaced in the printing press. All prints were performed on the same screen without changing over or cleaning between print cycles – with a control squeegee used to compare variation in print between the start and end of the series of print cycles. None of the printing parameters was altered and the ink was kept in excess to deter drying in the mesh. A gel type flexible silver paste was selected as it was stable over time and not prone to drying in. The substrate was 330µm Melinex 339 PET (DuPont Teijin Films). The screen used for printing consisted of three bands of identical test images which coincided with the different wear bands. A range of different line widths in both print direction (perpendicular to the squeegee) and at 90 degrees to the print direction was included. A total of ten prints were made for each squeegee configuration, giving a total of 140 prints. Including changeover time, this took less than two hours. The condition of the ink had not noticeably changed in that time.

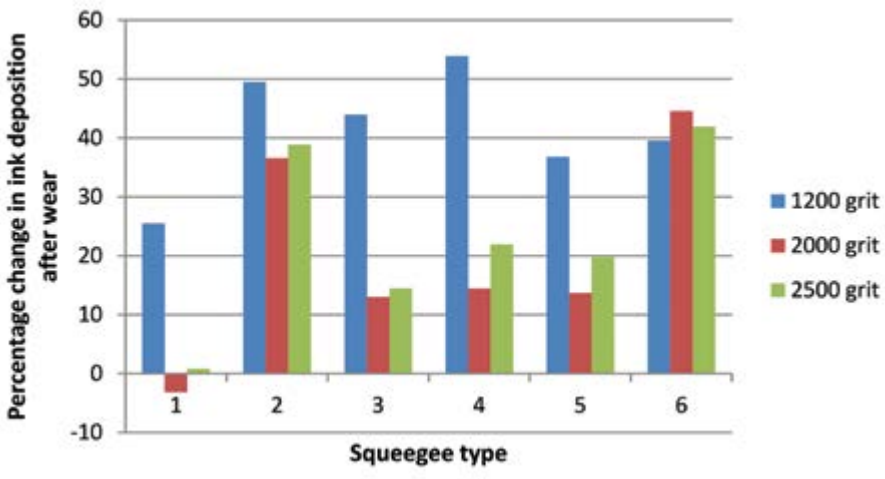

Figure 5: variation in ink deposition as a result of squeegee wear with different abrasives

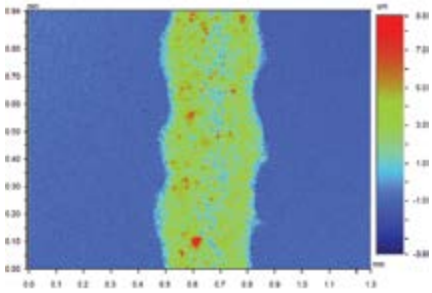

Figure 4: sample topographic profile of a 400µm screen-printed silver line

MEASUREMENT OF PRINTED SILVER LINES

The dimensions of the printed features were measured using white light interferometry. This allowed a full three-dimensional surface profile to be captured, so that line width, print thickness and local surface variations could be evaluated. Lines of 400 and 600µm nominal width were measured both in the print direction and at 90 degrees to the print direction. A measurement area of 1.25 x 0.94mm was used. A sample surface profile is shown in Figure 4; the colour represents the height at that position, with the substrate blue and the line in green, with peaks in red.

Average line width and ink film thickness for each printed line were evaluated from the surface profiles using WCPCLine software written by WCPC. The software was able to use the roughness data for the substrate to precisely differentiate between ink and substrate. The electrical resistance of the lines was measured with a Keithley 2400 multimeter using the two-point probe technique. A probe was applied to the contact pads at each end of the printed tracks and the resistance recorded.

CHANGES IN INK DEPOSITION AS A RESULT OF SQUEEGEE WEAR

The change in ink deposition as a result of wear is shown in Figure 5. Ink film thickness, line width and, hence, ink deposition generally increased with the

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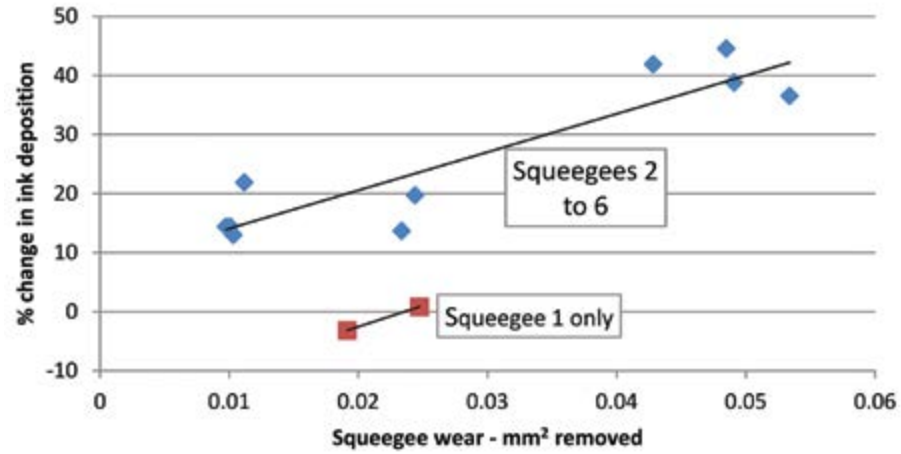

Figure 6: relationship between squeegee wear and change in ink deposition for 2000 and 2500 abrasives

amount of wear on the squeegee. However, the dominant factor in the deposition was the change in ink film thickness rather than the width of the line. This would lead to greater ink consumption and, therefore, cost/unit and an increasing likelihood of product failure or rejection. For the roughest abrasive, an increase in ink deposition and, therefore, ink consumption, of 25.5% was recorded for squeegee 1, while the other squeegees showed greater increases between 36.8% and 53.9%. For the mid roughness abrasive, squeegee 1 showed a small decrease of 3% in ink deposition due to wear while the other squeegees all increased deposition, in varying amounts, between 13% and 44.6%.

For the smoothest abrasive, squeegee 1 showed only a negligible change in deposition (+0.8%) while the other squeegees all increased deposition, in varying amounts, between 14.5% and 41.9%. The small reductions in deposition, mainly observed in squeegee 1 for 2000 and 2500 papers, were most likely within the inherent variability in the process and gradual drying in the mesh (demonstrated by the control prints).

The relationship between the amount of wear and ink deposition, while generally showing an increase in ink deposition with increased wear, was not straightforward (Figure 6). Squeegee 1 differed from the other squeegees, with substantially lower variation in ink deposition, even with comparable wear levels.

For squeegees worn with the roughest, 1200, abrasive, there was a reduction in line resistance for all lines due to the increase in ink deposition from the worn squeegees. The lowest reduction in line resistance was observed in Squeegee 1, with an average 21% reduction in line resistance across all lines. This was followed by squeegees 5, 6, 2, 3 and 4 with overall reductions of 29 to 37%. These trends mirrored the patterns seen in the printed line geometry; the greater the increase in ink film deposition, the greater the reduction in resistance. For the mid roughness abrasive, squeegee 1 showed a small increase of 3% in line resistance due to wear, due to reduced ink deposition, while the other squeegees all showed a reduction in resistance, in varying amounts between 12.7% and 37.8%. For the smoothest abrasive, squeegee 1 showed only a very small increase in resistance of 1.5% while the other squeegees all gave reduced resistances, in varying amounts between 17.8 and 32.3%. The resistance data highlights the changing electrical properties due to worn squeegees. When used in electrical products, such variations in conductivity might lead to unpredictable behaviour. Properties of other functional layers such as dielectrics and insulators would be affected similarly in terms of capacitance, resistance etc. This would lead to a higher failure and rejection rate for the products.

The relationship between the ink deposition and the reciprocal of the measured line resistance is shown in Figure 7. While the worn squeegees gave a general increase in ink deposition, which gave a reduction in line resistance, there was no deviation from the relationship which would suggest a reduction in the performance of lines printed with the worn squeegees. Print defects, such as broken lines, would lead to higher than expected resistances. This highlights the benefit of a controlled wear methodology rather than testing squeegees worn through printing which might suffer nicks or other uneven damage and cause broken lines.

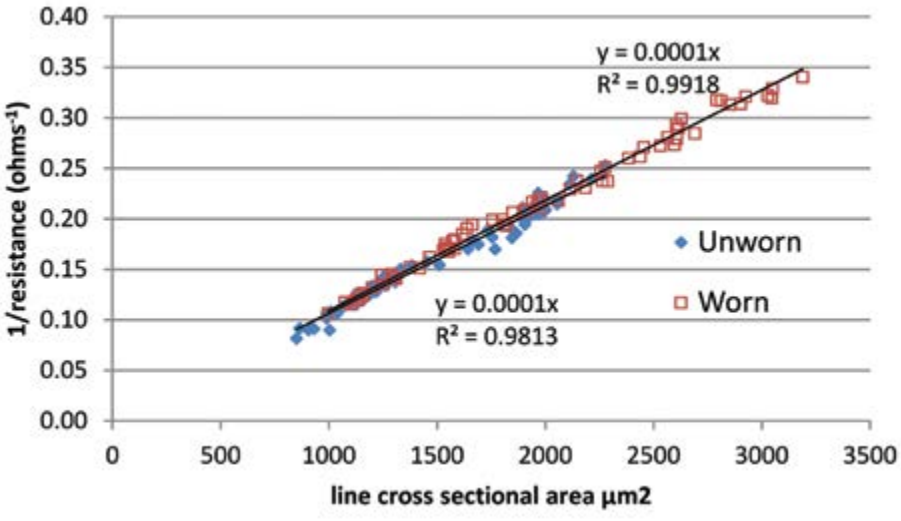

Figure 7: correlations between ink deposition (line cross-sectional area) and line resistance

CONCLUSIONS

This investigation highlighted differing wear characteristics, and hence longevity, for a range of squeegees. Squeegee wear led to increases in ink transfer and thicker printed lines. This would lead to greater ink consumption and therefore cost/unit and an increasing likelihood of product failure or rejection. Squeegee 1 (Unitex Ulon HP 500/4) was the best performing in terms of maintaining consistency in the print after wear, with a marked contrast between its performance and that of the other squeegees, suggesting a greater lifespan and lower ink consumption than other squeegees.

This work was funded by Trelleborg Applied Technology. Experimental trials were performed at the Welsh Centre for Printing and Coating with support from D Beynon, S Hamblyn and G Davies. ■

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MORE THAN JUST T-SHIRT PRODUCTION

Matthew Rhome discusses how to decorate different items with a direct-to-garment printer

Most direct-to-garment printer equipment manufacturers offer standard sized platens for printing on T-shirts, and a few even offer special ones for printing on long sleeves or pockets. But did you know there are so many more things you can print on using your direct-to-garment printer? By using it to produce printed items other than the standard T-shirt, it might help increase sales for your business.

Water-absorbent stone coasters are available in a variety of shapes and sizes, including a small round made especially for the drink holder in most cars. Coasters can be easily printed on most direct-to-garment printers by simply lowering the printing platen until the coaster will clear the print-head(s). To help align the print to the coasters, most coaster suppliers will offer a template for most software packages. By printing the template to paper taped to the platen it gives you a guide for proper placement of the coasters and alignment of the printed graphic.

Other items that are frequently printed direct-to-garment are tote bags, golf towels, pillowcases, cloth napkins and other fabric products. Some of these items can simply be smoothed out and laid on the platen for printing, but most will have to be secured in some fashion. Some direct-to-garment printer users utilise black binder clips or tape to hold the product in place but, for improved stabilisation, many prefer to use an aftermarket gripper kit that attaches to the bottom of the shirt platen. Equipped with opposing rubber tubes that hold the fabric taut, the gripper kit ensures a smooth surface for printing. Make sure you lower the platen before printing as these speciality items are often thicker than a T-shirt and one does not want a print-head striking the garment.

Tote bags can be printed successfully on a direct-to-garment printer

The Brother GT-3 direct-to-garment printer

PROFITABILITY OF PRINTING ONTO SPECIALITY ITEMS

Printing on speciality items can be profitable, but it can also take a longer amount of time to load the item on the printer and position the printed design to the product to be printed. For those direct-to-garment printer users that are going to print regularly on these types of items, they should consider investing in speciality platens (which are also referred to as fixtures or jigs) that are designed to help speed up the printing process and maintain the integrity of the finished piece.

Collapsible foam can coolers are a unique item that can be printed on most direct-to-garment printers. A special jig is available that is placed on top of the standard direct-to-garment shirt platen that has small arms to hold multiple can coolers for printing. The jig manufacturer should provide a layout template to work with your design software to ensure proper placement of the printed graphic. Since most can coolers are made of polyester they should be pre-treated with a poly spray before printing.

There are many direct-to-garment printer manufacturers that offer a cap platen, and a few attachments will even allow for printing on the bill of the cap as well. All are unique in the way they work, but the main focus of all of them is that they flatten out the cap so that it can be printed. Attaching a cap to any of the cap platens does take a little more time than loading

Stone coasters being produced on a direct-to-garment machine

a T-shirt on a standard platen and requires some skill to get the cap properly flattened out.

Unstructured caps are the easiest to print on a direct-to-garment printer, because their shape allows them to be easily flattened. Often a mistake made by direct-to-garment printer operators when printing caps is when one does not take the time to remove all the wrinkles in the cap. If you don't remove all the wrinkles, there will be folds in the cap fabric and the print will not image correctly. One has to be patient when loading a cap but the end result is worth the effort.

TRANSFORMING CANVAS SNEAKERS

The newest item that is imaged on direct-to-garment printers is canvas athletic shoes. Speciality platens are made that allow for printing on the sides and tongue of the shoe. Direct-to-garment printing can transform an ordinary pair of canvas sneakers into a fashion statement and add additional profit to your business. Users should mask off the sole and eyelets of the shoe to create a clean print line for the best looking product possible and prevent over spray from soiling the areas that are to be left unprinted. After printing the shoe the ink can be cured using a standard heat gun (commonly used to remove paint or wall paper) or in a conveyor dryer.

There are so many items that can be printed using your direct-to-garment printer and we have touched on just a few. So now you might ask what else can I print with my direct-to-garment printer? Use your imagination and the possibilities are virtually endless, but always be sure to consult your product's operating manual to ensure your proposed material is within the machine operating specifications. ■

Cap printing can be another business opportunity

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FROM T-SHIRTS TO MEDICAL TRAYS

Mark Vasilantone explains how to match a conveyor dryer to a screen-printing application

One of the most critical steps in the screen-printing process is drying, or curing, of the ink after it has been applied to the screen-printed item. This is accomplished by heating the ink to the temperature at which it cures as a printed garment or other item passes through a dryer on a conveyor belt. Popular plastisol inks require cure temperatures of approximately 160 to 171 degrees C, while other types of ink cure/bond at slightly different temperatures.

Figure 1: this Vastex BigRed I infra-red conveyor dryer is used to cure inks on shirts, hats, signs, tote bags, bumper stickers, vinyl labels, binders, hockey pucks, metal parts and other screen printed items at high rates

CHOOSING BETWEEN GAS AND ELECTRIC

Gas and electric dryers offer different advantages depending on budget, required capacity, available floor space and the cost of gas versus electricity.

Gas dryers have an open flame that heats air within a chamber and transfers the heated air to the area through which garments or other printed items are conveyed. The heat is then transferred to the ink by air convection, equivalent to heating food slowly in a gas oven.

An electric dryer, by contrast, uses infra-red radiation that causes ink molecules to vibrate, generating heat that raises the temperature of the ink rapidly without heating the air around it, akin to heating food in a microwave.

The primary advantage of a gas dryer is its ability to maintain a constant temperature and avoid overheating of the ink. Primary disadvantages are dwell times of two to three minutes to heat the ink, requiring long dryer lengths that increase capital cost and consume floor space. Additionally, thick insulation is needed to prevent the outer walls from attaining dangerous temperatures. As a result, gas dryers are generally recommended for large print shops, provided that natural gas or propane is available and less expensive than electricity is locally.

Gas dryers are typically larger and more expensive than infra-red conveyor dryers for several reasons:

1. Gas dryers handle significant volumes of high temperature air, requiring costly air handling systems with motors positioned away from the hot air stream
2. Complex safety controls are required to protect operators from combustible pressurised gas
3. Thick insulation is needed to prevent the outer walls of gas dryers from attaining dangerous temperatures

In comparison, infra-red conveyor dryers

Figure 2: BigRed V30 models (76.2cm belt width) can dry 475+ plastisol-printed pieces, 200+ water-based-printed pieces, and 56 digital-white-printed pieces per hour/chamber. BigRed V54 models (137.2cm belt width) can dry 950+ plastisol-printed pieces, 400+ water-based-printed pieces, and 112 digital-white-printed pieces/hour/chamber.

The Vastex sub-compact D-100 model with 45.7cm belt width and 116.8cm belt length can cure up to 110 plastisol-printed pieces/hour (lower output for discharge-printed textiles)

are smaller and less expensive because they do not require insulation. In addition, they are shorter in length due to reduced dwell times, since infra-red radiation attains ink curing temperatures more rapidly and efficiently than heated air, particularly when curing plastisol inks. However, if items are conveyed through an infra-red dryer too slowly, the ink can overheat and break down chemically.

Unlike installed gas dryers, infra-red conveyor dryers are also expandable. For example, a relatively large infra-red dryer capable of curing approximately 1,000 screen-printed items/hour, can cure 2,000, 3,000 or 4,000/hour by adding one, two or three heating chambers, in addition to lengthening the conveyor and increasing its belt speed.

In terms of size, the infra-red electric dryer shown in Figure 1 measures 2.1 to 2.4m in length and cures approximately 300 items/hour, versus approximately 3.1 to 3.7m for a gas dryer of equivalent capacity.

REMOVE MOISTURE FROM WATER-BASED INKS RAPIDLY

A common misconception is that forced hot air is needed to evaporate moisture from water-based inks and to expel it from the dryer. In reality, it is infra-red radiation that heats the ink and causes evaporation. This is then removed from the heating chamber by a high velocity exhaust system with high efficiency – on a par with the efficiency of an infra-red dryer curing plastisol inks.

For example, a Vastex Big Red infra-red conveyor-dryer (Figure 2) exhausts 11 cubic m/minute of air from the drying chamber and supplies roughly 14.16 cubic m/minute (500 cubic feet/minute) of air, warming but not superheating the air to pull moisture from the ink and exhaust it, while preventing outside air from entering through the dryer exit.

COMPARE QUARTZ TUBES WITH INFRA-RED PANELS

If the application calls for an infra-red electric dryer, users can maximise results by understanding different ways in which infra-red radiation is generated.

Some dryers use quartz tubes while others use infra-red panels. Because quartz tubes radiate 360 degrees, they require a reflector to direct energy radiated from the top portion of the tube back towards the garment, losing efficiency in the process.

Infra-red panels are made of a ceramic quartz fabric and are flat, directing virtually all energy toward the garment, offering higher efficiency (less power usage)/unit of radiation.

Quartz tubes are also relatively fragile and typically have a shorter life, whereas infra-red panels are more durable and have a useful life of up to 20 years, making them less costly in the long run.

Infra-red radiation is measured in terms of wavelength (not temperature), which is expressed in microns (one millionth of a meter or 0.000039 inch). For most screen-printing inks, the optimum frequency is 3.2µm (0.000126 in.), which is at the top end of the mid-micron range. At this frequency, the infra-red radiation is readily absorbed by the ink, causing its molecules to vibrate and generate heat.

However, most quartz tubes in dryers for screen-printed items generate infra-red radiation in the mid-micron range making them less efficient for curing of screen printing inks.

ELIMINATE COLD SPOTS WITH PROPER CORE DENSITY

An infra-red panel is powered by a long electric wire routed back and forth in a parallel pattern across the panel, with the distance between the wires determining its core density. Because the temperature between wires spaced widely (51cm) can drop by approximately 30 degrees C, you should specify a heater having wires spaced at approximately 1.9cm, providing sufficient core density to prevent the ink from cooling as it passes between wires.

KEEP YOUR OPTIONS OPEN WITH A WIDER DRYER

It is advisable to specify a wide dryer, if budget permits, for drying larger garments or two smaller garments side-by-side, as well as blankets, signage, binders, metal parts,

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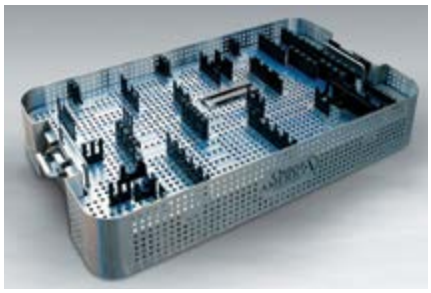

Figure 3: the same equipment that produces screen-printed textiles also produces screen-printed hard goods such as these surgical instrument trays

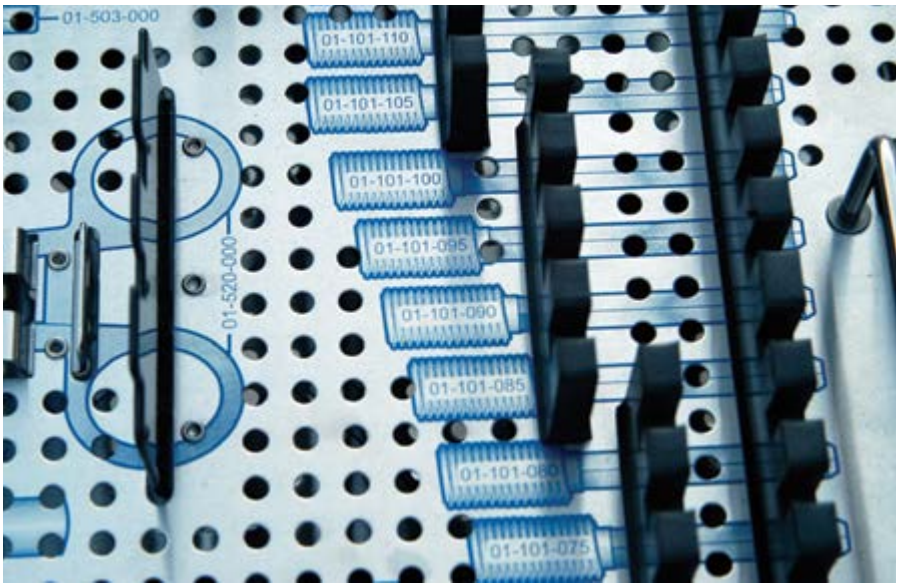

Figure 4: a Vastex EconoRed I dryer cures special heavy duty, hard-to-handle inks screen-printed on stainless steel, aluminium and plastic surgical trays that must withstand repeated autoclaving

advertising specialties, and other screen-printed items. A dryer with a 76.2cm wide belt, for example, cannot cure an overall printed shirt that measures 102cm sleeve-to-sleeve.

If your budget is limited, the higher cost of a wider dryer can be offset by purchasing a shorter (less costly) dryer initially, and then adding heating chambers (depending on brand) at a future date to increase capacity as you grow.

APPLICATIONS BEYOND PRINTING AND DRYING OF TEXTILES

It is typically less expensive to purchase a dryer, that offers greater capabilities than you need today, than it is to purchase a larger dryer when you require greater capacity or the flexibility to expand beyond textile printing.

Consider that the same screen-printing presses and dryers, used daily by thousands of textile printers world-wide, are also used to print and dry a diversity of signage, and hard goods as previously mentioned.

One example is screen-printing on medical delivery trays (Figures 3 and 4) that contain and identify surgical instruments. Because the trays are utilised several times/day, they are sterilised in autoclaves where they are subjected to pressurised steam after each use, placing rigorous demands on the screen-printed graphics.

Screen-printing has long been the industry standard for printing on instrument delivery systems because of the need to use highly specialised inks that stand up to repeated autoclaving, and due to the varying shapes of the trays.

A growing portion of the manufacturers' trays are printed on two, Vastex one-colour table-top 2000HD heavy duty screen-printing presses and cured in a Vastex EconoRed 30 infra-red dryer.

The industrial-grade presses are constructed with tube steel legs, square steel rotor arms, heavy-gauge steel rotor assemblies and non-warp steel pallets, with all critical moving parts riding on ball bearings. The dryer is equipped with a 4300 Watt heater and a 168mm long, heavy-duty conveyor

Two EconoRed I models with 167.6 cm belt length are recommended for small- to medium-size shops: an EconoRed I 30 with a 76.2cm wide belt and new 4300 Watt heater (shown) capable of curing 190+ pieces/hour/chamber and the EconoRed I 54 with a 137cm wide belt capable of curing 380+ pieces/hour/chamber

This 76 cm EconoRed II infra-red conveyor is utilised for drying of plastisols, water-based and discharge inks, and heat transfers

capable of printing 190 pieces/hour.

This application involves specialised inks and uncompromising quality standards, while others involve irregularly shaped items, extra large (heavy) screens, extremely short runs requiring fast set-up and micro registration, extremely tight multi-colour registration and other future requirements that may hinge on the capabilities of your screen-printing equipment. It is therefore prudent to select equipment that will expand, rather than limit, opportunities that may arise during your screen-printing career, even if you cannot utilise some of the equipment's capabilities at the onset. ■

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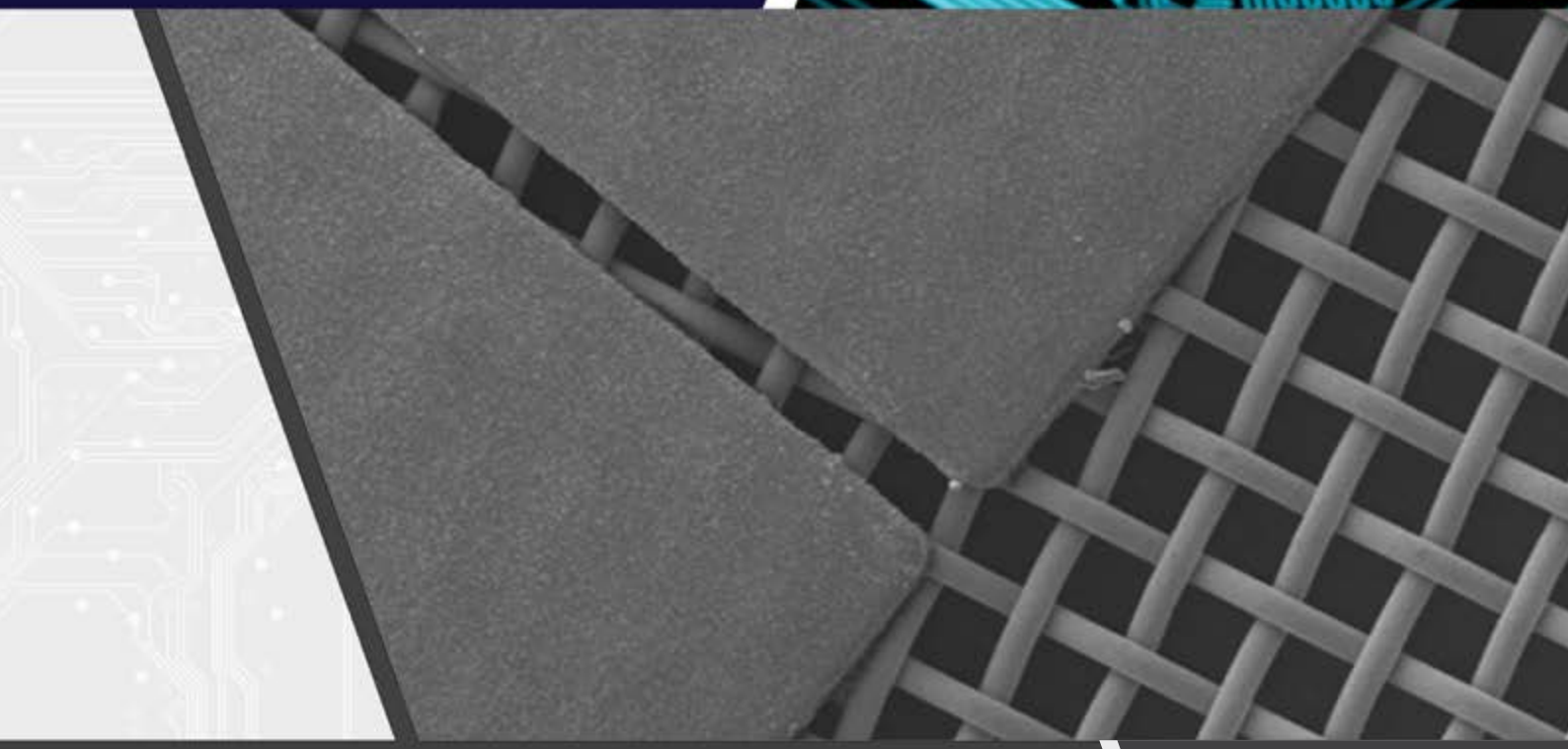

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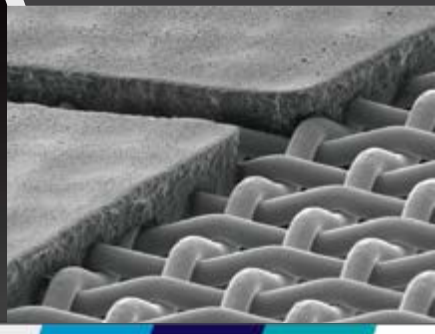

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SPECIAL OPPORTUNITIES FOR UV-CURABLE PRINTERS

Michel Van Vliet describes three distinctive applications

One of the greatest advantages that UV-curable ink offers is that it can print on almost any surface. It also has a very wide and varied scope of application. Not only are specific LED UV printers used in mock-ups, packaging proofing and in the labelling industry, but this technology has proven its capabilities in other sectors as well.

PERSONALISED CLOTHING WITHOUT WEEDING

The textile personalisation market is a large and continuously expanding one. Promotional clothing, team wear and limited editions are just a few examples. In most cases, transfers are used in which the printed matter is affixed on the garment or accessory using a heat press. Flex and flock are the popular choice of materials for this purpose. Sublimation is another popular technique. Each technique has its advantages and disadvantages. The combination of Roland DG eco-UV inks and Forever No-Cut offers an alternative that removes some potential disadvantages of the different techniques.

The name says it all as Forever No-Cut is a material that does not require cutting and weeding. This eliminates the need to remove excess material, a major advantage in the case of photos, fineåcharacters and complex designs.

In this technique, the negative image is printed on a Roland DG VersaUV printer. The UV-curable ink acts as a block-out and is not transferred when the print and the fabric are placed under a heat press. Only the recessed No-Cut material is transferred onto the textile.

The washability of these transfers is very good since the film itself is transferred, not the ink. However, the film is barely visible and the transfer feels soft to the touch. There is hardly any visible difference to screen-printing.

Forever No-Cut shows little visible difference to screen-printing

Water slide decals applied to a model plane

DIGITAL PRINTING OF WATER SLIDE DECALS

Water slide decals (or slip decals) have been produced on analogue machines for many

Soaking the water slide separates the print from the film

A water slide being applied to a thermos flask

3M's double-sided adhesive film, 7956 WDL, is suitable for the production of control panels

The Roland DG LEC-300 VersaUV print-and-cut solution

Roland DG's Eco-UV ink catridges

years. A faster, cheaper digital alternative is now available. In water slide decals, the print separates from the film on soaking in water. The print is then affixed on the carrier.

Among other things, the advantages are that they are very thin and heat-resistant. They can also be affixed on complex surfaces without any problem, and conform to the shape of the object. Examples of objects include model planes, helmets, vases, lampshades and furniture. More specifically, they can be used on wood, plastic, porcelain, glass, ceramics, stainless steel, coated aluminium and painted surfaces.

These decals are digitally produced using Roland DG UV-curable inks combined with the Trudigital material made by Tullis Russell. The UV-curable inks remain on the material, in contrast to solvent-based inks that are absorbed into the material. The varnish is printed below the full colour image and acts as a carrier of the ink.

OPERATOR CONTROL PANELS REQUIRE FLEXIBLE INK

Roland DG's UV-curable printers are also suitable for printing operator control panels (touch panels). Since flexible inks are used, the ink does not break if the button is pressed frequently. Furthermore, the printing is done on the back of the material which, for this application type, is usually a polyester or polycarbonate. It is durable, heat-resistant and resistant to chemicals.

Roland DG recommends the use of a Folex Go-Ag DUV polyester and a 3M double-sided adhesive film, type 7956 WDL, for this application. This adhesive film has a threefold function. The white or silver coloured polyester film carrier can be used as background for the panel, and this eliminates the need to print a white top coat. Moreover, it is not yet possible to use UV-curable inks for silver-colour printing. Furthermore, this double-sided adhesive film also includes a block-out layer that totally blocks light at the desired location.

ECO-UV INKS AND LED-UV PRINTERS

The Roland DG range includes several printers that use Eco-UV inks. The VersaUV series includes two LEC devices that combine printing and cutting and a device that is print-only, the LENJ-640. There is also the compact flat-bed LEF-12, that can print directly on objects of up to 10cm thickness.

The UV-curable ink is available in six colours of CMYK, white and varnish (or clear ink). The latter can be provided with a glossy or matt appearance by adjusting the lamp settings, and the clear ink can also be used for relief printing. This can be carried out by printing various ink layers one on top of the other in specific areas.

The ink is dried using LED curing lights. These do not have heating-up and cooling times and also produce minimal heat. ■

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PRINT IS EXPECTED TO BE THERE, AND SO IS THE QUALITY

Mike Horsten believes that print is something we don't think about any more

Is print dead? No – it's not but it is changing. We used to print everything on paper but with the growth in technologies during the last few years, we have been able to start printing on all kinds of materials. With the introduction of digital print we have been able to generate more colour output. More than ever before, we are changing.

Just think back; book printing was done with one colour (black). Then, with the maturing of industrial screen-printing and mechanical block printing we advanced to more colours on fabrics, cardboards, plastics and, even, metals.

At the same time, a new way of printing was developed, namely offset. Offset printing became easy to use in the 1970s and large presses arrived offering four, five, seven or even more colours. Varnish and UV coatings to enhance print were now possible. Extras on top of the print were and still are fashionable.

The entrance of the digital printing arena made more possible than most people knew or could even imagine. The fast reduction of printing costs like making plates, cleaning and adjusting the presses are part of the past, we went to computer-to-plate and, in digital, we went from slow to fast in full colour.

A FACT OF LIFE

Digital printing today is a fact of life; we print twice the amount in digital than maybe only two years ago. Digital printing has evolved into a massive industry that does not look at the printing market alone. Most of your car dashboard is printed digitally or with traditional screen-printing where the screens were made digitally. At the point-of-sale, plus billboards, pens, lighters, backlights are almost always printed digitally today.

With the introduction of faster and reliable small-format UV-curable flat-bed printers, these markets will even grow faster.

Mimaki recently introduced the UJF-6042 A2 small-format flat-bed printer with resolutions up to 1,800 x 1,800dpi. This is higher than the traditional offset print or, even, photo printing.

Realising photographic imaging on a great variety of substrates enhanced the industry's capabilities to produce different articles without losing the flexibility they are used to. This new equipment allows generating output on a multitude of substrates, not only digitally, but better than old technologies on glass, acrylic, wood or plastics. Even photographic imaging became possible with digital at qualities that the old silver emulsions could not reach.

But digital goes further. Textiles have been traditional rotary screen-printing or gravure but, due to the changing demand of the retailers, they want more on-time stock. Where, just a few years ago, the retailer needed to manufacture say 5,000 pieces in red and 5,000 pieces in blue. But if the blue garments sold out, he could not easily get a new batch produced, as it would cost time and the volume needed to be big, carrying the risk of overstocking the new colour. So the large fashion retailers have been thinking and using the new digital print technology to print fashion-on-demand.

If stores sell more red then they produce extra red digitally. Although the cost is higher/unit, the waste is less, there is less over-production and the customer has a choice.

The biggest benefit is that the retailer became flexible. So, also in this case, everybody wins with digital printing.

Digital is something not only mind changing. It has changed the way we do business. So enjoy print – digital or traditional. ■

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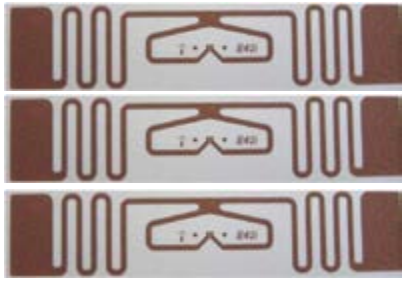

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CREATING TEXTURES AND RAISED OBJECTS WITH UV LED INK-JET PRINTERS

Matthew Sands outlines how to achieve special effects on a digital platform

Textured and raised object printing is something that has been achievable on digital direct-to-substrate UV LED printers for quite some time now. However, making this process robust and durable enough has been a challenge. It is necessary to have all the proper elements in place so raised printing is efficient for the end user. A curing system that includes a UV lamp and the appropriate inks, extensive control over the printer driver and print-head, and a system for creating files that output texture prints are the physical components required to get started. Superior textured and raised prints are not possible, however, without an extensive understanding of the process as well as its components.

The UV lamp is an integral part of the system. While the market for ink-jet slowly moves away from mercury lamps and into LED technology, the number of available UV LED manufacturers world-wide has greatly increased. LED lamps have a greater life expectancy, ranging from 10,000 to 20,000 hours and have the ability to be air-cooled, which means an overall smaller footprint. UV lamp intensities are usually measured in Watts/cm^2. Most air-cooled lamps range from 2 to 8 Watts/cm^2 and any higher than that will most likely require a water-cooled system. However, wattage is not the only factor we should concern ourselves with when discussing UV LED lamps.

CHOOSING THE RIGHT INK

The importance of choosing the right ink cannot be overstated. If the ink cannot cure instantly – if the ink and UV light do not work in tandem – bleeding or spreading of the ink will occur when the large amounts required for texture are laid down. This may require

Raised objects printed on top of a flat UV LED print

running the machine at a slower speed so the ink has more exposure to the lamp and therefore more time to cure. Slowing the machine down means slower production output, making texture or raised object printing inefficient. This is where having the proper ink comes in to play. Each UV LED lamp will output at a specific wavelength measured in nanometers. UV ink contains photoinitiators that cure at different wavelengths. Most UV LED lamps range from 385 to 395nm wavelengths. It is crucial to formulate the ink to cure within this range. Having the proper cure rate will allow the user to output more ink and cure it instantly, creating a raised object.

Jetting a large amount of ink from ink-jet print-heads is sometimes easier said than done. To maximise the amount of ink lay down, it is essential to have control over the printer driver and the print-head electronics. Most printer drivers will only allow a certain size dot to be output at a certain resolution. For example, higher resolutions usually output a smaller dot to ensure high quality prints. However, higher resolution also means that the print-head is performing more passes over the substrate. So, if the printer driver can be manipulated so the high resolution can output a large dot then the ink lay down is invariably maximised. This might lead to concern about the print quality of the finished product, being printed at a high resolution but with a large dot. Again, having control over the printer driver solves this issue. If different channels can be placed on different dot set-ups then the user can leave the channels that are used for building the texture or raised object, usually white or clear ink, at a large dot and use a

Raised lettering combined with a textured football

Textured prints on mobile phone cases

A raised object with a flat UV LED print over the top provides an embossed look

smaller dot for the CMYK which is responsible for printing the coloured image. This is the best way to achieve acceptable quality prints.

THE CORRECT LED LIGHT SOURCE

Having the right LED light source, coupled with the right ink set and extensive control over the printer driver, is important but means nothing unless a specially designed file can be created and sent to the printer in a language it can understand and transform into a print. This is where the differences between raised object printing and texture printing are really highlighted.

Raised object printing is simply printing a large amount of ink to achieve a certain height and then printing colour on the top. The raised object is simple because it outputs the same height across the entire object. Texture printing is different in that, contained within the same image, there are variations in height. Prints can be created that imitate the look and feel of a basketball or golf ball, for example. Some designs even appear to come to life. There are multiple ways that a file can be manipulated to output a textured print.

As stated before, the texture is usually created using the spot colours, such as white and/or transparent inks, that are installed in the printer. The best way to achieve texture is to lay these colours down first and print the colour image on the top. Through various design techniques, the user has control over the varying heights within the texture layer. This will give the most realistic feel to the finished product. Some systems will output a colour image and apply transparent ink on the top; this gives more of a doming effect rather than a true texture feel.

DESIGNING THE LAYER

The best way to go about designing a texture layer is by altering a duplicated image of the original. Convert this image to greyscale and use the colour adjustment curves to adjust contrast; the darker the area the more texture, or ink, it will output. After this is complete, convert that image into a duotone using the spot colours mentioned above. This will keep the relationship between the dark and light areas but will output using only spot colours so there are varying heights. While the design work uses well-known tools, there will most likely need to be an intermediary RIP (raster image processing) program to interpret this design and output it correctly to the printer.

Creating these unique prints takes some careful consideration about the hardware and software being used. At times it can become a balancing act, finding the correct UV lamp system with the correct ink set or determining the proper resolution while keeping production throughput times in mind. However, there are digital ink-jet machines on the market that have all the right components in place to do this and it adds incredible value to the system. ■

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THE FUTURE OF MERCURY VAPOUR UV CURING

The Focus on LED feature in Issue 2, 2013 of Specialist Printing Worldwide prompted a high level of response from readers. Alan Shaw, Commercial Director, and Rick Mann, Technical Director, of Natgraph explain in this introduction why they strongly felt the need to respond with their article in the following pages.

Specialist Printing Worldwide: In your article in this issue, you seem to offer readers contrasting information from our last issue?
Alan Shaw/Rick Mann: The article from Fimor in your recent Focus on LED was very well-balanced because, even though the applications they detailed might not be for screen, they have the all-round knowledge of screen-printing. However, other articles were written from the digital viewpoint including some generalisation into screen. It should be made very clear that this is a completely different area of expertise. Manufacturers of LED UV systems are understandably looking for every opportunity to install their technology, but there needs to be a real understanding of the challenges of screen-print curing.

In an ink-jet application, the ink is contained in the delivery system within the head and the only time it starts to see the natural light is at the point it's emitted by the ink-jet itself. It's then cured by the UV light source. However, within a screen-printing application, the ink comes in large tins, is dispensed onto a screen and is open to light. So if you modify the wavelength to make it cure more easily (which is what you need to do to use LED), you get into the problem of accidental exposure to UV light which will actually make it go off. So the environment that the customer then has to provide for the UV ink before it's cured may need modifying and that's a significant investment and or change in working practices.

SPW: As a leading manufacturer of conveyorised dryers, utilising forced air, infra-red energy and ultra-violet radiation, what is Natgraph's interpretation of legislation about the possible future banning of mercury lamps and switches?
AS/RM: We cannot find any references at all in legislation to medium pressure mercury vapour discharge lamps used for UV curing. If there is not a viable replacement for mercury in an application then it is being excluded. Affected areas like domestic lighting, for example, are infinitely larger than our niche UV curing sector. If mercury were to be banned from every type of lighting, the whole world might grind to a halt!

SPW: What advantages does UV LED have over your technology?
AS/RM: UV LED certainly has some significant advantages such as being able to switch the lamp on and off at will and having very compact lamp houses that don't have to have extraction and don't contain mercury. These advantages are detailed in our following article. But the disadvantages in most applications far outweigh these because they cost so much to purchase. We estimate they have a limited lamp life of 10,000 to 15,000 hours; they are not limitless as some claim because we know of instances where after 10,000 hours the lamps have failed to provide an acceptable cure. In continuous use, that would only be 18 months before the whole of the head would have to be replaced which is probably between 75 to 85% of the purchase price of the whole system. Even if it's not in continuous use, that's still a lifespan of somewhere between three and nine years depending on use. Does a customer want to spend that kind of money knowing that, within nine years, he may have to almost completely replace it?

Natgraph's Rick Mann and Alan Shaw with an electronic UV system.

SPW: Is it fair to say that UV LED is perceived as being more modern technology than mercury vapour UV curing?
AS/RM: Natgraph is not wedded to traditional technology. There is a false conception of mercury vapour UV curing technology being old fashioned, switched on all the time and being very hot. In truth, we have researched, developed and pushed forward UV technology to an amazing level where curing efficiency has now been improved by 100% when compared to ten years ago and, with the use of electronic UV, we've lowered the operating costs by 50%. This technology is still moving forward and is far more viable than in the past. There are serious advancements, such as, for example, temperature sensitive substrates being processed on our UV systems. We are having great success in the screen-printing sector due to the longevity, efficiency, power usage, lower-temperature within the dryer and being able to process temperature sensitive substrates. Because of all the complex technology going into them, one customer recently told us that: "Natgraph no longer makes dryers – you make advanced drying machines".

SPW: Are your customers asking you for LED UV solutions for sheet fed screen-printing applications?
AS/RM: Yes, and that is covered in our following article. But to our customers, it's not usually applicable or viable, even though some think it should be. It's about the perception of LED being seen as reasonably cheap to buy, using hardly any energy and having a long lamp life. But these principles are being applied in the mind-sets of our customers to curing and curing is not lighting, they are so different. All customers are trying to lower operating and supply costs. But even when the incredible advantages of electronic UV are very clear to them, it is still a challenge in this economic climate for them to invest in electronic UV compared to standard UV, (where the extra price is only between only

£6,000 and £8,000). If you then say that the LED equivalent will cost at least an extra £40,000+, how are they going to justify that within their budget?

SPW: Are there not successful applications where LED UV is working already in screen-printing?

AS/RM: Yes, and in our article we list multi-colour bottle printing applications, reel-to reel presses and on containers where the advantages of the small lamphouse and the lack of extraction are very worthwhile. It is possible that the extra investment could be justified in those types of applications. Maybe there could also be roll-to-roll applications in a high-value equipment installation. So there are applications where it's perfect if customers are prepared to accept the higher purchase price and are aware of the potential lamp life issue.

At Natgraph, we can't bury our heads and ignore LED; if a customer came to us with a specific curing problem that needed an LED unit, we would be very happy to develop it and put it on the machine. It's something we've tested and evaluated and will continue to do so. The only Natgraph conveyorised dryer that currently has LED UV fitted is working in a specialist industrial application for 3D medical containers where the cost was not the most important factor. As you will read, unless it's a specialist application like that, we can't present it as a viable option for our customers.

Would a screen-printer buy a UV LED dryer that they know will only do a certain type of work and for which a limited supply of inks are available? If they are a general screen-printer, when they buy a UV dryer they expect it to be able to do anything that comes through the door. If they are an industrial screen-printer, they not only want to be able to do a specific process but also cope with any adaptations that might come along. They are not going to buy a piece of equipment that is dedicated to a particular wavelength if changing their product means they can no longer use that unit – they want to buy a piece of kit that has a multitude of wave length outputs. One of the great things about electronic UV is that you can change from an iron lamp to a mercury lamp (in Europe it's mostly mercury, in America it's a mixture of mercury and iron and in Asia its mostly iron).

SPW: In your opinion, what has to happen for LED UV to become a more viable option for screen-printing applications?

AS/RM: The hardware costs would have to drop, the range of inks available would have to be massively improved from the current narrow range available and the lamp life would have to be proven to be longer. To become more competitive with electronic UV, costs of LED UV could possibly decrease via a knock-on effect from the heavy investment in LED lighting from the large lighting manufacturing companies that are looking for improved efficiency. Even though we doubt the need for such investment, some of the improvements achieved for lighting could then be transferred to curing.

The specific inks being used in most applications we are involved with are high-end industrial products – the inks for these products have taken a long time to develop and they require very high UV outputs. So a much wider range of LED UV inks would have to be developed, involving a very lengthy testing process to meet the quality standards demanded by tier one suppliers and their OEM customers. ■

If you are an expert in the field of LED UV or mercury vapour UV curing and would like to respond to any content in Specialist Printing Worldwide by submitting your own editorial for consideration, please contact Dave Fordham at davefordham@specialistprinting.com

UV CURING FOR SHEET-FED SCREEN-PRINTING – ARE WE BEING 'LED' ASTRAY?

Alan Shaw compares LED UV systems with the latest developments in conventional UV technology

LED UV V STANDARD V ELECTRONIC UV

Recent articles and comments proclaiming LED UV to be ready to supersede conventional mercury UV curing systems and be a fully developed working solution for screen-printing applications has prompted Natgraph to publish the following article that compares LED UV with standard UV and the latest electronic UV technology. This is intended to confirm if we are being 'LED' astray.

Natgraph is a major global manufacturer of conveyorised dryers for sheet-fed screen-printing applications, with in excess of 13,000 installations located in more than 100 countries since 1979. As a part of its complete in-house manufacturing process over 4,000 UV transformers have been produced in the company's 3,700 square m (40,000 square ft) factory located in Nottingham UK, these being installed within the company's range of UV dryers.

UV CURING

Ultra-violet curing is certainly the most desirable way to achieve a finished screen-print because of its considerable advantages in terms of higher print and curing speeds, reduced floor area, ease of printing, increased resolution, absence of solvents and reduced energy consumption etc when compared to solvent based inks. Natgraph has continued to develop its UV technology for more than 30 years and, as a part of that evolution, the recent opportunity to use LED as an alternative UV light source is potentially an exciting one.

Recent innovations in Natgraph's conventional UV systems, using electronic power supplies, have delivered massive improvements to both the efficiency and control of the UV curing process, with a reduction in electrical power usage of 50%, extended lamp life and reduced heat output at the substrate. To be able to improve the process even further, with the perceived advantages of LED in terms of size, running costs, heat output and lack of extraction required, would be extremely desirable.

EVALUATION TESTING

To evaluate this emerging technology for Natgraph's core market, (sheet-fed screen-printing), tests were carried out in the Natgraph's Drying Solutions Centre where a fully automatic Sakurai cylinder press and a flat-bed Thieme semi-automatic screen-printing press are used in conjunction with a Natgraph Air Force UV Combination Dryer. Several LED UV inks from a leading ink manufacturer were screen-printed to a measured ink film thickness onto clear polycarbonate and other substrates using different makes of LED UV units above a standard conveyor.

The results were mostly good, with cured inks achieved from all of the LED UV units, (all outputs in the 395nm wavelength), using different belt speeds and lamp heights with no appreciable thermal effect on the substrate; LED UV certainly cured these test inks. As a part of this evaluation the substrate-to-lamp distance was noted and the electrical energy used by the high powered LED units measured, as well as the water chiller unit needed to keep the LED lamp arrays at their optimum internal operating temperature. The LED units all had to be set on full power to obtain a good cure and adhesion; the best results were achieved at 15m/minute with a lamp-to-substrate distance of 20mm, but one manufacturer had to use two LED lamp arrays, one placed behind the other.

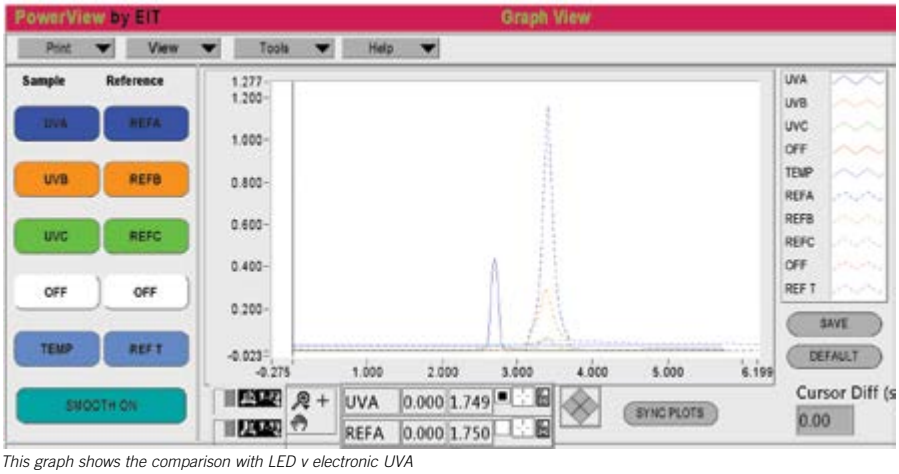
At the close of the tests and, as an additional evaluation, the same trial was carried out through Natgraph's Electronic UV Dryer using one iron lamp set at 50% (of 170watts/cm) and a belt speed of 40m/minute; the result was again a full cure with no visible thermal effect. This was the lowest setting that the dryer could be set to at this point, so the actual minimum setting to cure the LED ink was not able to be confirmed.

The results of these and subsequent tests drove Natgraph to carry out a further study to confirm the viability of LED UV compared to electronic UV, taking into account the important criteria used by its customers when purchasing UV curing units. It is certain that LED UV curing technology works, but is it viable for screen-printing when everything is considered, particularly for sheet-fed, industrial screen-printing? (As this is the growth area in the screen-printing industry).

The most important/common points considered when purchasing a UV dryer for sheet-fed screenprinting are:

- Purchase price
- Curing capability and print speeds (to utilise press potential)
- Electrical power consumed (running costs)
- Cost of ownership (price of consumable parts)

To carry out an objective comparison, all of the above points were investigated and where possible tested, using information provided by several LED UV equipment manufacturers and suppliers as well as Natgraph's own data.



This graph shows the comparison with LED v electronic UVA

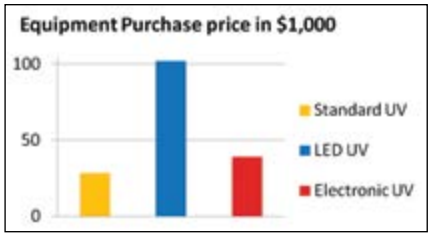
Natgraph's Air Force UV Combination Dryer Model 110

The following comparisons are made using the most common size and specification of conveyorised UV dryer Natgraph has manufactured during the last five years, this being a freestanding UV dryer model 110, (with one lamp as needed to cure the LED ink). This dryer has a 110cm (43 inch) wide curing width/conveyor, with standard and electronic versions compared to the dryer fitted with one LED UV array to cure the same width.

PURCHASE PRICE

For this calculation the full purchase price of the Natgraph dryer is used, (both in standard and electronic form) and then, to ensure an accurate comparison is obtained, a pro-rata reduction of the price is deducted for the removal of the standard UV components, with the sales price of the 110cm wide, single LED array ($77,500) then added on.

1 Standard UV = $28,500
2 Electronic UV = $39,000
3 LED UV = $102,000



Note: the installation costs of the different types of dryer are calculated as being similar, although there is no ducting needed for the LED. This is negated by the requirement for cooling pipework from the chiller unit needed to cool the LED array.

As can clearly be seen from the above graphic, the purchase price of the LED UV Dryer is actually double that of the electronic UV dryer and more than three times that of a standard unit, so the return on investment will need to be very good indeed to give a reasonable payback period for the higher purchase price.

CURING CAPACITY AND PRINT SPEEDS

Thousands of Natgraph UV curing units are operating successfully around the world and the higher power of Natgraph's electronic UV system takes this to another level of curing capability and production speeds. If there is any doubt, then testing can be carried out at the Natgraph Drying Solutions Centre using the particular inks and substrates to be processed. The curing capacity, low substrate temperatures and efficiency of this technology are fully established.

Information available also indicates that LED is able to cure specified UV inks manufactured for dedicated processes. Existing installations for fully automatic screen-printing of 3D bottles and containers have proved that LED works well for these applications. It is also being reported as being used successfully on a roll-to-roll press so, for these types of installation, (on very high value multi-colour machinery), with dedicated substrates and controlled curing conditions, LED UV certainly is working.

ELECTRICAL POWER CONSUMED

Standard UV dryers normally only have power switching in large steps, typically 70% and 100% of 120watts/cm (300 watts/inch). The lamps take 60 to 90 seconds to get to full power from cold, but cannot be switched off and on at will. The cool down period is also 60 to 90 seconds, so a total of three minutes is required for an off-on cycle. Therefore, in normal use, a standard UV dryer is not switched off unless there is a long period between printing runs. Transformer or ballast based UV technology is only 15 to 20% efficient, (electrical energy converted to UV output). This makes the standard dryer the least economical to operate as it will typically be left switched on for the entire shift.

The Natgraph electronic UV dryer is based upon a completely different technology, using electronic power supplies. The lamp power setting is infinitely variable from 50 to 100% of 170 watts/cm (450watts/inch) and so the exact power setting required can be selected, ensuring the energy used is no more than required. In addition, this technology uses a substrate sensor or signal from the print machine to instantly switch the lamps down in power to a stand–by power level of only 23% when no printing activity is sensed within 20 seconds. The electronic UV power supply also ensures that the lamp can switch back up to the pre-selected power level almost instantly, so power usage is controlled automatically and kept to an absolute minimum.

Controlling the lamp in this way to reduce energy usage and also having a higher power output at 170 watts/cm, (making one lamp usable instead of two), typically reduces energy usage by 50% when compared to a standard UV dryer. Electronic power supplies also operate on all three electrical phases and so lower the total power figure demanded when compared to transformer systems that only operate on two phases. The 110cm wide lamp, running at 50% (as proven in the test on LED UV inks at Natgraph) of 170watts/cm output uses 10.5kW. Electronic UV technology is also 20 to 25% efficient, (electrical energy converted to UV output), so is more efficient than the other two systems in converting electrical power to UV energy.

In testing, the LED UV units were operated at 100% to achieve a good cure and, with the higher speeds required from the screen-printing process, this will certainly be needed. The higher power units (typically 8 to 12 or even 16 watts of peak irradiance) require much more electrical energy and so will cost much more to operate than for other printing process applications.

The greatest advantage of LED UV is that the light source can be switched on and off at will, with no delay to full output and no apparent detriment to the LEDs themselves. However, this control is not easy to achieve in sheet-fed applications where a wide variety of substrates, with different positions, thickness, colours, opacities, flatness and surface finishes are travelling at varying speeds on a not always flat conveyor. Therefore the same substrate sensing system, as used with electronic UV, will have to be used to ensure

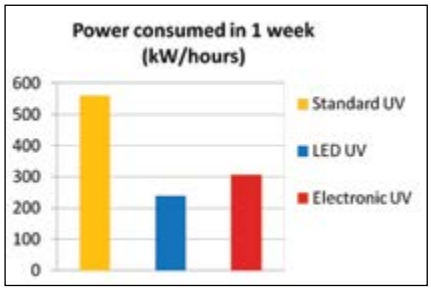
Continued over

every single sheet is cured, and the same timings will therefore be used for the power usage calculations below.

The power consumption figures of LED UV systems appear very difficult to confirm, as the manufacturers don't seem to include this information on their specification sheets. However, the LED UV systems Natgraph has tested used approximately 3kW for a 375mm curing width, so an average of 80 watts/cm is a total of 9kW for a 110cm curing width. LED is quoted as 15 to 20% efficient (electrical energy converted to UV output) which indicates that it is a less electrically efficient technology than electronic UV.

The power consumption figures used for the comparisons were as follows:

1 Standard UV = 15kW/hour
2 Electronic UV = 10.5kW/hour
3 LED UV = 12kW/hour (including 3kW for the water chiller unit required to cool the lamp arrays)



Note: the above figures are based on a 40 hour working week, with 50% total curing time, the standard UV system staying on for the complete week, the electronic UV running at 50% power for the curing time and switching down to 23% for the non-curing time and with the LED UV switching off for the non-curing time.

The figures above show that LED UV uses approximately 22% less power than the electronic UV system (when set to cure LED inks) and 60% less energy than a standard UV system. These figures confirm that LED UV is more economical in operation, but not massively so.

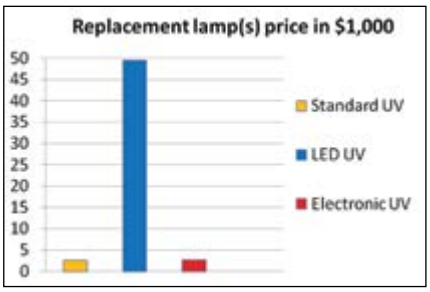
COST OF OWNERSHIP (PRICE OF CONSUMABLE PARTS)

The cost of ownership for any modern, reliable UV system is normally just replacement lamps. Natgraph dryers have advanced cooling systems for the lamphouse, reflector and lamp, so the lamps life is optimised. The guarantee Natgraph offers with all UV lamps is 1,000 hours of use but, typically, this can be upwards of 1,500 hours before the output drops significantly. This period is extended with the electronic UV system because the lamp is running at stand-by (23%) for a high proportion of its life and so its deterioration is a slower process.

For the purposes of calculating the costs of consumable parts used during the lifetime of a unit, 1,000 hours will be used for a standard UV dryer and 1,500 hours for an electronic UV unit. Current retail prices for replacement UV lamps for these two systems will also be used.

LED UV system manufacturers quote wildly different lamp life figures, these vary from 'endless' down to 10,000 hours. Insider information confirms that 10,000 to 12,500 hours is a reliable figure and that a degradation of up to 15% of output can be experienced towards the end of that period. So a worst-case scenario of 10,000 hours will be used for the calculation.

At the point where the LED UV unit has reached the end of its lamp life, (which can be less than two years on three shifts with 100% use, or four years with 50% use), then the complete UV housing will need to be replaced. The manufacturers quote costs of this replacement from 25% up to 85% of the original equipment cost, so for this calculation 60% will be used as a mid-point.



Note: the above figures are based on a standard UV lamp price of $258, an electronic UV lamp price of $405 and an LED UV lamp array at 60% of $82,000 = $49,200 with a costing period of 10,000 hours used for all three.

The above figures show the cost of ownership of the three UV systems taking into account replacement of the lamps/arrays. Even if the figures used for LED UV lamp life are inaccurate, there is a massive difference in costs shown here, with standard and electronic UV proving to be extremely low by comparison.

CONCLUSION

As a leading global manufacturer of UV curing equipment for sheet-fed screen-printing applications, Natgraph cannot endorse the use of LED UV technology for this market at present. The technology does without doubt work and has many advantages, but the extremely high price, (even with the modest power savings in operation) and the costs of replacing the complete LED array when the unit reaches the end of its life, make the choice of LED UV technology for sheet-fed screen-printing applications difficult to support.

A UV dryer for this application also has to be a versatile unit, able to cure UV inks onto a vast range of substrate types at high speeds. LED UV curing technology is not able to achieve this as the ink ranges are not available. It should also be noted that the screen-printing process involves manual application of the inks onto the screen frame and these inks are then open to either daylight or factory lighting during the printing process. The curing wavelength of LED UV ink is nearer to visible light and so a more dedicated lighting environment is required in the print room to ensure the ink does not begin to cure in the screen.

A major consideration when using any dryer is its 'tunnel height; a normal conveyorised dryer that can process screen-printed sheets at speeds of up to 4,000 iph will have a clear area above the belt of approximately 40mm (1.25 inch). Natgraph UV lamphouses have flat quartz infra-red filter windows at this spacing and the UV intensity is measured at this distance. LED UV system peak intensities are typically measured at a

Continued over

A Natgraph UV system with PLC control

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A typical Natgraph dryer for sheet-fed screen-printing applications

much smaller distance, typically from 3 to 5mm from the LED housing, which presents a major issue for the successful processing of substrates, particularly at higher production speeds. If the 'tunnel height' is doubled, the power delivered to the UV ink is reduced to a quarter, (inverse-square law).

These commercial and practical points lead Natgraph to the conclusion that LED UV is not viable for this application now, but may be in the future if the price of the technology reduces and if lamp life is improved.

Is this judgment correct? Natgraph does not know of one single installation for sheet-fed screen-printed production using LED UV – do you? If so, please get in touch so we will know if, indeed, we are being 'LED' astray.

OVERVIEW

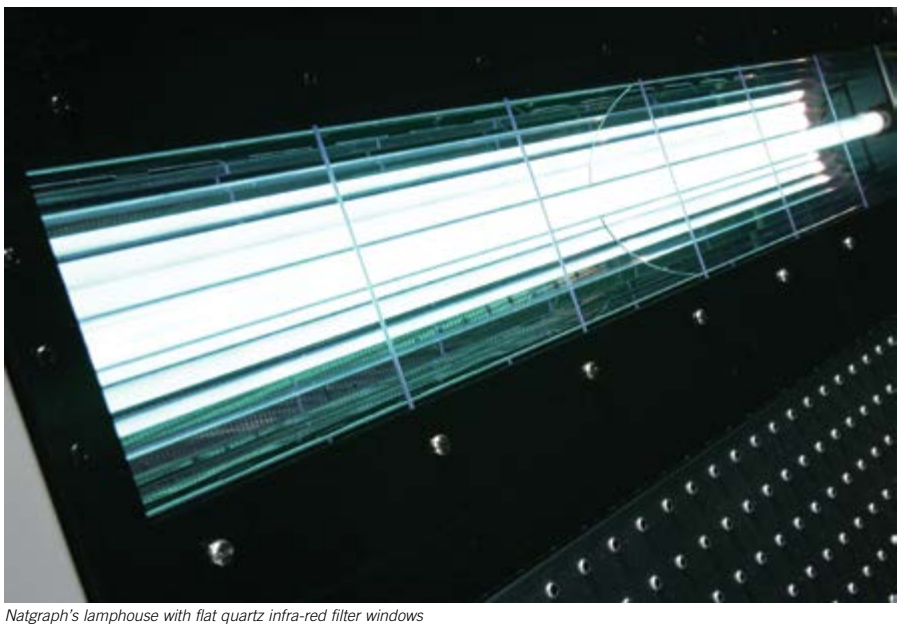
LED UV is an emerging and exciting technology that works for many applications. For many printing applications it would seem to be a good solution, particularly where a relatively small area is to be cured, for example as required by a scanning lamp in wide-format digital ink-jet machinery.

It would also seem a viable option when installed on roll-to-roll and 3D object printing lines, as these applications allow the lamphouse to be positioned close to the substrate and the compact nature of LED lamphouses is ideal for these installations. The higher costs of LED Systems can also be better supported in a high value line like this.

The advantages of being able to switch the lamp on and off at will, compact lamphouses and lack of extraction are all desirable features, although the lower running costs when compared to the latest electronic mercury UV systems are not as significant as often claimed. In terms of heat output, LED does produce energy as heat and this needs to be removed by either forced air or chilled water cooling, otherwise the LED array will overheat and fail. Modern mercury UV systems using quartz infra-red filter windows and/or dichroic reflectors run cool and also allow temperature sensitive substrates to be cured.

STOP PRESS

RadTech (The Association for UV and EB Technology) has just published a detailed report on UV-LED that seems to be an excellent resource for any company considering this technology. It can be downloaded from http://www.radtech.org/uvledbook/



Natgraph's lamphouse with flat quartz infra-red filter windows

FOOTNOTE

Recent claims that mercury lamps are to be banned by a proposed recast of European legislation are somewhat inaccurate and would seem to be a blatant case of scare-mongering by marketers of LED UV. The recast of the WEEE Directive 2012/19/EU article 7, paragraph 6 quoted, refers to the re-examination of the collection rates of various electrical items including mercury lamps. In simple English, this directive covers the collection and disposal of Waste Electrical and Electronic Equipment, (including mercury UV curing lamps), not their use and they are certainly not being banned. This directive actually refers to another document (a restriction of use directive), 2002/95/EC that lists lamps as being excluded from a restriction of products that can contain mercury.

High pressure mercury vapour lamps for lighting applications are being banned in Europe from 2015; medium pressure mercury lamps for UV curing and many other lamps containing mercury are excluded from this ban.

Natgraph and its lamp manufacturers do comply with the latest WEEE directive and encourage customers to return used UV lamps in their original packaging so that they can, in turn, be safely returned to the lamp manufacturer for recycling and disposal in a responsible and lawful manner. Details of these procedures and UK collection points for waste lamps are freely available from http://www.recolight.co.uk/About-Us/ ■

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SPOT CLEANING TRICKS OF THE TRADE

Simon P Clifford runs through the essentials for removing soils

Any screen-printed garment can be quickly reduced to a worthless rag by a careless smudge of ink or a misaligned screen. Fingers in the ink, a dropped squeegee or a pin hole in the screen – all spell the end for the work of art that you or your company have invested serious money to produce.

At first you pretend not to notice. There's nothing there. There can't be. It couldn't be. Say it isn't so. Then reality (and depression) hits; there is an ink smudge on your baby. Your immediate response is of course thoughts of throwing it in the garbage, which is no way to treat your baby.

Of course anyone who has spent even a limited amount of time in a screen-print shop, can now recognizes the staccato buzzing of a spot cleaning gun. "I love the sound of a spot cleaning gun in the morning – you know what that is? It's profits being recovered."

Spotting guns, sometimes called blow-out, knock-out or, simply, spotting guns are the last line of defence for the costly markdowns in screen-printing shops throughout the world. Obviously good housekeeping and a careful printer can avoid a lot of these small smudges; however, these days, due to the speed that presses are running at, soils are inevitable. Although limited, there is a certain science behind the equipment, chemicals and techniques used in effective spot cleaning. It is important though, to recognise that sometimes it simply isn't practical to remove a large design or ink mark, as it would take more cleaning fluid and time than the garment is worth.

SIDE-BY-SIDE COMPARISON

Just like oil companies producing gasoline, there are quite a few companies manufacturing spot cleaning fluids. Most spot cleaners are very similar, with each brand making various claims to greatness, again similar to the oil companies. Often side-by-side comparison is the only way to really tell. How fast does it break down the ink? How quickly does it dry? Is there any residual staining? How much does it cost? These are some of the considerations that must taken when comparing.

Spot cleaning fluids can be separated into three basic types. Firstly there are the non-flammable products based upon methylene chloride, dba dichloromethane, dba MEC. These are by far the widest used cleaners out there and for a very good reason; they simply are the most effective ink removers. The second group is flammable solutions which normally contain a very high content of acetone (some times they are 100% acetone). The obvious drawback here is the flammability issue. As a cleaner, acetone does OK; however, you can expect a higher degree of colour bleed (ink running into other parts of the garment).

The final type are pretty new, utilising a solvent called NPB (normal propyl bromide or n-propyl bromide). This product is very new, with very little data available. It is currently unregulated, but there are a lot of reports floating around that question the health risk potential of this product. In the USA the Occupation, Safety and Health Administration has issued warnings about it on some of their websites and advise quite stringent safety guidelines similar to that of MEC. Other disadvantages with these types of products are their costs, typically about 50% higher than conventional spot cleaning fluids. More importantly though, is their questionable ability to do the job!

When looking at equipment, first and foremost is the spot cleaning gun. A spot cleaning gun needs to have sufficient power to easily blow the dissolved ink out of the shirt. Manufacturers tend to make somewhat outraged claims as to the performance of their guns. 2,000 or even 3,000 PSI (pounds/square inch) of force seems to be a common claim. In a testing environment, most electric airless spray guns (which is all that spot cleaning guns are) can produce extremely high pressures. This however, can only be measured if the fluid nozzle is sealed off and connected to a pressure

A free-standing cleaning station

The Tekmar Exhaustex 1500 spot cleaning station

gauge. The pressure will build up after a few seconds. Obviously if the fluid stream was at anything close to these pressures it would cut through the fabric like a razor blade.

SUFFICIENT FORCE

In realty, the fluid stream of all guns hits the fabric with a force of 30 to 60 pounds. This is sufficient to force the dissolved inks and soils out of the fabric. It is also enough force to easily puncture the skin of the hand or finger that has inadvertently been left in the fluid path. Never, never, never point the gun at any part of your own or anyone else's body (there will be more never, never, never warnings later in this article). An adjustable nozzle is very important as it allows a wider use of the gun. Certain tricks and techniques require the use of an adjustable nozzle. These are explained later in the article. Consideration should be given to the overall performance of the gun, warranty, available accessories and of course price. Remember, like anything else, cheap is always the best deal and price isn't always an indication of quality.

In today's environment of work place safety, vacuum exhauster units are becoming more than a luxury; they are now a virtual necessity. New laws have now lowered the acceptable exposure levels of many spot cleaning chemicals. Most exhausters have been designed to allow compliance with the new standards of workplace safety.

Exhausters have two main functions. As the name implies, they exhaust the contaminated air away from the operator, while they simultaneously dry the fabric being cleaned. Some units are now available with charcoal filters that actually clean the air before exhausting it out of the work area. These are obviously very useful where access to an outside wall is limited. Whenever possible, the exhaust hose should be vented outside. The hose should always be installed as low as possible, as most spot cleaning fluid vapour is heavier than air, and has the potential to fall back across the breathing zones of operators, if vented too high

HIGH-SPEED DRYING

The second big advantage is high-speed drying. This controls ringing and colour bleed. By minimising the amount of chemical spreading out on a shirt, you greatly reduce the likelihood of bleeding ink and causing a stain or ring; a ring is a concentration of ink, dirt particles or fabric finishing chemicals that build up at the edge of the wet area.

When shopping for an exhauster, the same basic rules apply as for buying spot guns. The warranty should be your first clue; if it's backed well, then it's probably built well. Because of the job that it has to do, high airflow is paramount. Airflow is measured in cfm (cubic feet of air/minute); a flow of 500 cfm is an acceptable level for most shops.

The cleaning screen should be stainless steel, and sized so that you can lay the soiled area and surrounding fabric over the vacuum unit. If it is too small an area, the fluid will run out in the fabric and take longer to dry, possibly causing ringing or stains. If the cleaning surface is too large an area, then the fabric will take longer to dry as the air will be diverted to other parts of the cleaning screen.

Table-top exhausters now offer very high performance without the high price tag. They can be placed on a bench or table and do not require additional floor space. An additional consideration when shopping for an exhauster is its compatibility with flammable cleaning fluids. If your solvent is flammable then you must use an explosion proof unit.

As a final note on exhausters, before all you inventors rush out and grab your industrial Shop-Vac, PVC pipe and toolbox, consider the following. Shop-Vacs have a tank that will allow the spent solvent to accumulate. This can produce a explosive situation and the spent solvent will become hazardous waste that you will need to dispose of. Exhaust units completely evaporate the chemical, so that there is nothing to dispose of. Additionally, the life expectancy of a Shop-Vac when used with spot cleaning solvents is about three months; you do the dollar maths!

Continued over

A spot cleaning gun is a first line defence against mark-downs due to soiling

SPOT CLEANING STATION ACCESSORIES

Other accessories for a well set up spot cleaning station include a weight balancer. This is a retractable cable on a pulley that will support the weight of the gun to reduce operator fatigue. It also stops the gun from being dropped, which not only is very inconvenient, but can also be very costly. Most good cleaning stations have an arm that the weight balancer can be attached to. Some even include a weight balancer.

Another great accessory is an air dryer attachment for the gun. This fits to the gun and then connects to the in-house air supply. It is very useful as it will dry the spot cleaned garment quickly and helps eliminate the formation of rings. There are some newer models that now include an integrated air dryer that really speeds up the operation.

The final accessory for consideration is a direct feed. This allows the gun to be hooked directly to a larger reservoir of cleaning fluid to eliminate frequent refilling of the gun. They are available to fit most of the better guns out there. Be cautioned though; direct feed to slightly decrease the performance of the spot cleaning gun.

TRICKS OF THE TRADE

So you have gone out and purchased the best spot cleaning system your money can buy. Or at very least you have borrowed your neighbouring print shop's gun! Now what? Spot cleaning guns are as important as your printing press. You own the press for one reason, to make you money. If you get a mark down or a spoiled shirt you are loosing money. The gun recovers that lost profit.

The first step is to determine if the time and material cost to salvage a print is cost effective. If you are intending to remove a complete back design from a $3:00 T-shirt, it probably isn't, however, if it's a smudge on the shoulder or a $35.00 jacket, it becomes far more viable.

This spot cleaning gun has an integrated air dryer

To spot clean safely, place the garment on the exhauster screen. If you don't have an exhauster, get one; if not use an old t-shirt, bunched up, placed on a table in an open area with lots of ventilation. Remember there are strict guidelines to comply with when using most spot cleaning chemicals. Grasp the gun in one hand and place the other hand either on the adjustable nozzle or around the container to stabilise the gun. It is very tempting to hold the T-shirt; however this just puts your hand in the danger zone. Remember – never point the gun at any part of your own or anyone else's body. Just like a firearm, never point the gun at anything that you are not prepared to destroy. Keep your finger off the trigger until you are ready to spot clean. This will help stop accidental injury from the fluid jet. Follow the solvent manufacturer's recommended safety guidelines when using the gun. This can include specialised breathing masks, gloves and safety glasses. Once the garment is laid out and the gun is in position, use short burst from the gun to clean the soil or mark. Take care not to saturate the shirt as this will only increase your chances for contact with the solvent. If any body contact occurs, follow the solvent manufacturer's instructions for such an event.

SPOT CLEANING PLASTISOLS

When spot cleaning plastisols, always make sure that the ink is completely dry and cured, otherwise it will run and give you a bigger mess to clean up. If the ink is soft and will smudge when you rub it with your finger, it may be under-cured. Run it back through the dryer before attempting to clean it. Other inks, such as water based and catalyst inks, should be tested prior to printing. First try it cured; if the results are unsatisfactory then try it uncured. For small spots, smudges or fingerprints, place the shirt over the exhauster. Using a pinpoint jet, holding the gun about 15cm (6 inches) from the fabric, start circling around the soil, spiralling into the centre until the ink has been completely removed. Care should be taken not to allow the jet to hit any part of the image, as this will damage it and really destroy the shirt.

To avoid the formation of a ring, especially on darker shirts, this feathering technique can be applied. Immediately after spotting, adjust the nozzle to the widest fan setting. Spray around the edge of the damp area in a continuous manner, spiralling out and away from the fabric. The results should leave a smooth transition from wet to dry, with no sharp edges, and when dry, no ring. If you do get a ring, treat it just like a spot and clean it with a soft spray and then re-feather the edges.

For marks that are very close to the image a slightly different approach is needed. This is where a steady hand is needed, so early to bed the night before. Adjust the nozzle so that it produces a spray pattern of about 1.3cm (0.5 inch) from a distance of about 15cm (6 inches). Start spraying on the side of the mark furthest away from the image; slowly move through the soil until it is flushed away. This will take slightly longer than usual, as less pressure is being used.

An advantage of this technique is that the softer spray has less potential to damage the image, should it momentarily contact it. This same technique can be used to eliminate ghosting or double imaging, caused when a screen misaligns over a shirt and transfers some built up ink. Simply run it along the edge with a medium spray until the shadow has gone.

Never run the shirt back through the dryer to dry it. As well as the obvious risk of a flash fire if a flammable solvent is being used, this will guarantee one thing – a ring! To dry the shirt, use an exhauster, air dryer or a combination of both. The faster you dry the shirt, the cleaner your cleaning will be. If you do not have either drying device, you can use a clean airline or even the cool setting on a hair dryer. If all else fails then wave it in the air; this will dry the shirt and also let your customers know that you surrender.

Spot cleaning guns are not miracle makers. They are not a replacement for good housekeeping in the print shop, nor will they keep the printers hands clean. They are however, a first line defence against mark-downs due to soiling. Like anything else they are tools that need to be used correctly and safely. By following the above guidelines, spot cleaning can be accomplished very effectively and cost efficiently. Remember to keep in mind that it is was ruined before you started, so you really can't make things any worse, only better. ■

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THE SMART ALTERNATIVE TO FILM LAMINATION

Claudia Bauer looks at the benefits of liquid coatings

The finishing is the final key when it comes to protecting a digital print or turning it into a distinctive eye-catcher, and more and more customers would like to profit from the possibilities offered by finishing and protecting high-quality digital prints. But how can the technical process be optimized while possibly lowering the costs at the same time? The printing inks specialist Marabu responds with the introduction of its innovative segment: 'Liquid coatings'.

The general question is: "Why would you want to protect and finish digital prints?" First of all, laminated images are known to be very suitable as promotional items. Secondly, the lamination protects the image permanently from harmful impacts caused by liquids, UV radiation, mechanical abrasion, or chemical impacts which can harm the printed image or let it fade. Thirdly, laminating can create high-gloss or deep-matt effects to differentiate promotional items from others, a unique point of distinction that should not be underestimated.

LIQUID COATINGS V FILM LAMINATION

Film lamination is a common way of finishing digital printings – films are applied to the substrate using hot or cold lamination. Nowadays, constantly improving quality of ink-jet printers keep leading to better and better printing results and, with the improved adhesion of the print, their suitability for finishing with liquid coatings instead of lamination is given. The advantage of liquid coatings lies not only in lower costs for the coating compared to film, but

UV-curable liquid coatings achieve high production efficiency

in the higher efficiency of the entire process. The print can be completely coated in just one step, eliminating the time-consuming process of cutting-to-size that comes with lamination. Expensive cutters can also be factored out of the budget.

UV-CURABLE OR WATER-BASED

Marabu offers both UV-curable and water-based liquid coatings. The long-term experience with UV-curable inks paved the way for the high-quality UV-curable liquid coatings. These products offer new possibilities with regard to printing on challenging substrates such as glass or polypropylene. Using the roller-coating process, a printed image is finished with a UV-curable liquid coating utilising an applying roller, without time-intensive post-print cutting. Furthermore, a lamination remains on the surface, whereas liquid coatings crosslink very well with UV ink-jet inks.

With the acquisition of the US company Clearstar Corp, a specialist for water-based coatings, Marabu completed its product range. Water-based liquid coatings achieve excellent results on flexible substrates such as fleet graphics or self-adhesive films.

MARABU'S THREEFOLD FOUNDATION

The primary role of a top coat was to provide protection. Since then, the demands rose, and new requirements came up as well. Marabu's answer is the threefold foundation of its liquid coatings, these being primer – finishing/protection – colouring.

This application example shows Marashield UV-CGL used for interior wall décor glass pictures (produced by Eurographics IWP GmbH)

User-friendly and with short set-up times, the Buerkle RCL 1300 roller coater is distributed by Welte GmbH

PRIMER

Ink-jet inks often fail to adhere to challenging substrates such as glass or polypropylene. A homogeneously applied primer improves not only the adhesion by acting as a bonding layer, it also guarantees easy overprintability. In addition, primer can be used for finishing. Thereby, the printed image is finished and protected at the same time.

FINISHING/PROTECTION

When we talk about 'finishing', we usually have eye-catching glossy or matt effects in mind. They create an impressive, aesthetic appeal, especially for point-of-sale applications. The call for protective functions, however, arises from quality requirements. Liquid coatings guarantee high chemical and mechanical resistance against abrasion, chemicals, and UV radiation. Best practice is Marashield UV-AG. If Marabu's Anti-Graffiti effect is applied first, any graffiti can be removed easily, without harming the original printed surface.

UV-curing: for both requirements (primer and finishing/protection) a UV-curing unit with 80 to 1,200Watt/cm lamp power is sufficient for the curing process.

COLOURING

Colouring refers to the complete (coloured) coating of a substrate like glass (for example, kitchen splashbacks or interior décor glass pictures), and plastic or cardboard (for example, displays). Special effects such as metallics (silver/gold) or glitter are also suited for edge-to-edge colouring. Owing to the high opacity and the rather thick layer of coatings, two UV-curing units (medium-pressure mercury lamps) are recommended for sufficient curing.

A frequently asked question concerns the layer thickness of liquid coatings. Basically, the thickness of the layer is influenced by the choice of the applying roller. An applying roller with 80 grooves/inch allows an average application of 22 gsm. This layer thickness guarantees highest protection as well as impressive high-gloss and deep-matt effects. An applying roller with 64 grooves/inch is recommended for colouring. Transparent materials, such as glass require high opacity, and the recommended layer thickness is approx. 45 gsm.

PRODUCT PORTFOLIO LIQUID COATINGS

As a printing inks' specialist Marabu offers a wide range of solutions for diverse application possibilities:

- Marashield UV-RG/RM: Rigid substrates gloss/matt
- Marashield UV-FXG/FXM: Flexible materials gloss/matt
- Marashield UV-AG: High-gloss coating with anti-graffiti effect
- Marashield UV-PGL: Transparent primer for glass and metal
- Marashield UV-CBG: High-gloss coating for corrugated board
- Marashield UV-CGL 170: Opaque White for coating glass

DISTRIBUTION AND CO-OPERATION WITH MACHINE MANUFACTURERS

Marashield UV Liquid Coatings were developed and tested in cooperation with Robert Buerkle GmbH, a leading manufacturer of roller coaters, based in Freudenstadt, Germany, sharing the same demand for quality. This demand includes homogeneously coated surfaces without any orange peel skin effect, reproducible results, short set-up times, and user-friendliness, supporting customers getting started with roller-coating. Buerkle roller-coating machines and Marabu Liquid Coatings are distributed by Germany based company Welte GmbH, offering professional service and advice for this combination.

In the future, more Marashield products will be launched. A special focus will be placed on the colouring process which will be completed by professional colour mixing systems for the application on glass. Marabu's global network of experts will keep searching for high quality solutions to round off the product range of digital printing inks with Marashield Liquid Coatings. ■

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THE FOUR PRIMARY BENEFITS OF G7 TO THE SCREEN-PRINTER

Mike Ruff discusses the advantages of working to a standard

Mike Ruff

Before 2005, the sheet-fed offset and the web-offset print community world-wide worked from international standards that produced very good results if a printer took them seriously and applied them diligently. Print standards were based on the ISO 12647 print standard series. 12647-1 set forth the parameters and measurement methods of the print standard families and then the ISO Print Standards added special requirements for different print technologies. They then were separated by a dash + a number. For example:

ISO 12647-1: 2004 = Graphic technology – Process control for the production of half-tone colour separations, proof and production prints – Part 1: Parameters and measurement methods

- ISO 12647-2 = Offset lithographic processes
- ISO 12647-3 = Coldset offset lithography on newsprint
- ISO 12647-4 = Publication gravure printing
- ISO 12647-5 = Screen-printing
- ISO 12647-6 = Flexographic printing
- ISO 12647-7 = Off-press proofing processes working directly from digital data
- ISO 12647-8 = Validation print processes working directly from digital data

THE 2005 BREAKTHROUGH

In 2005 a small group from the IDEAlliance Print Properties & Colorimetric Council took note of a common weakness of the print standards that were currently in use. The weakness was that, if all elements of the standard were followed, there was still a high likelihood that the result would not be the same from printer to printer and job to job. The reason was that colour was being specified and controlled by 'non-colorimetric' measurements we call TVI (dot gain) and density, (the amount of light reflected back to a densitometer that indicated the 'strength' of a primary colour.)

Don Hutcheson of HutchColor LLC had been using a neutral grey calibration technique to neutralise non-standard inks and substrates for years. The Print Properties Pioneers were encouraged by Hutcheson to test a colorimetric method of print calibration on multiple presses at multiple locations and evaluate the feasibility of this, solving the print variation that was not corrected by TVI. He freely shared his technique with the print properties committee and then with the world. Although it was not called G7 at first, G7 was born.

"G7 delivers a known arrival point at the press that a printer can print to in confidence and a production manager can defend that arrival point"

NOT A REPLACEMENT FOR ISO STANDARDS

The technique and procedures of G7 were not designed nor were they ever promoted as eliminating the need to use the parameters and measurement methods of the 12647 family; but it was obvious that G7 was a needed next-step in improving accuracy and productivity by adjusting TVI through the use of a spectrophotometer and colorimetric aim points. The unique formula and neutral grey calibration methodology is now an ANSI Print Standard in TR015 and is referenced in CGATS.21-1 and CGATS.21-2 and is moving into ISO Standards as an accepted method to calibrate to neutral grey.

WHAT CHALLENGES OF SCREEN-PRINTING ARE BEING SOLVED BY G7?

The production of four-colour process in screen-printing is challenged by five very unique characteristics of our trade.

1. Print designers of process colour printing are not using the characterisation data sets that align with screen-printing.
2. We print with non-standard inks.
3. Most substrates we print on are not paper but durable substrates and mostly plastics. These substrates are not normally compliant to the print designers' assumptions.
4. The transparency of our ink is very different from other print technologies.
5. Screen-printers are challenged to match proofs produced for and by the most common print technology, ISO 12647-2 offset lithographic processes.

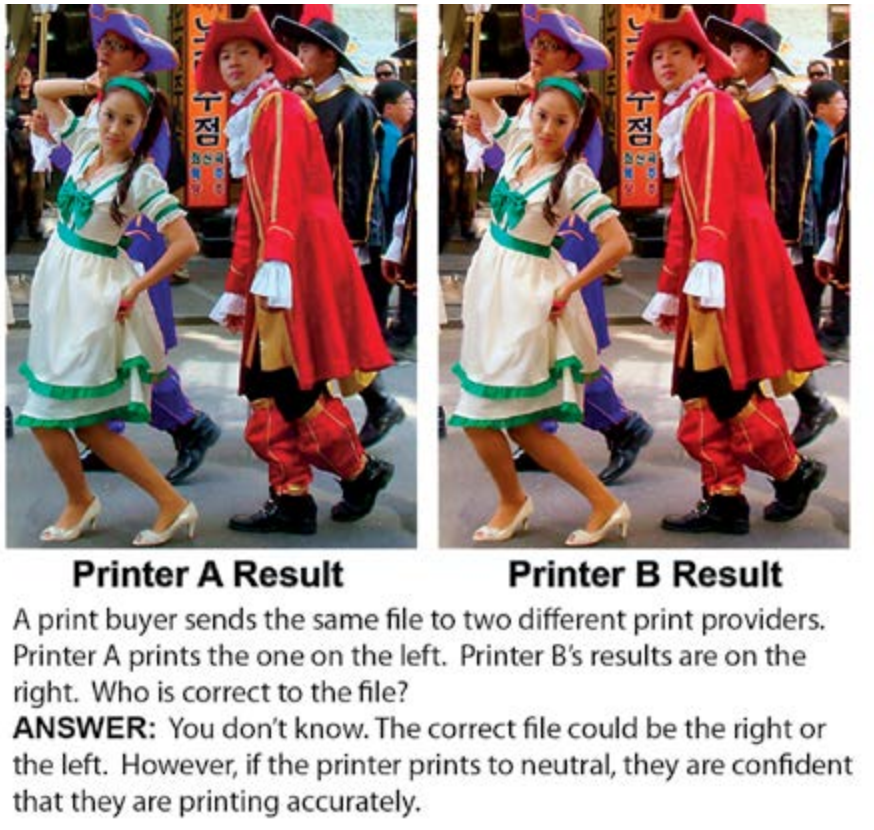

Figure 1: This image is an example of the challenges and the importance of knowing that you have printed the image accurately

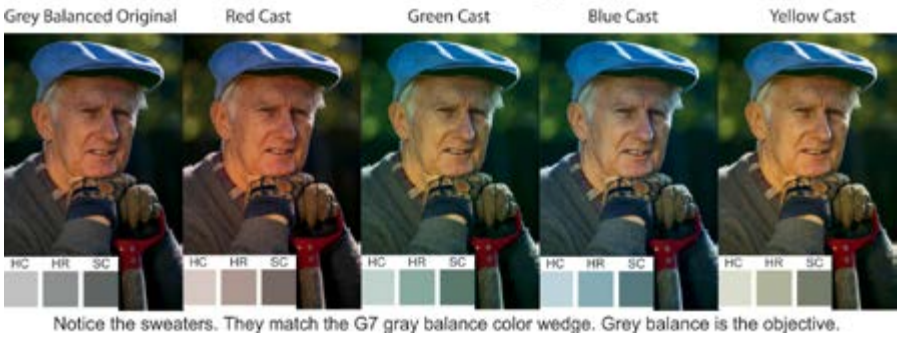

Figure 2: Correct grey balance image and four images with a colour cast

G7 IN SCREEN-PRINTING AND WIDE-FORMAT INK-JET PRODUCTION

I taught the ISO methodology for many years at SGIA's Screen Print 4-Colour Process Control class. We would explain to the classes that the objective in four-colour process printing was to print to a specified TVI (dot percentage) and use ink that was targeted to a specific density, and the colour result would be as close as possible to a common accurate proof excluding the effect of the substrate and ink colour. This was true but there was a flaw in the system that G7 would soon fill.

In 2006 I was reading about Don Hutcheson and the G7 Pioneers testing a dynamic grey balance formula that produced a 'common visual appearance' on different substrates and even non-standard inks. I knew before I put the magazine down that this was the missing link that would drive productivity forward in the graphic screen-printing industry. I signed up for the training and started implementing G7 in the US screen-printing industry immediately. Johnny Shell, Jeff Burton and Mike Robertson of SGIA recognised the value and benefits and supported my efforts. The result was screen-printers could now deal with different ink and substrate challenges and produce a 'common visual appearance' by implementing the simple methodology of colorimetric grey balance through G7.

Don Hutcheson encouraged our efforts and Joe Fazzi of IDEAlliance realised screen-printing and wide-format digital were now ready to become a part of the G7 community. The rest is history and the history has now expanded to wide-format ink-jet, dye-sublimation and any other process colour imaging that is produced using the CMYK production process.

Now on a weekly basis I am asked what are the benefits of G7. There are many benefits of G7 and the list below is certainly not exclusive but I feel there are four primary benefits that are common to all G7 Qualified Master Printers.

BENEFIT 1: PRODUCTIVITY

The primary killer of productivity in the production of process colour is colour adjustments on-press. The in-line press didn't make it better; it just allowed us to make unnecessary colour moves faster. The clients were even invited to stand at the end of the press and adjust their masterpiece in real time and our profits slipped away as they stood in incorrect lighting and made subjective colour moves.

G7 has not eliminated this entire problem but well trained print providers now are able to show a client they are in balance on the press and the print is as accurate as possible on the substrate they are printing through G7 compliant colour bars. G7 delivers a known arrival point at the press that a printer can print to in confidence and a production manager can defend that arrival point. The ability to know that a print is in grey balance drives productivity and eliminates much of the subjective colour tweaking.

BENEFIT 2: ACCURACY TO THE FILE

Accurate to what? This is a difficult question to answer in today's printing environment but the absolute truth is the file is our God. The trend now is to send a file and no hard proof. Since we do get a hard proof most of the time, we don't really know if our prints are accurate to what the customer wants so we now have to revert to being accurate to the file. After pre-flight standardisation is complete. G7 print methodologies have provided screen-print and ink-jet digital printers a point of reference that at least establishes a measureable point of accuracy – colorimetric neutral grey balance. Figure 1 shows the same image but two very different print results.

If a client sent you this file and you printed the print on the left and another printer printed the one on the right, who is accurate to the file? The accuracy metric that G7 provides is that if your press or printer is printing to neutral, you have not added any unwanted colour cast to the file (Figure 2). You are probably as accurate as possible to the file you have printed. A G7 bonus is you can prove it by measuring the neutral grey colour bars. This does not mean the customer will not want to adjust to colour or ensure that they will like the result; but it means there is now a high likelihood that they will accept this logical and accurate result. This is something that we have never been able to accomplish before using G7 methodologies and it has made many printers much more profitable and the client happier.

BENEFIT 3: CUSTOMER DEMANDS

G7 methodologies are now being driven by print buyers. The challenge of time to market and increasing shipping cost has created an opportunity for print buyers of major national and international retailers to use G7 Master Printers in different areas of the country or even the world. The reason they could not do this previously with confidence was that different printers used different ink colours and printed on different substrates. TVI and Density created good-looking prints but did not have a common visual appearance unless ink, substrate, colour sequence, overprint transparency and TVI were matched perfectly. (Whew!) That never happens printer-to-printer. Print buyers know that G7 Master Printers print with the same calibration aim points that are colorimetrically adjusted to a NPDC (Neutral Print Density Curve). This provides a common visual appearance world-wide regardless of substrate and ink challenges that are common to screen-printing and wide-format digital ink-jet printing.

BENEFIT 4: INTERNATIONAL COMPLIANCE

ANSI CGATS 21-1 and 2 are now print standards and are based on G7 methodologies. ISO standards are now being written or modified to include the 'Neutral Print Density Colorimetric Aim Points' established by G7. ISO 10128 provides the option for using the G7 based grey balance procedure. New print standards like ISO 15339-1 and -2 provide the grey balance formulae for G7 tonality and colorimetric grey balance as well as 7 CRPC (Characterised Reference Print Conditions) that are all grey balanced using the G7 principles. ISO 12647-7 Proofing from digital data has grey balance control patches that allow the proof to be G7 Compliant. ISO 12647-5 has removed TVI and density requirements and is now a colorimetric standard. Wide-format ink-jet standards are common colorimetric aim points. This means that if you are a G7 Master Printer you should be able to easily comply with these new ISO standards as they evolve.

CONCLUSION

The four primary benefits of G7 in screen-print and ink-jet digital printing are internal and external. They help move production to a new level. It gives printers and customers confidence in a visually acceptable result without blaming the substrate. It will drive quality and profitability to a new level. My advice is to get on this train as soon as possible. ■

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ACHIEVE MORE WITH MIXED MEDIA

Don Copeland describes how mixing two or more different apparel decorating techniques into one design can raise profits

In today's economic climate, digital garment print shops must offer something extra. To survive, they have to think outside the box, differentiating them from the competition.

It is a fierce struggle to see a larger share of a limited customer base, and the savvy business owner must do whatever it takes. The best method to increase market share is to offer a unique, in-demand product that your competition cannot, or will not do. Mixed media design is a great way to stand out and gain that market share.

Mixed media design offers stylish, cutting-edge styles that are increasingly popular with customers – especially sports' teams, dance groups, cheer-leading squads and other 'spirit-related' clients. The retailer that offers mixed media designs to its clientele, from direct-to-garment or screen-printing with rhinestones added, to embroidered Ts or caps with spangle designs, realise that end-users will pay a premium for these fashionable styles.

MIXED MEDIA MADE EASY

If you are not familiar with the techniques of mixed media designs, it may take some time to get comfortable. You might end up with a room filled with test garments before you are quite happy with the results, but it will be worth the effort. Adding mixed media design to your product line will increase your attractiveness to customers, and maximise profits on each item sold.

Hot-fix rhinestones added to a direct-to-garment print

The DTG M4 is built with high volume in mind

With any new technique, there is a learning curve. The following are some tips to make your training a little easier:

- **Start simply**

At first, start with only two processes on a single piece; adding rhinestones to direct-to-garment printing, or embroidery to screen-printing. Two at a time will be an excellent starting point for the mixed media beginner. Begin slowly, to grasp the concepts and master the basics, before transitioning to more complex designs. When you are satisfied with your skills, you can get into employing three, four or more forms of decoration.

Tip: Hotfix Rhinestones will adhere well right on top of direct-to-garment prints, but will not wash well if you put it onto screen-print.

Blackjet rhinestones added to hair

- **Avoid adding too much**

From a mixed media design stand-point, an understated design is usually best, at least when you are first starting out. For example, a hooded sweatshirt highlighting an embroidered name added to a direct-to-garment tiger paw pattern may be enough bling for the customer. Going the extra step of adding further enhancements to the garment could make it look cluttered and tacky.

Combine decorating processes, without getting carried away by filling up the garment too much. A second and third layer of decoration should be only highlights, not entirely new designs laid down on top of previous pieces.

Tip: Consider adding just a few hot-fix rhinestones to an embroidery design using an

An embroidered Bag with hot-fix rhinestones

applicator wand like the Glitz Up tool. A few well-placed stones or studs will add value to the end product.

- **Be logical in the design application**

To include the mixed media approach to the product line for your garment-print shop, consistency is the key. Your approach must have a logical order – one that can be repeated rapidly and efficiently.

For most designs, starting with the printed layer (or the embroidered layer for embroidery shops) is the best design strategy. With designs employing screen-printing or direct-to-garment, always do the printing first, as it will give you a reference point for the subsequent steps.

For instance, when combining direct-togarment printing with embroidery and rhinestones, every step in the process should be standardised – lay down ink first, followed by stitches, then stones. Rhinestone transfers usually come on a clear sheet of silicone paper, making it easier to apply them over a combination of print and embroidery.

An example is the first layer of a jungle design on a T-shirt screen-print, followed by an embroidered panda. Rhinestones can add emphasis to the panda's eyes; they can be easily added by hand, avoiding registration issues.

Some new software applications make it easier by allowing you to combine your embroidery and rhinestone designs in one interface. This makes it simple to import your embroidery, then create a rhinestone outline to output to an automatic rhinestone setting machine or plotter system.

Order is required here. It wouldn't make sense to do the sewing first, or you will be screen-printing right over it. Further, it doesn't make sense to put stones before the embroidery, or you will risk damaging the embroidery needle by driving it through a rhinestone.

Tip: Write this process down and post it somewhere in your shop where your employees can see it. You will avoid mistakes while everyone gets used to the process.

- **Create a reference point**

A digital print design integrating mixed media needs a reference point, the point indicating the centre of the design.

One-word slogans have always been popular, and lettering offers a convenient reference point to create a larger design.

Spiritwear is clothing and uniforms designed for groups – sports' teams, cheerleading squads and other team-orientated groups. Spiritwear is also one of the largest growing niches for mixed media design, especially those incorporating rhinestones or some sort of bling. For those designs, rhinestones can be added manually, or by using a tool.

- **Leave room for mistakes**

Embroidery is difficult in tight, fitted areas; in these instances, it would be a good idea to leave some room for error. In mixed media garment decoration, the background is usually the first layer present on the product; make sure there is enough 'real estate' on the garment to accommodate inaccuracies.

- **Price your product right**

This may be obvious for any businessperson, but it always bears repeating. In your pricing, allow enough profit in pricing mixed media. Remember, these garments require additional time in design and application processes – don't sell yourself short!

RHINESTONES REBOOTED

Rhinestones can be added by hand, but machines can make the application process considerably easier. Software programs can be used to determine rhinestone placement. Designs with basic shapes and outlines are easy to work with, but often you will have to do the fills by hand. In most newer rhinestone transfer machinery, the design is imported into the system software, usually in bitmap format.

Returning to the panda design pattern, rhinestone transfer

Continued over

machine software can open the image of the panda helping you decide on placement of additional stones.

The biggest challenge in utilising rhinestones is to avoid attaching stones straight to ink layers since they are more likely to fall off the inked areas. A better strategy is attaching the stones directly on the garment, where they will make a stronger bond. This does not apply to direct to garment prints, only to screen and transfer methods.

If the pattern gives you no choice but to adhere the stones directly on screen-printing or direct-to-garment layers, the customers must be made aware of any special care for the garment, such as hand washing.

An additional way to incorporate a mixed media design with rhinestones is by using transfers created with stones already in mind. It can be as easy as using a heat press to apply transfers, cutting down on the time you would spend waiting for rhinestones to be applied, even by machine.

SPANGLES AND SEQUINS

Spangles have become another up-and-coming trend in garment decoration, adding to the premium you can charge the end-user. Spangles are simply hot-fix sequins, the difference being that sequins are sewn on and spangles are glued and pressed. Spangles are relatively new to the market so your shop could be the first in your area to add this great option to your mixed media designs.

- **Marketing mixed media**

If you are new to mixed media garment decoration, selling a new line of products can be challenging. After years of purchasing simple screen-printing, direct-to-garment printing or embroidery from decorators, customers have been conditioned to expect a limited range of products from shops. They may not even be aware of what a full-service garment printing shop can genuinely make, but you know better! When adding mixed media designs to your existing product line, it is necessary to emphasise the wide selection of designs your shop can supply.

This example was embroidered using an SWF machine, with rhinestones added by hand

When marketing mixed media designs, start by sending regular customers samples of your new combinations. Make sure there are samples of your most creative projects on display, either in the front showroom or customer reception area. The logo for a local recreation league team can be re-designed using mixed media enhancements, and the proposed design presented to a coach, equipment buyer or league director.

Sales calls are an excellent opportunity to showcase the range of design skills of your shop. While meeting with prospective clients, your outfit should show your company's logo, employing an intricate mix of rhinestones and embroidery. Sales meetings are the perfect time for you to go the extra mile; show both existing customers and prospects that you provide an exceptional product – something that features the latest trends and innovations.

Of course, shirts are not the only product that can be value-added with mixed media designs. Everything from belts, caps and bandanas to shorts and other items can be customised with different media, which can all be sold to end-users at a premium. There are virtually no limitations to the high-profit design choices your shop can supply.

A combination of direct-to-garment printing and rhinestone transfer

The extra labour involved in working with mixed media requires you to think only in terms of what is popular with customers. With this product, you must know exactly what your clients want.

At this time, spiritwear is one of the largest markets for mixed media garment design; your shop can appeal to that niche to expand your customer base. Another growth market for mixed media garment design is urban wear.

- **Finally**

Adding Mixed Media to your product line will expand your markets, your customer base and your bottom line if you do it right. Take advantage of this growing business by adding rhinestones, sequins, embroidery or direct-to-garment to your existing high-quality product line.

Tip: Another aspect of mixed media decoration is digitally printed appliqués. One of the hottest fashion trends is weathered-looking appliqués. They are easy to work with and highly profitable; simply print the image on cotton appliqué fabric, cut it out, and sew it on the garment with an embroidery machine. This method works best with caps, visors, sweatshirts and hoodies. ■

This watch was printed on DTG Viper machine with hot-fix rhinestones added by hand

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WHAT IS INDUSTRIAL PRINT?

A survey, analysis and quantification by sector of industrial print markets and the opportunity they represent for digital print technology

FUNCTIONALITY

Industrial print was originally defined as when print was applied to manufactured products, such as a logo on a washing machine, or come to that, print on the manufactured product which is packaging as perhaps the most important example. In this format print usually conveys information, identifies brands and communicates motivation to buy the product in some combination. But it can also include print for the sake of decoration on its own, as say, on building materials. It has now even come to include patterning and deposition of functional materials on or in manufactured products (think printed circuit boards, and their successors, printed transistors). In all these applications the overriding characteristic of industrial print is that it is a sub-process in manufacturing – a kind of product component. That has important implications for the performance parameters of print processes, which must be subordinated to often extreme manufacturing parameters. (Think of flexible meat packaging proceeding from plastic granules through multiple laminations of functional material passing through extremes of moisture and temperature having to be printed somewhere along the way before the meat is packed and pallet-ready for despatch to retail at the back door of the factory).

PRINT STANDARDS

When print is applied to manufactured products generally a lot more is asked of it than in the document printing world. It has usually to be of a very high quality often exceeding document standards, especially on miniaturised surfaces, must be able to be applied economically to shapes, forms and surfaces which are not optimised and are sometimes outright unfriendly for print, and it has to be supremely durable on products that long outlast their communications' 'lives' at retail. The appearance of products largely embodies in fact the perception of the product by the user.

INDUSTRIAL PRINT PROCESSES

Because of the unusual diversity and complexity of the surfaces that must be printed in the industrial sectors, and because of the conditions to which print is subjected during and after manufacture of products, industrial print often calls for relatively specialised print (and pre-/post-print) processes. There are no simple rules about this and ordinary 'document' print processes like offset and gravure are often used where they can be as they bring low cost and high quality. But many times in industrial sectors rough (technically on a micro-scale three-dimensional) surfaces, very thin and rigid surfaces dictate the need for flexo printing where a flexible image carrier 'plate' can conform to the surface (think metal plates, or very thin flexible films in packaging or an embossed decorative panel, or textiles which require screen rollers to 'push' large quantities of ink into its absorbent weft).

Sometimes, too, the substrate is in a macro sense three-dimensional, or curved like a metal part. That can call for screen-printing or even pad printing for severe curvature (think a rounded product edge or handle/knob/button) where say a screen image carrier can be customised to the surface or allows extreme flexibility (silicon pad for example). If you have to print a relatively small number (hundreds, say) of a very large surface in one go that can also be appropriate for screen-printing which is capable of large sizes without dictating large run length economics. As you might expect, choice of print technology is sometimes an economic choice. In general in industrial print markets you find that shorter run jobs make up a bigger share of overall print volume within the fragmented structure of such a diverse marketplace than you would in say document printing. This translates to relatively high print costs, or in another way of thinking of it, relatively high print margins. Both ways of looking at this suggest opportunity for enhanced technology offerings like digital print.

Due to the low surface energy of many industrial market substrate surfaces you find in these markets a more common application of solvent ink chemistry than elsewhere. In fact, there are whole sub-sets of specialist chemistries as well for markets like ceramics (ceramic pigments) or say glass (acid frits), or textiles (acid, reactive and sublimable dyes).

MARKET SIZE

It is not easy to size the industrial print market mostly because the print component of manufacturing is not usually separated out as a cost. This is even true of packaging converters who rarely focus alone on printing. You can do what a lot of market commentators do and take the full manufacturing value of products, which are printed. That is a relatively easily available number and is important since when digital printing appears in particular its effects are usually on the total manufacturing process. However the manufactured number is so large that it can tend to get print industry opportunity-seekers over-excited.

We peg print cost value of industrial print at about $100billion world-wide. The corresponding total process value for the manufactured goods that are sold as finished products with print on them is open to debate, but a minimal number of another $450billion is realistic. Final process value of manufactured goods can sometimes mean a product finished for users like a printed garment, or a semi-finished product like a washing machine facia (such as before it has been integrated into a washing machine). We value manufactured products at the next point after printing at which they are 'sold' up the value chain to the next participant in the chain, so we are not referring in most cases to retail prices for final products.

The $100billion number counts analogue print cost of industrial products involving screen-print, flexo, pad print and a mix of specialised variants on standard print technologies. We split these values by major segment as follows:

$B	Current user Expenditure on analogue product
Textiles	$15.00
Ceramics	$4.00
Floor Coverings	$8.00
Decorative Laminates	$5.00
Glass	$9.00
Wood	$0.50
Product decoration	$8.00
3D	$0.25
Printed Electronics	$4.00
Bio-Medical	$2.00
Packaging	$45.00
Total	$100.75

EXISTING MARKET GROWTH

The industrial print market is fundamentally driven by consumers (packaging, say), and the industrial infrastructure (building, durable goods, electronics infrastructure etc). First of all there is no virtual threat to this kind of printing. No Internet application to date replaces the need for cornflakes to be bought in a container for example. That is particularly good news for anyone used to the collapsing document print market. Secondly, the overall market is unbreakably linked to the world economy. While we complain about that economy, it is in fact all we have, it is not going away and it will proceed forward in a creatively dynamic way, which will give rise to changing and growing demand for products. And when we speak of growth, the consumer-driven part of industrial print will benefit

especially from the underlying dynamic of the world economy, which is the growth in a global middle class.

So the industrial print market is not subject to any external threat other than general recession. It will stay there doing what it does in its present form and will grow until something better comes along to do its job. The only candidate on the horizon for such improvement is digital print.

THE PLACE OF DIGITAL PRINT IN INDUSTRIAL PRINT MARKETS

Digital print in industrial markets is at a very early stage of development. The authors of this white paper believe, and have publicly said over 25 years that the industrial print markets will be bigger, more valuable and more defensible for digital than all the digital document printing markets put together ever were. However, the mutual knowledge of users and digital technology providers is minimal, and the conditions for entry are formidable. And just to ice the cake, we may also add that we speak at a time of existential crisis for the $150billion digital print industry as about 90% of its markets (office and consumer) are in more or less relatively steep decline. That bodes ill for resource application to industrial under the current financial organisation of the vendors, although some very important early wedges gave been driven into the market in areas such as label printing, 3D 'printing', textiles and ceramics.

Still, the prospects for digital printing rest on some critical factors and value propositions that we should summarise briefly.

• Printing scale

In general the economics and capabilities of industrial analogue print (the way it is done now) are showing signs of diverging from the underlying developing demand patterns for the products being printed. Concretely, for example, much of packaging printing is geared towards very high volumes and low costs at a time however when demand patterns for products are becoming much more fragmented due to changing demographics and more focused product diversification in a way which might better suit a press-button on-demand digital print mode. In another way, in the automotive industry for example competitive pressures are making it cumbersome for an instrument panel decorator to print formable panels with ten screen passes where a theoretical single ink-jet pass would do the job (already done in Japan). Similarly, why would you print screen identical spot colour panels for a multiple aircraft interiors where you could individualise single aircraft with process colour images. It is not to say every manufacturer wants to do it always yet; it is to say that a lot would like to do it sometimes at least.

• Non-contact benefit of ink-jet

Ink-jet technology is a non-contact print technology. In theory at least (though little realised today) this means that you have a universal technology able to deal with almost any chemistry on almost ay substrate on any scale. This is the promise of ink-jet, and one that is achievable. Though that is not to say you can have all this out of the box today.

• Ink-jet's newly-established credibility

Ink-jet technology has reached a credibility breakthrough of serious proportions in the last five years in terms of volume capability (speeds of up to 800 feet/minute at widths up to 42in) as well as in terms of reliability (head life commonly exceeding one billion pages in document presses). Textiles can now be printed with specialised textile chemistry at up to 1,000 square m/hour – a true production speed. Ink-jet printers can print reliably at production speeds ceramic pigments in ceramic tile factories on the production line – that industry is in process of replacing up to 70% of its analogue capacity with ink-jet as we write.

• Digital print's promise of true customisation of messaging

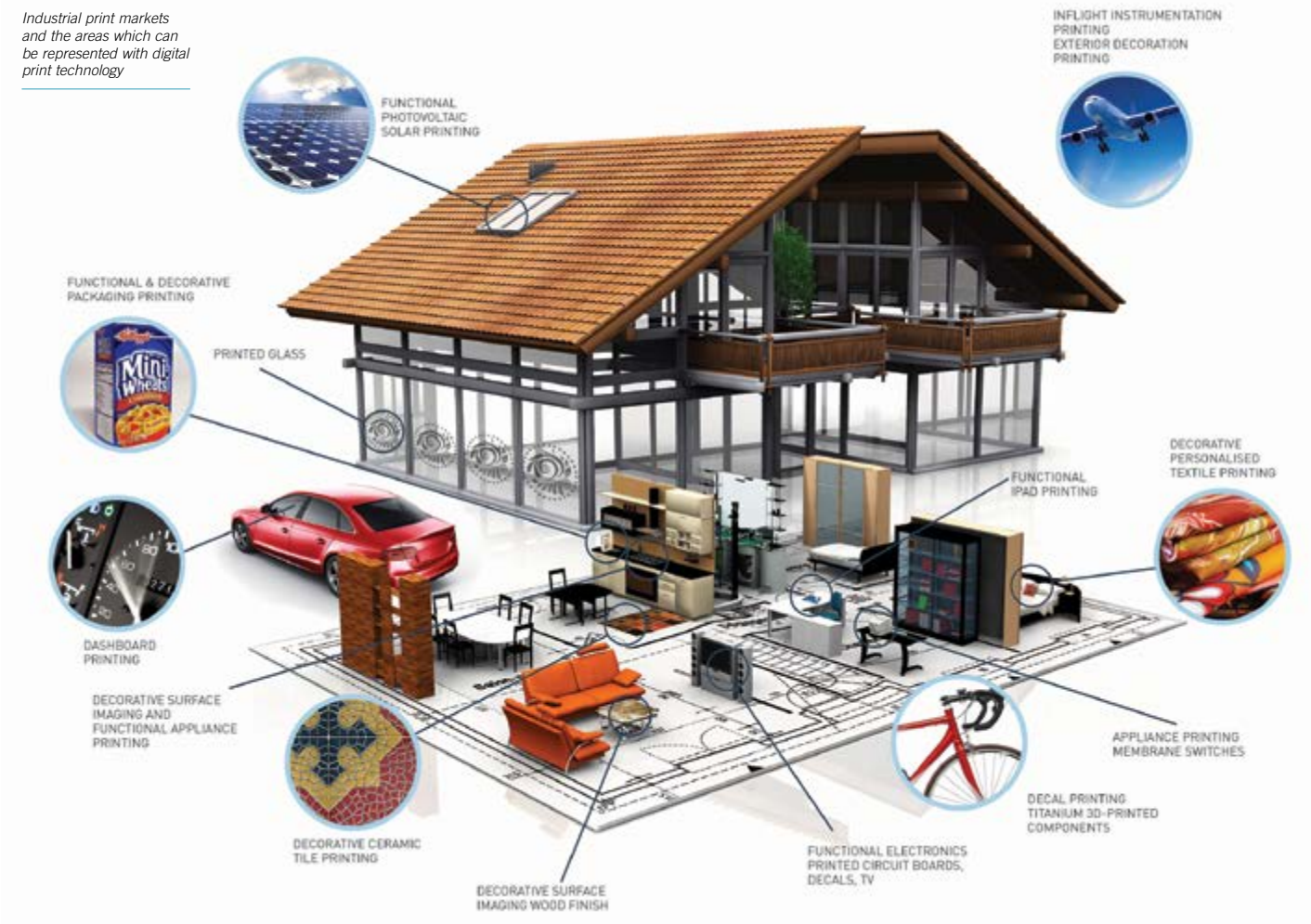
Ink-jet and digital printing technology in general carries with it the long-term promise of true customised print based on fully variable data input. Now there are in fact major obstacles to the development of that true capability which have more to do with IT issues than print, but the ultimate value proposition of digital print will come to be the ability to target all communications within a massive market in aggregate. This is what analogue print will never be able to do.

Size of world-wide digital industrial printing market 2012 and projected potential ten year out:

$B	Current user Expenditure on digital product	Potential user Expenditure on digital product in ten years
Textiles	$2.00	$8.00
Ceramics	$0.40	$2.00
Floor Coverings	$0.25	$0.60
Decorative Laminates	$0.10	$0.40
Glass	$0.02	$0.10
Wood	$0.03	$0.10
Product decoration	$0.12	$0.38
3D	$0.02	$0.10
Printed Electronics	$0.60	$2.50
Bio-Medical	$0.08	$0.40
Packaging	$0.15	$7.00
Total	$3.77	$21.58

Note that the numbers given above for the digital market in 2012 represent digital vendor revenues for hardware and ink. The numbers projected for 2012 are intended to represent potential with current technology and demand patterns. It is not a forecast. The difference is the presence of a co-operative and informed group of suppliers and users doing everything required to realise the market. These conditions only pertain very partially, so that it is highly unlikely that the potential will be achieved over the next ten years.

Continued over



Industrial print markets and the areas which can be represented with digital print technology

SUGGESTED DIGITAL PRINT MARKET DEVELOPMENT GROUND RULES

We have seen patterns over the last twenty years of development of digital print technology and its markets – some of them already true industrial markets – which suggest certain ground rules which we offer as a loose starters' guide for what to expect and maybe even how to fit in and leverage the technology best.

NEW MARKET CREATION, NOT OLD MARKET SUBSTITUTION

In the long run digital print only finds a place where it does something analogue print cannot. Sometimes that is a direct feature of the technology where say screen-print quality standards can be exceeded, or sometimes it is more of an indirect feature as where digital print as a component of an integrated digital factory enables 30% cost reductions in manufacturing. In this sense no-one buys digital print to substitute analogue print technology whose reason for existence is cost leadership against digital whose cost is significantly higher than analogue

STRENGTH OF 'SMART' SCREEN-PRINTING IN INDUSTRIAL PRINT PRODUCTION

It is important to note that the strength of screen-printing in industrial print production means that where particular applications are growing, so too, will the use of screen-printing. For example in the consumer electronics area it is clear there is significant growth. Indeed, Gartner in a recent study forecast growth of 100% within two years, for the production of touch screen tablets. Throughout the production of touch screen, the screen-printing process contributes considerably to the function of the product itself. Screen-printing, its maturity, speed and sophistication afford it process dominance in this category which, in 2012, led to 700,000,000 units of sales for touch screen smartphones and tablets. This is forecast by Gartner to double by 2015, meaning continuing strong growth for industrial screen printing in this sector.

INTRODUCTION OF FUNCTIONAL INK-JET

Whilst it is clear that ink-jet is making gains in terms of decorative surface imaging, there are clear innovations within functional print where ink-jet is being introduced into the decoration and function of white goods. Whilst it is still early in the innovation cycle, the technology may well provide manufacturers with additional value in terms of technology that assists personalisation, helps effective prototyping and could also be integrated into the manufacturing line.

EARLY ECONOMICS VALUE; LONG-TERM VDP VALUE

In early applications digital print sometimes makes existing processes more efficient by allowing warehousing reductions or allowing faster access to products by saving time through avoiding the need to mount printing plates. These are early benefits which fade with time, and even as a result of constantly improving analogue print technology. But in the long run digital will live or die by its ability to permit a kind of infinite variability in output. The ability to leverage variable data into customised communications will be the core reason for larger scale adoption of digital, and by implication, that adoption will not take place until the ability to access, manage and leverage large databanks is available, which it mostly is not today.

INTEGRATION – ENGINE AND INTO MANUFACTURING AND LACK OF SCALED CAPABILITIES

Custom integration of digital technology into customised presses and print engines along with integration of the engines often into manufacturing lines and processes are requirements for the success of scaled industrial digital print. These services are complex and suggest a need for a full

suppler infrastructure as digital vendors do not provide such services, nor for the most part would they know how to.

LACK OF USER ROI AWARENESS

Say you have the right technology, the right integration and the requisite support against the background of a well-understood value proposition for digital print. That is not enough. It is necessary to get to the final user and make the case to him in the overall context of his industry, not just as an individual, that it is worth him spending a lot of money at some risk on a print technology considerably more expensive to run than the existing technology. There needs to be a comprehension in a broad sense of ROI for the technology. The ROI usually derives from a fundamental change in market capability suggesting a change in business model. Effecting change in attitude like that takes a long time and a lot of resources. That is also the measure however of how fundamental the digital value proposition can be.

HEAVY EARLY RESOURCE INVESTMENT FOLLOWED BY SHALLOW GROWTH CURVE TO REACH INFLECTION POINT

Because of the cost and complexity of developing industrial digital print systems and because of the time it takes to get the ROI argument over it may be expected that the early growth curve in the industrial market will be long and shallow. There is plenty of evidence of that from established digital print markets which have now scaled up. But the curve reaches an inflection point marked by an industry's common acceptance of ROI and then comes the acceleration, but not before. This process can be longer or shorter but it is never actually short.

CORE DIGITAL PRINT TECHNOLOGY IS A HIGH TECHNOLOGY REQUIRING DEEP INVESTMENT AND WITH LONG DEVELOPMENT CYCLES

The commonest misunderstanding among people new to digital print technology is that it is simple, relatively easy and low cost. Wrong! Digital print technology is high technology with huge investment requirements and long investment cycles. This is also an argument against companies trying to do too much themselves without the fuller involvement of core technology developers.

INK-JET IS IT

Finally, we have been referring all along to digital print, but in practice we mean ink-jet in nearly every case. There is no other technology of digital print which can long-term match the speed, width and substrate/chemical versatility of ink-jet, though those capabilities don't just come out of the box at all times from all suppliers either. There are early applications of laser printing to some industrial markets today, and notably the important prime label market has been opened up by electrophotographic technology in liquid toner format. There will continue to be liquid toner solutions which do extend the capability of laser printing significantly, so ink-jet will not be entirely alone, but that does not mean it will not be dominant. ■

REVIEW OF INDIVIDUAL INDUSTRIAL PRINT APPLICATIONS

Market	Digital value proposition
Textiles	Markets separately for soft signage as preferred vinyl alternative in display graphics, R2R sampling for clothing, direct-to-garment direct printing of T-shirts and first production apparel systems in high end EU luxury apparel market. Single production apparel print systems can consume 20T of ink per year. Total digital textile print is 0.003472% of analogue printed textiles market. In the apparel market digital can reduce time-to-market from current 6 months average to 2 weeks. Huge cost/waste savings. Barrier is disaggregated supply chain based on Chinese manufacturing cost-leadership model. That is changing with model reversal by huge apparel companies like Zara, Uniqlo, Shanghai Tang etc.
Ceramics	Market is for printing ceramic tiles. Much faster process and cheaper changeover than with analogue as well as higher quality. Is replacing most analogue systems now. Market has short life until saturation. But market has potential for expansion as a wider variety of print patterns become available more or less on-demand through digital
Floor Coverings	Specialist market for digital but with strong early appeal through event-related applications. Longer-term custom design around lifestyle design in short runs could revitalise a relatively stagnant component of the construction industry with separate consumer and commercial sectors.
Decorative Laminates	Same arguments as for floor coverings, though laminates are even better suited for the commercial market in customizing building environments. Poor ROI understanding as yet, and poor vendor support on the digital side
Glass	Glass has a special appeal in building design and as an advertising/decorative surface in retail and its potential as a carrier of custom design and even functional coatings enabled by short run digital printing is significant again as a trend-leader.
Wood	Wood is another construction material considered to offer potential in customised decoration in high-end interior design markets. A smaller market, but a high profile and high value foothold for a new design capability.
Product decoration	Very large market ($25billion USA alone) but very fragmented and hard to channel. Value is process colour v spot and much higher speeds of production as well as variable information on manufactured products as a type of advertising and personalisation not available with analogue printing.
3D	Ability to generate functional products in editions of one inside an enclosed 'box' environment. This is a new market that was up to now slow to develop hampered by software availability and much competition from non ink-jet technologies. However, it has begun to accelerate as more functional materials have appeared and a network of service bureaus has added to market infrastructure.
Printed Electronics	The potential of printed electronics is to allow a radical reduction in cost of component manufacture with roll-to-roll manufacturing techniques replacing today's batch manufacturing. This would open a whole range of new applications at radically reduced costs raging from today's area-imaged electroluminescents to tomorrow's field effect layered transistors for low speed switching of displays. Digital print offers one of the most precise and directly controllable methods of achieving this. But there is still much work to be done in basic materials science in order to realise this dream beyond simple conductive products. This more patterning of functional materials than true graphics printing, though the principles of deposition remain the same.
Bio-Medical	The capability of ink-jet to permit very precise metrics in deposing specialist chemistry suggest ink-jet as a solution in assaying biomedical responses and even micro-dosing specialist drugs in manufacturing. These activities have begun in the USA and Japan.
Packaging	Huge potential as main advertising carrying substrate for consumer goods to customise messaging and reduce run lengths. But technical parameters are hard for digital to meet yet, and ROI is not understood by packaging users well enough against higher cost of digital print in a cost-driven industry. This market has seen a significant and commercial digital foothold established in the analogue prime label market community

This white paper is an introduction to a full study on industrial markets prepared by I T Strategies simultaneously with, and in direct support of, the InPrint initiative. *See page 75 for more details on InPrint 2014.*

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FROM RESEARCH AND DEVELOPMENT TO PRODUCTION:

Lou Panico provides an update on why the printed electronics industry is coming of age

A little less than a year ago, the Printed Electronics Test Center Network was launched by Xenon Corporation to help drive the commercialisation of printed electronics. Specifically, the goal was to provide researchers with direct access to the knowledge and resources of the world's most advanced laboratories, in order to help accelerate the development of PE applications around the world.

Based on the activities we have seen across the Test Center Network, it's clear that printed electronics is no longer a multi billion dollar industry of the future. It is an industry that is arriving now, in 2013.

DRIVING DEVELOPMENT

The PE Test Center Network is a global consortium of companies and universities that make their laboratories and resources available to product developers for only a nominal fee to cover costs. The concept is based on Xenon's 50 years of experience in applying pulsed-light technology to new applications and industries.

We have found that, when a new market is emerging, product developers face technology and cost hurdles that make it difficult to get product ideas out of the research stage. By making a variety of critical technologies and expertise available to product developers, in a cost-effective way, it is possible to remove those hurdles, accelerate R&D, and expedite proof of concept – thus shortening the time required to move from research to commercial production.

Xenon's Sinteron 3000 provides adjustable pulse energy up to 3300 joules and was developed to support accelerated research into the use of copper-based nano inks for printed electronics

Xenon's Sinteron 5000 will soon be on-line in actual commercial PE applications

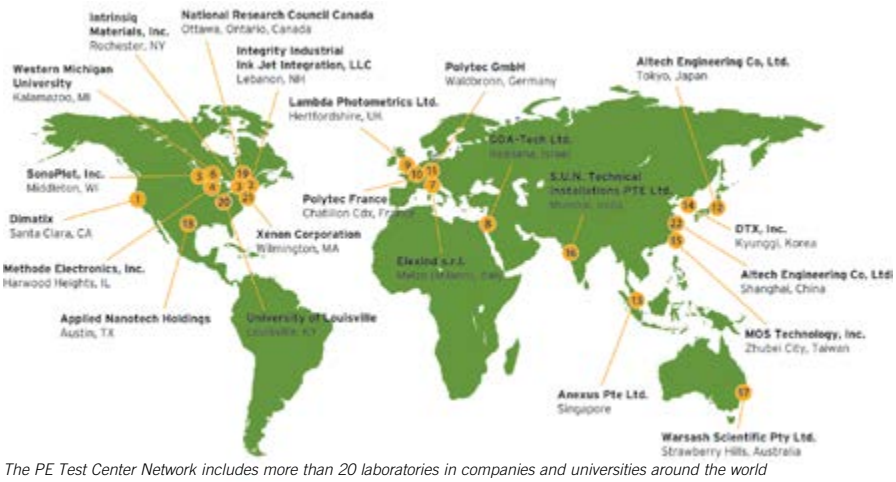
Xenon provides sintering equipment at all participating labs, along with technical support from pulsed light engineers. Each laboratory also offers various other capabilities, depending on its expertise, to assist product developers in researching such areas as:

- Behaviour of conductive inks through various dispensing systems
- Performance of inks on various substrates
- Energy requirements for sintering in various processes
- Electrical performance resulting from various materials and processes

WIDE RANGE OF RESEARCH

One sign that progress in PE is accelerating is the number and range of product testing being performed. In the nearly one year since the Test Center Network was announced, literally hundreds of tests have been conducted in participating laboratories around the world.

Most research has been focused on copper and silver inks, and conventional materials such as paper and PET, where commercial applications are currently most promising. But research is also being pursued



The PE Test Center Network includes more than 20 laboratories in companies and universities around the world

in a host of new areas using exotic inks such as gold (especially for medical devices), and a wide range of new materials such as graphite, ceramics and diamond. To keep pace with the burgeoning research efforts, Xenon has introduced several sintering systems in the past few years, including the Sinteron 3000 for use with copper-based inks (Figure 1).

Some of the research in the Network's labs is performed under NDA but, where permitted, we will be sharing results in white papers in the near future.

Based on successful initial tests and proofs of concept, more than 70 Xenon Sinteron systems have been purchased by organisations that have decided to ramp up major development efforts in-house.

THE NETWORK GROWS

Another sign of the growing momentum in PE is the fact that the Test Center Network itself is growing, as word spreads of the research and results being achieved. Most recently, three world-class labs have been added to the Network: a major producer of gravure printing, a screen-printing distributor for a global enterprise, and the laboratories of a major technical institute in California. There are now more than 20 participating labs around the world (Figure 2).

It's important to note that the interest in printed electronics is global, with half or more of the research taking place in Europe and Asia, and with China in particular investing in PE research and development.

FIRST PRODUCTION SYSTEMS

The most telling proof that Printed Electronics is arriving as a commercial industry is the fact that Xenon recently received orders for several Sinteron production lines, including the Sinteron 5000 roll-to-roll sintering system.

The Sinteron 5000 system (Figure 3) uses Xenon's patented pulsed light technology to deliver high-energy bursts of near UV light for sintering silver nano inks on the production line at up to 30.48 m/minute (100 feet/minute).

One of the applications moving to production is an appliance back-panel. Another is for RFID tags, a high-volume global application that can benefit greatly from high-speed roll-to-roll sintering. Most exciting of all, these are not the only applications moving towards full-scale production. We expect to see several more production line applications starting up as the year progresses.

CONCLUSION

For years, printed electronics has been predicted to become a multi-billion dollar industry. The PE Test Center Network was formed to help make this happen and, based on the activities of the past year, it appears the industry has finally arrived.

We have seen hundreds of product ideas being tested and developed in the laboratories that have joined the network. We have seen companies so encouraged by results that they have purchased their own sintering systems to pursue major development efforts in-house. And, we are now seeing production lines starting up, with the first shipments of roll-to-roll sintering systems moving out the door.

After years of promise, and countless man-hours of research, it appears that 2013 will be the year that printed electronics moves from the research lab into commercial production. The future, as they say, has arrived. ■

Lou Panico is president and CEO of Xenon Corporation

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HARMONISING INFORMATION AND NOTIFICATION REQUIREMENTS

Elaine Campling details the classification on hazardous industrial mixtures

Industry continues to battle with the information on hazardous mixtures that is to be provided to poison centres (PCs) according to Article 45 of the CLP Regulation (The European Regulation on Classification, Labelling and Packaging of Substances and Mixtures (CLP) Regulation (1272/2008 EC). Article 45 is not prescriptive in defining exactly what information should be provided and how it should be notified, leading to a further requirement for the European Commission to involve stakeholders in a process to try and harmonise the information and notification requirements. The European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) continue to pursue the submission of information that goes beyond the capabilities of industry to comply with, and for which little or no added value would be achieved, certainly in the case of industrial mixtures for professional use.

The specific points of concern for suppliers of industrial mixtures including the following:

INDUSTRY IS NOT PERMITTED TO MAKE ITS OWN ARRANGEMENTS

Industry is committed to the protection of employees and professional users of their products. Workplace occupational legislation is also in place to ensure the protection of workers. The duty for responding to emergency incidents, e.g. accidental contact with a product, was generally the responsibility of the organisation supplying the product and would normally be managed by the provision of an emergency contact identified Section 1 of the safety data sheet (SDS). There is a strong argument for continuing with this system, since representatives of the organisation supplying the product are in a stronger position to provide a meaningful and product specific response.

Statistics from PCs also demonstrate that only a few instances of calls to PCs involve industrial mixtures. Industry representatives believe that it would therefore be more prudent to allow the suppliers of industrial mixtures to 'opt' out and make their own provisions for dealing with emergency incidents. The most that should be required is a SDS, but this is still burdensome, unless a centralised workable system is set up, or some other means to provide access to SDSs is permitted, e.g. providing PCs with access to company systems.

IDENTIFICATION OF NON-HAZARDOUS INGREDIENTS

EAPCCT argue for compositional information on non-hazardous components: Many materials used in the formulation of industrial products are actually mixtures of substances, so called 'mixtures in mixtures'. The SDS is the tool for communicating compositional information, but it is not a legal requirement to identify non-hazardous components. Product manufacturers will therefore not have compositional information on these ingredients and cannot disclosure information that they do not have.

THE THRESHOLD FOR IDENTIFYING HAZARDOUS COMPONENTS

EAPCCT expect identification of hazardous components when present at 0.1% and above in a mixture. However, this is unworkable for many classification categories, since 0.1% is below the concentration level at which most hazardous substances are required to be identified in the SDS. Again, product manufacturers will not have compositional information on these ingredients and cannot disclose information that they do not have.

UNIQUE FORMULATION IDENTIFIER

A unique formulation identifier is said to be necessary for each formulated version of the product in order to identify a particular product with the specific composition, since composition changes are common without a resulting change in the trade name. However, even variations on current versions are common for industrial products, which are often performance driven, e.g. to meet specific customer requirements – for example, altering viscosity by addition of a solvent to a printing ink for one customer, but not another. A typical industrial formulation will also very likely be subject to fairly regular revision, especially during this current economic environment, when substance rationalisation is common.

Many mixtures are also sold to organisations that make small additions to the product. In other instances, no additions are made, but the product is rebranded for onward sale. The latter will result in multiple UFIs for the same product, since the UFI is company specific. All examples will result in overload of information to PCs with little benefit in the case of industrial mixtures and extremely resource intensive for product suppliers already over-stretched in complying with their legislative duties.

ESMA
Driving Print Excellence

CONFIDENTIALITY

Confidentiality of information is a huge concern for Industry. Strict measures must be taken by PCs to ensure that the information they hold is used only to provide medical advice in the case of an emergency (and for the purpose of statistical analysis). Supply chain issues on confidentiality are also a concern, relating to downstream user obligations to provide the compositional information to PCs.

CLOSING COMMENT

Industry will battle on for a sense of proportionality and workability to the format and information that is to be made available to PCs. Access to product SDSs will enable PCs to do their job in the case of industrial poisoning incident and this is the most industry should be expected to provide. The best scenario is to let industry take responsibility for providing an emergency response service, which to all intense and purposes has been managed adequately for many, many years given the limited number of calls to PCs relating to industrial poisoning incidents. ■

Elaine Campling is Chairman of ESMA's Health, Safety and Environmental Protection Committee and Product Safety Manager for Fujifilm Specialty Ink Systems

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ESMA INFORMATION NOTE FOR CUSTOMERS:
The new classification and labelling scheme

ESMA's Health, Safety and Environmental Protection Committee has produced an Information Note to explain the new classification and labelling scheme, already in operation for single substances that will also apply to mixtures of substances, e.g. printing inks from June 2015, though some companies may implement the new scheme ahead of the June 2015 deadline.

The changes have been made to align Europe with a new global system that has been introduced to try and achieve consistency of classification and hazardous communication. Prior to the introduction of the new system, there were different rules on classification and labelling around the world and therefore different ways of communicating the hazard.

The wording of the text on the labels will change to varying degrees and the way the information is presented will change, but essentially the purpose of the scheme is hazard communication.

The familiar orange/yellow box will eventually be completely replaced with red-bordered pictograms, in some cases containing different symbols. The example shows that the St. Andrews Cross, will be replaced with the red bordered pictogram containing the exclamation mark, in this case to denote that the contents are irritant.

Irritant
R38 Irritating to skin

Warning
H315 Causes skin irritation

Note the Indication of danger/signal word change from irritant to warning.

Hazard (H) statements will replace risk (R) phrases. Labels will be different, but this is not an indication that there is any change in the hazardous properties of the product, only the way in which the hazard detail is communicated. For example, some products will have the new flame symbol to indicate that they are flammable, which was previously not required for flammable liquids.

Some products will appear to be more severely classified, but this is not because the product constituents have changed, but is due to differences between the two classification schemes. For example, products classified as posing a risk of serious damage to eyes will now be classified as corrosive, rather than irritant under the previous classification scheme.

It remains very important to read the label and ensure that the safety measures recommended in the safety data sheet are followed.

Always contact your supplier if you need more information on the new system.

ESMA's Health, Safety and Environmental Protection Committee have produced an Information Note to explain the new classification and labelling scheme, already in operation for single substances that will also apply to mixtures of substances e.g. printing inks from June 2015, though some companies may implement the new scheme ahead of the June 2015 deadline.

Further information:
web: www.esma.com

ADVANCED STENCIL TECHNOLOGY

Alfred L Guercio explains the manufacture of advanced films, emulsions and screen chemicals

Alfred L Guercio

We focus on three clear objectives – first, to improve stencil imaging properties (resolution and acutance); second, to manufacture products that are fully dependable, with reproducible results every time; and third, to develop products that make stencil production faster, easier, and less costly.

In recent months, our corporate focus has yielded exciting dividends – 'the innovation we promised' – in three major technological areas.

ANTI-HALATION EMULSION

This is direct emulsion that is fast-exposing, yet also significantly 'masks' light scattering (halation), a principal cause of reduced stencil resolution. The key is Ulano's development of an exceptionally fast-exposing, pure photopolymer that will not polymerise or age prematurely. Only Ulano has this technology!

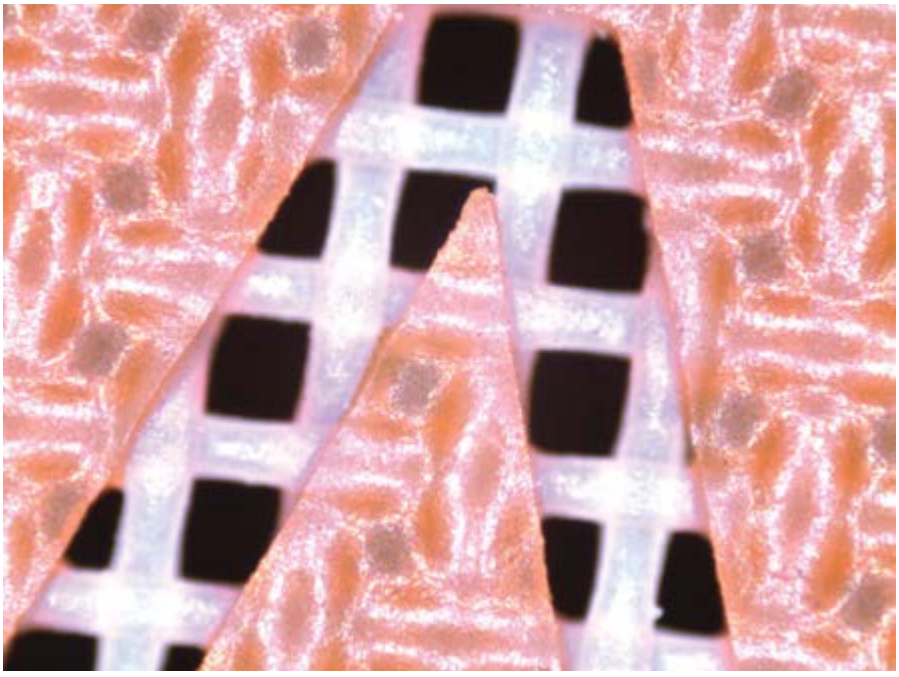
Benefits: Ulano anti-halation emulsions, such as Orange, offer superior resolution without the need to purchase costly dyed mesh in order to avoid halation.

RD SENSITISING TECHNOLOGY

Advanced photo chemistry enables Ulano to provide its traditional diazo-sensitised and diazo dual-cure emulsions in a pre-sensitised form, with no need to add diazo.

Only Ulano has RD sensitising technology, and we add the suffix EC, which stands for Epic-Cure, to the name of our traditional emulsions to denote this technology.

Benefits: Ulano's Epic-Cure emulsions, such as Proclaim EC, eliminate mixing errors and the de-bubbling time required by traditional diazo-added emulsions. They are convenient and ready-to-use, with the additional bonus of an extended, 18-month pot life.



Orange, first in a series of Ulano anti-halation emulsions

ADVANCED-FORMULATION CAPILLARY FILM

Ulano has introduced two advanced-formulation capillary film groups. CDF Vision supersedes traditional diazo-sensitised CDF Direct-Film and diazo dual-cure CDF/LX and CDF/Matrix. CDF Lexar supersedes pure photopolymer-sensitised CDF/QSR.

These are state-of-the-art capillary films and, yes, only Ulano has this technology, too!

Benefits: CDF Vision and CDF Lexar offer the speed and processing simplicity of capillary film with superior imaging properties and solvent resistance.

When asked about future stencil technology, I reply that Ulano Research and Development will look for ways to combine anti-halation properties with RD sensitising technology in film and emulsion products. And we will continue to develop, as our corporate tag line promises: 'Advanced Stencil Technology.'

Our goals are very clear – to improve stencil imaging properties, to manufacture products with always-reproducible results, and to make stencil production faster, easier, and less costly. ■

Proclaim EC utilises Ulano's proprietary RD sensitising technology

CDF Lexar and CDF Vision

Alfred L Guercio is President of Ulano

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REALISING SIGN-MAKING POTENTIAL WITH DIGITAL PRINT FINISHING SOLUTIONS

Janine Roberts outlines the benefits gained from a good routing system

AXYZ CNC routers have been specially developed for both the sign-making and print finishing industries. Printed heavy substrates, for instance, require a machine with a heavy construction combined with a powerful spindle, whereas a knife head system may be the preferred option for lighter materials. With AXYZ a heavy duty router and knife tool combination can be configured on the same machine, making it possible to process a wide range of sign-making materials with ease.

The AXYZ routers can be supplied with a combination of oscillating or tangential knife systems which will handle a variety of substrates delivering a clean cut edge. Both of these can be used in conjunction with the state of the art AVS camera registration system, which recognises registration marks along a substrate and adjusts the router's cutting path accordingly, enabling precise edge-finishing on a variety of materials.

Precision alignment for cutting out pre-printed materials with AXYZ's AVS camera registration system

RECENT TESTIMONIALS

Bill Baker of Park Place Sign Systems

"The price was very competitive and AXYZ worked with us to make sure our unit performed the way we expected. The purchase of our table provides more consistency in the finished sizes of our sign products when compared to hand finishing by our fabrication personnel. We also realised an increase in capacity and a reduction of labour costs by utilising the AXYZ AVS registration camera. The AXYZ machine is a vital part of our company's constant improvement program. The implementation of the AXYZ machine has decreased production time and improved product quality. So we decided to order a second machine to help handle the continuing increase in our business."

A 4010 series machine, part of AXYZ's configurable range of CNC routers

Andy Wassall of Daytona Visual Marketing

"We chose AXYZ International as a working partner and not simply as a machine supplier. Routing and cutting is only a part of what we do but it is everything in which AXYZ specialises. We have been impressed not only by the reliability and quality of the machine but also by the way in which AXYZ engineers work closely with us to achieve our clients' requirements and in particular those which are more difficult or challenging and which demand a high level of ingenuity, versatility and adaptability. Having access to AXYZ International's considerable knowledge base has enabled us to complete some very complex and high quality projects."■

Janine Roberts is Marketing Assistant at AXYZ Automation

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UK's first EFI VUTEk GS3250LX Pro goes to Nottingham display specialist

Nottingham-based John E Wright has moved to EFI for its latest wide-format UV-curable printer, investing in a VUTEk GS3250LX Pro with full greyscale capabilities in a drive to increase quality and speed of throughput while maintaining a more environmentally friendly production operation. The requirement for a 3.2m true hybrid printer with LED curing needed to be complemented by precision colour accuracy and the ability to work with a growing range of rigid and flexible materials, including digital textiles.

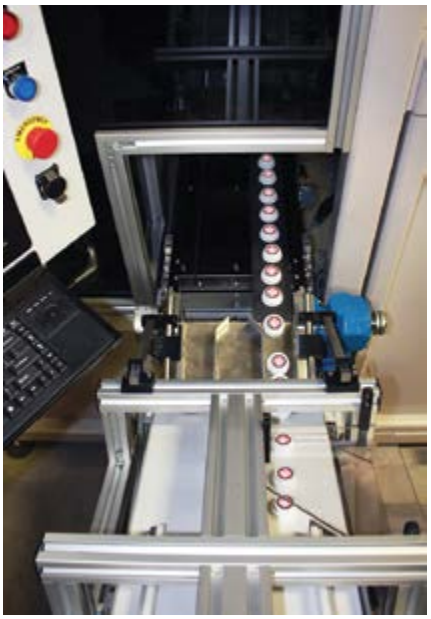
During the past decade John E Wright has been printing direct to substrate, investing in the latest UV-curable systems to produce the best quality results. Recognising the benefits of LED curing, managing director Tony Barnett swiftly ascertained that, for his latest investment, EFI was the only manufacturer that could provide a versatile flat-bed and roll-fed printer that incorporated this technology.

"It was also essential that we invested in a printer with a full 3.2m width for both rigid and roll-fed materials, along with the ability to print continuous boards," states Barnett. "The decision to purchase the VUTEk GS3250LX Pro from EFI doesn't only give us more efficient curing; it also provides the ability to work with heat sensitive materials at fast throughput speeds, eliminating problems that can occur with buckling and surface damage when using traditional UV lamps." ■

Tony Barnett and Julie Boaden, Group Sales Manager at John E Wright, with the new VUTEk GS3250LX

Easiway Systems expands globally

Easiway Systems, manufacturer of the EasiSolv elite line of screen cleaning chemicals, has expanded globally. The company has partnered with distributors to expand the availability of their products, allowing printers all over the world access to its premier line of environmentally conscious cleaning solutions. Sara Broghamer, International Marketing Co-ordinator at Easiway Systems, states: "The global expansion of our company is truly an exciting move for the screen-printing and graphic arts industry. Easiway makes the most premier chemicals in North America and it is a great opportunity to be able to offer these same safe, conscious products to other markets." ■



The ink-jet system is capable of printing 45,000 bottle caps/ hour in a single pass

New multi-colour industrial printer from PPMOV

Pad Print Machinery of Vermont says it has concentrated nearly ten years of significant research and development into a versatile multicolour industrial ink-jet printer which requires no pads, clichés or screens to change, saving set-up time for production runs.

Made in Vermont, the new system is designed with modular components in which hardware, software and printing arrays can be configured to meet specific print requirements. The flexibility of the design was recently demonstrated for a closure manufacturer in the packaging industry with the high-speed printer configured to print on eight different sized bottle caps. The added custom automation included a bulk loading cascade feeder, eight-lane sorting system, in-line flame pre-treatment, and part counter/accumulator with bar code labelled packaging system.

PPMOVT has developed its own ink controller which provides precise ink temperature control ensuring print uniformity, flexible fine tuning for specific printing applications and advanced diagnostics support. The print engine utilises Xaar 1001 print-head technology for greyscale print resolution and reliability.

A multiple lane system enables the printing volume to exceed 45,000 bottle caps/ hour, all controlled through an industrial PC with LCD touch screen. The controller can store and recall hundreds of art files and print parameters instantly for quick production changeovers. The user interface is a simple to use touch-screen display where operators can add, view or count current print jobs, and monitor ink supplies and status. The software architecture is also modular and is customisable to meet specific customer requirements. ■

JM Coatings + Inks launches single component ink for tempered glass

Hong Kong based ink manufacturer JM Coatings + Inks has launched its series SS-4000 single component glass ink, which the company says allows superior performance on glass along with cost reductions.

Highlights include the fact that no hardener is required, and fine detailed prints can be produced with 140T and 165T mesh, along with a short curing time, water and chemical resistance.

The series is designed for tempered glass printing on touch panels, plus the motor industry, electrical appliances and other interior decoration. It is compatible with the JM ColorMaster colour matching system and special effects such as mirror, holographic, optical variable applications.

SS-4000 is stated to be environmentally friendly and conforms to EN71:Part3:1994, RoHS and REACH SHVCs directives. ■

SS-4000 single component glass ink from JM Coatings + Inks

Berger set to pursue expansion plans partnered with NORD Holding

As one of Europe's biggest suppliers of digital printing textiles in up to 5m width, as well as the accessories for textile finishing, A Berger has formed a new partnership with NORD Holding.

NORD Holding is a leading German equity investor for the medium sized business market, with more than 40 years of experience. A Berger's pattern of growth will be strengthened by an expansion of its range, whilst still maintaining and developing distribution in the future.

NORD Holding invests its own assets and holds its shares on a long-term basis. Participating companies profit from this as they can develop without any external pressure and therefore use their growth potential. Currently it is committed to more than 30 companies who are based in Germany and with German assets abroad. ■

Kala sponsors and wraps transatlantic trimaran

In May 2013 Kala sponsored an offshore trimaran racing boat with skipper Gilles Lamire. Named, Rennes Métropole & Saint Malo Agglomeration, and representative of the main cities located next to Kala's operation, the boat was built in 2009, has the latest technologies and races in the 50 feet long trimaran category.

Because of Kala's activity with wide-format digital printing technologies, it was decided to wrap the boat entirely with digital printed vinyl. This had to become the first boat of its kind and size to be entirely wrapped and to compete in transatlantic races.

The choice of material used for this wrap was 3M Envision 480 printing and laminating media which is PVC and Phthalate free material. The production process involved latex ink and a Kala Arkane laminator with double heating (superior and inferior), driven by the need for environmental friendliness in line with wind sailing competitions.

A professional wrapper from a company named The Dezynery and based in Phoenix, Arizona came to France to perform the wrapping. The total surface of vinyl being wrapped was 270 square m (2,900 square ft), and the boat took one person four days to complete the job. The weight of the material/square m was 250 grams (0.05lbs/square ft). ■

New dye sublimation product from J-Teck3

J-Teck3, the Italian digital printing ink manufacturer, used FESPA 2013 to launch world-wide its new dye sublimation product J-Cube RF40/KF40 which has been specially developed for Ricoh and Kyocera printing heads. The company's stand was dedicated to the new ink and attracted many visitors whose interest for the product showcased proved to be highly motivated. J-Cube represents a new line in the digital textile printing panorama. J-Teck3 says it meets the market demand for a high quality product suitable for the new water-based printing systems as an alternative to Epson. These products are particularly dedicated to industrial printing applications such as fashion, home décor and visual communication which need very stable and faster drying inks. J-Cube has been formulated according to J-Teck's Cluster Technology which is born from a deep and accurate research carried out by J-Teck during the past year. The company is now ready to approach the world-wide market in both versions of this ink, RF for Ricoh and KF for Kyocera, in CMYK colours. J-Teck3 says that FESPA 2013 also confirmed the growing success of J-Next Subly JXS65 digital dye sublimation ink for DX6-DX7 print-heads. ■

SilkScape print media is suitable for latex printing

Drytac has confirmed that its SilkScape digital print media line is compatible with latex printers. A profile for the HP Latex 260 (formerly the Designjet L26500) with Caldera's RIP software is available upon request. The banner material can also be used with solvent-, eco solvent-based and UV-curable printers, making SilkScape a good low cost solution.

SilkScape is an 8mil, 99% opaque white polypropylene film with a satin matte finish and single-sided print receptive coating and is available in 915mm (36 inch) rolls. It provides outstanding image quality no matter which print technology is used. In addition, the material's edges are curl-resistant and do not fray, making it an ideal choice for use with the Drytac line of retractable banner stands.

"SilkScape has fantastic print quality and hangs nicely in the stand," says Nate Goodman, Drytac's Product Manager. "It is a great option for customers who are looking for a cost-effective solution that acts like a higher-end product." ■

Malahide acquisition strengthen Spartanics hot stamping systems

Spartanics, specialist in card manufacturing equipment and laser cutting systems, has purchased Malahide Hot Stamping Presses, formerly located in Vancouver, Canada.

This acquisition strengthens the Spartanics line-up of full sheet and roll-fed hot stamping systems by offering smaller, one-up hot stamping equipment designed to add security foil features, signature panels and full colour graphics to financial transaction cards, paper cards, loyalty cards, membership cards, poker chips, ribbons and many other promotional items.

Malahide technology will be engineered, manufactured, sold and serviced by Spartanics in Rolling Meadows, Illinois, USA. Electronic marketing of the Malahide Hot Stamping Press will continue on the Malahide website at www.malahide.com. ■

From left:, Spartanics CEO Bill Gillen, Malahide Sales Director Paul Birch, Tom O'Hara, President of Spartanics and Tom Kleeman, CEO of Spartanics

Ikonics announces screen-printing emulsion for smaller circuitry

Duluth-based Ikonics has announced that its Chromaline Screen Print Products division recently introduced Alpha E-20 Micro-Line Dual Cure Emulsion, allowing electronics and other high-tech printers to produce lines down to 20µm. This translates to smaller circuitry, an attractive feature in the area of consumer and industrial electronics.

Marty Medvetz, Chromaline's Alpha Products Specialist, states: "The introduction of Alpha E-20 represents the continuation of an ongoing effort to target applications requiring circuitry down to 20µm. Until now, engineers in the printed electronics industry have found it very difficult if not impossible to achieve such fine detail."

"Alpha E-20 incorporates the industry's smallest particle sizes, providing exceptionally sharp stencil edges and pristinely smooth stencil walls, promoting optimal ink flow and release," explains Medvetz. ■

Walsh Graphics appointment strengthens Irish Mimaki channel

As Mimaki's exclusive Irish and UK distributor since 1996, Hybrid Services has appointed Cork-based sign and digital print supplier, Walsh Graphics, as a reseller. Established for more than 20 years, the company currently supplies sign-making and wide-format printing materials and consumables to customers across both Northern Ireland and the Republic.

"With the addition of some key staff with years of industry experience in machinery we are continuing to grow our wide-format solutions due to the demand from our customers," says Michael Walsh, Managing Director of Walsh Graphics. "Requests from our commercial print clients for wide-format consumables and substrates have naturally led on to demand for complete systems, so by securing Mimaki reseller status we can supply and support a premium solution."

"Investment in wide-format solutions by litho printers is a big growth area for Mimaki," comments Hybrid's National Sales Manager, John de la Roche. "Our products suit a broad range of needs and Walsh Graphics is perfectly placed to provide expert advice." ■

John de la Roche of Hybrid Services (left) with Michael Walsh of Walsh Graphics

New Texsol 600 Eco emulsion is completely harmless

Kissel + Wolf has introduced a water resistant two-component photoemulsion for texting printing of screen with a globally valid Eco Passport. Texsol 600 Eco has been developed in response to demand from producers of branded T-shirts, imprinted sportswear and fashion textiles that require print producers, as well as even their own print production, to use products and production equipment which is free from all contaminants and therefore harmless for the user, whether they are buyers or wearers.

During the printing process, textiles come into physical contact with the screen-printing stencil, and thus directly with the emulsion which, of course, is an integral part of the printing screen. Kiwo's Texsol 600 Eco is a certified emulsion meeting all requirements of the global Oeko-Tex Standard 100.

This new emulsion is characterised by excellent resistance to aqueous textile print media and plastisol inks with good decoatability, as well as very good imaging and resolution quality. Purple when unsensitised and brown-violet when sensitised, it has a viscosity of approximately 9000 mPas (Rheomat RM 180, MS 33, D = 100 s-1, 23 degrees C) and a solids content of approximately 40%. ■

Kiwo's Texsol 600 Eco meets all Oeko-Tex Standard 100 requirements

Lüscher transfers to new ownership

Wifag-Polytype Holding Heliograph Holding Gmbh have jointly taken over all intellectual properties, products, current assets, brand and logos and a part of the employees from the former owners Xpose Holding Ltd and Lüscher AG Maschinenbau. As a result, a new company called Lüscher Technologies has been founded with the whole operation and organisation of the former Lüscher AG being transferred into new premises in Bleienbach. This move will enable the new Lüscher Technologies to take advantage of all kinds of synergies in the area of administration, logistics and operations using the infrastructure and support of Daetwyler Graphics, a subsidiary of Heliograph Group. Lüscher Technologies will continue to service and manufacture the former products – XPose!, MultiDX!, XDrum! and JetScreen to support the operation of the installed base for all customers globally. Sales and service of all products will be handled by the sales and service hubs of the Wifag-Polytype Group and the Heliograph Group according to market and product application segments. This means Lüscher Technologies gets access to two non-competing sales networks of more than 20 sales and service organisations globally. Lüscher Technologies is managed by Peter Berner, former CTO of Lüscher AG, to ensure continuity combined with the leverage of operational and logistical potentials of the new owners. ■

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New identity for Hollanders reflects its positive roadmap for the future

A strong, bright new corporate image has been announced by Hollanders Printing Systems to mark the company's continued growth in the digital textile market and to coincide with the announcement of the latest machines being added to the ColorBooster series of solutions. This new identity has been streamlined to reflect the company's roadmap for the future with its recent investment strategy and positive growth plans.

The idea behind the new Hollanders logo is to provide a representation of the company's core identity, combining its approach to pragmatic development of solutions at an industrial level with its flexibility in developing and building products that are tailored to customer needs. The resulting design depicts two separate lines that form a continuous flow showing a constant co-operation of two entities, these being the customer and Hollanders, and the Competence Center partners and Hollanders.

Hollanders was founded in 2003 by Peter Hollanders whose vision of digital textile printing continues to grow as more sign-makers and display producers invest in this technology. The adoption of a brighter red in the new logo links to a brighter future, thanks to the new investors, new staff and new products, and the clean design also reflects the equipment produced at the company's Eindhoven head-quarters.

"Although we are still Hollanders Printing Systems, our customers always talk about owning a Hollanders, so it became obvious that we should refer to ourselves by this shortened name," states Roland Biemans, the company's Marketing and Communications Manager. ■

New sublimation inks from Kiian

Kiian states that the new series of its Digistar Hi-Pro inks has been developed for printing onto light and/or low coated paper, for transfer sublimation printing and is compatible with the next generation piezo print-heads. It has excellent drying quickness, high chromatic performance, high colour concentration and no risk labelling is required.

The Digistar E–Gold series of inks is produced for direct and transfer sublimation and is compatible with next generation DX7 print-heads as well as earlier versions. Features include very vivid and bright colours, good general fastness, a wide colour gamut, plus excellent outline definition and transfer release capacity. Again, there is no requirement for risk labeling. ■

E-2000 LED exposing units are offered with matching Dri-Vault screen drying cabinets

Long-lasting LED light pack introduced by Vastex

A new E-2000 Series of LED exposing units for screen-printers has been introduced by Vastex International. The long-lasting LED light pack delivers ultra-fast exposure times while producing high resolution half-tones and crisp detail on the most intricate graphics. Vastex states that the LED light pack also consumes far less electricity than metal halide lamps of equivalent surface area, and can last more than 50,000 hours, significantly reducing operating and maintenance costs. Standard features include a powerful vacuum hold down with rubber neoprene blanket for tight screen-to-film contact, easy-to-set fully-automatic digital controls for consistent exposures, shatter-resistant 0.63cm thick tempered glass and 120 or 240 volt power supply. E-2000 Series units are available in two sizes that accommodate maximum screen sizes (outside dimensions) of 58.4 x 78.7cm and 119.4 x 78.7cm. Both sizes are available mounted on matching Dri-Vault screen drying cabinets also manufactured by the company. The Vastex LED light pack is also offered separately as a kit to retrofit existing fluorescent exposing units of most makes and models. ■

Spandex offers Avery Dennison 777 cast film with next day delivery

Spandex states that the first stock of the new Avery Dennison low cost cast films has arrived at its warehouse for next day delivery. The new range of 100 coloured films offers conformability over rivets and corrugations, with up to eight years durability at a similar price level of a polymeric film. Avery Dennison 777 cast film is suitable for sign-makers being ideal for interior and exterior applications, including vehicles, boats, windows, point-of-sale and outdoor advertising. ■

M&R Challenger sets new world record

During this year's FESPA in London, Luis Omar Viera used M&R's high-performance Challenger III D J4 automatic screen-printing press, M&R's Passport automatic T-shirt unloader, and M&R's Fusion electric conveyor dryer to set a new world record of 2,139 T-shirts screen-printed in one hour by a single operator. This eclipsed his previous record of 1,909 screen-printed T-shirts.

Rich Hoffman, M&R's CEO, comments: "In 2010, Omar proved he was an elite screen-printer. And we knew we had a phenomenal automatic screen-printing press in the concept Challenger III D J4. But we also knew everything would have to go perfectly for Omar to set a new world record in London – much less to shatter the old record the way he did today. Even if you have all the elements necessary for success, an otherwise minor glitch can leave you short of your goal. To borrow a phrase from the sports world, 'It's why they play the game.' Fortunately, it all fell into place." ■

Rich Hoffman (right) and Luis Omar Viera with one of record 2,139 printed T-shirts

James MacDonald becomes Nazdar's Vice President of Marketing

Nazdar Ink Technologies has announced that James MacDonald has been promoted to the position of Vice President of Marketing for Nazdar Ink Technologies. Previously, he has led Nazdar's marketing team and advanced the marketing efforts for its digital product lines.

With more than 20 years' experience in the industry, MacDonald's primary focus will be to develop and implement marketing strategies to expand Nazdar's presence internationally.

"We recognise the need to integrate our geographic marketing resources into a global marketing organisation led by dedicated, focused executive leadership," says Richard Bowles, President of Nazdar Ink Technologies. "James's understanding of marketing, our product lines and market segments along with the experienced staff he will lead will create an effective marketing organisation." ■


Nazdar's James MacDonald

Scodix Metallic is recipient of 2013 InterTech technology award

Scodix has been the recipient of a 2013 Printing Industries of America InterTech Technology Award which recognises technological innovation and excellence in the commercial printing industry. Scodix Metallic's digital process enables service providers and their customers to enhance their prints with metallic colouring by simply utilising the CMYK colour process via the Scodix Sense digital single-pass print process. "The judges were impressed with the quality of the samples and how Scodix allows the service providers to easily differentiate their prints [and their operations] by making projects come alive," notes Dr Mark Bohan, Vice President, Technology and Research, Printing Industries of America. ■

Bordeaux's new vivid magenta ink expands red and orange tones

Bordeaux Digital Printink has introduced a vivid magenta ink to its low and mild solvent-based series. The company says this will accentuate red and orange tones for brighter, stronger and higher levels of colour accuracy. Tested extensively, the vivid magenta ink expands Bordeaux's low and mild solvent-based ink colours to CMYKLcLm and VM making difficult shades easier to reproduce. These inks are stated to offer excellent light fastness, fade and weather resistance and are ideal for high print productivity across all media, at a claimed 30% cost savings compared to OEM inks. Similar to Bordeaux's eco solvent-based inks, the new vivid magenta is compatible with most printers and print-heads. It is packaged in a one litre bottle, 440ml cartridge and one litre bag. ■

Andrea Hypes has more than 15 years' customer service and sales experience

New inside sales manager for Ultraflex

Andrea Hypes has joined Ultraflex Systems as its new Inside Sales and Customer Service Manager. She joins the Ultraflex team with more than 15 years experience in customer service and sales. Hypes's problem-solving skills and adept customer satisfaction strategies will aid in the support needed to educate, assist and elevate Ultraflex employees and their customers toward growth and success. She looks forward to forging strong relationships with the Ultraflex customer base and advancing the company's continuous goal of customer service. ■

MCT takes Versa-Tech manufacture to Wisconsin

The partnership between Milwaukee based MCT, Inc and UK based manufacturer Blackman & White has taken a new turn with MCT beginning to manufacture and perform complete assembly and test in Wisconsin. The first two systems will be demonstrated at SGIA. Featured will be a 1.6 x 3.2m Versa-Tech system outfitted with liquid cooled router, a full set of tangential knife cutting tools and a material conveying system – a typical set-up for a wide-format print service provider.

The second system will be the new 3.2 x 3.2m Versa-Tech with a 100 Watt liquid cooled laser and tangential cutting tools, outfitted for a typical textile finishing operation.

Formed in 2011, MCT has already sold and installed a number of machines of the type that will be manufactured in the USA from now on. The company has moved in this direction because of its growing needs for both textile and traditional graphics so the decision was made to manufacture closer to its market in order to keep pace with shorter delivery times and closer co-operation with key component manufacturers that are USA based.

In conjunction with Blackman & White, MCT sells its third generation vision-enabled Versa-Tech series of cutter/routers in sizes of 1.6, 2.0 and 3.2 x 3.2m, with a laser option for textiles. ■

Sato UK bets on Gallus EM 510 S modular label press

Dovercourt, Essex-based Sato UK has invested in a new Gallus EM 510 S which, equipped with four flexo printing units, will be used mainly for the production of water- and UV-curable roll-to-roll and roll-to-fold labels.

Director Jason Wise is convinced that the Gallus EM 510 S will make a significant contribution to the competitive advantage of Sato UK due to its high production speed, its proprietary platform concept and the special modularity.

The press was installed in March 2013 and completes its existing machinery which consists of nine label printing presses. The British company was founded in 1940 and is pioneer and leading global provider of integrated automatic identification (bar code and RFID technology) as well as a solutions' provider for data collection. ■

Print house Gildeprint Drukkerijen broadens portfolio with personalised printing

Dutch print house Gildeprint Drukkerijen has moved into the digital print market after investing in the Kodak Nexpress SX3300 digital production colour press. The investment has enabled the company to increase revenue by broadening its portfolio, notably in the personalised print sector.

Gildeprint has evolved into a healthy business, employing 14 staff. Before investing in new equipment, the company invariably turns to AtéCé Graphic Products, a leading supplier of graphic arts equipment. Peter Hendriks, owner of Gildeprint, was shown the Kodak Nexpress SX3300 press in action and was immediately convinced by the system's capabilities – and could envisage the positive impact it would have on his business.

Olivier Claude, General Manager for Print and Vice President Commercial Business EAMER, Kodak, comments: "Gildeprint is a great example of how investing in digital can really breathe new life into a business. They have seen that there is no compromise in terms of quality. And, importantly, they are getting creative and unlocking the potential of personalised print. They have a bright future ahead of them." ■

Typical of examples of Kodak Nexpress SX3300 output

Grünig and SignTronic grow together to focus on screen-printing

In September 2011 Marcel Grünig and Andreas Ferndriger informed its customers and partners about a new participation in SignTronic AG. The purpose was to make the best possible use of the synergies of both companies to strengthen reciprocal positions with regard to the competition and to offer the screen-printers systematic, sophisticated and customer-orientated solutions.

In addition, it was planned for Marcel Grünig and Andreas Ferndriger to take over SignTronic progressively during the next few years. To be able to ensure an optimal use of all synergistic possibilities and to implement them systematically, they have revised the scheduling of the take-over, with a planned accelerated procedure.

As a result, in June this year Grünig and Ferndriger took over 100% of the share capital of SignTronic. At the same time, former technical director, Henk te Brömmelstroet, retired from the company.

Both companies will continue to operate as legally independent entities but, going forward, will be more closely connected with one other. Ferndriger will remain in his function as Managing Director of SignTronic and Sales and Marketing director of Grünig-Interscreen. Grünig, as Managing Director of Grünig-Interscreen will also assume the technical management of SignTronic. ■

THE TIME IS RIGHT FOR INPRINT

Frazer Chesterman and Marcus Timson enthuse about innovative print technology for industrial manufacturing

Industrial print demands its own exhibition. And we believe that the rapidly developing InPrint Show is an amazing opportunity for both smart screen-printing and industrial ink-jet.

Since launching the InPrint Show we have spent time precisely defining industrial print. It seems to be commonly accepted by everyone we meet that the industrial sector represents an astonishing opportunity, but a common question that people ask is: "What is it you are classifying as industrial print? And how are you defining it?"

The definition we have settled on is that industrial print is: "Print that is part of a manufacturing process – print that either enables the function of a product or that enhances its appearance or decoration."

A print machine is only considered to be industrial if it is able to print applications that fit this definition, and a print machine is not industrial if it simply has a high capacity to print brochures, for example.

FUNCTIONAL FLUID

Additionally, industrial printing is not always the printing of an ink, but could also be a functional fluid. For example, the seven layers of silicone that are screen-printed behind the glass that enables a tablet touch screen to function is an industrial printing process.

In terms of applications, the key categories include 3D print, functional print that assists the working of an electronic product, decorative print or surface imaging onto unusual surfaces such as doors, wood, laminates, textiles, ceramics, and glass and it does include packaging print.

There is no doubt the growth potential for industrial print is impressive.

IT Strategies rates the potential of the industrial print markets growth to be considerable in the next ten years. From $100billion in 2012 to $120billion in 2022. This outperforms any meagre growth potential for other print markets, such as graphics.

In addition, industrial ink-jet is the third highest recipient of venture capital funding, behind social media and green technologies, demonstrating that the wider commercial market regards the industrial print sector as incredibly important, too.

Another compelling fact is that, unlike commercial and graphics' printing, industrial print does not have to compete with a powerful and rapidly growing alternative delivery mechanism such as on-line media, on-line retail and digital signage.

GLOBALLY EXPANDING MIDDLE CLASS

Growth for industrial print is linked to a globally expanding middle class, and its increasing consumption. There is also astronomical growth in key sectors such as tablet and smart phone production. Smart screen-printing in this sector has seen a steep incline in demand and we also see that ink-jet print technology is playing a key role in the trend for mass customisation.

Manufacturing processes are transforming in line with the demand for mass customisation. From the manufacturing sector there is an increased need for technology that enables shorter production runs. The development of ink-jet is at a stage where it can now deliver sufficient quality for localised and customised industrial printing.

Add to this the requirement for lower stock inventories, greater efficiency, faster turnaround and go-to-market production, and it should come as no surprise that ink-jet is high on the agenda for industrial manufacturing.

But smart screen-printing will continue to be the dominant process in key areas, such is the sophistication, durability and efficiency of the process. The robust position of industrial screen-printing suggests that digital ink-jet will co-exist, but not substitute, like it has done in the graphics' sector. Nonetheless, there is an undeniably increasing role for digital ink-jet to perform print roles that screen-printing cannot.

Marcus Timson (left) with Frazer Chesterman

AHEAD WITH TARGET BOOKINGS

In line with these positive facts, the InPrint Show, which takes place from 8 to 10 April in Hannover, is developing very well indeed. We are well ahead of target with exhibitor bookings; in fact, by the time you read this article, we will be more than 80% sold, and we are seriously considering taking on more space to cope with additional exhibitor demand.

Leading brands such as Agfa, Caldera, Canon, Dr Hönle, Durst, ESC, Fujifilm, Hans Frintrup, Huntsman, Hymmen, Industrial inkjet, INX Digital, JTeck3, Kiian, Lumejet, Marabu, Micron, Mimaki, Neschen, Pall, RK Siebdruck, Sensient, Stratasys, Thieme, Toshiba Tec, Xaar and Xennia have committed to exhibiting.

At InPrint you will see a show that is entirely focused upon industrial print production combining the best of smart screen-printing technology with the best of industrial ink-jet.

As well as more than 100 exhibiting companies, there is a 3D Print Factory sponsored by leading 3D print innovator Stratasys, a functional and decorative industrial print conference in collaboration with ESMA and IMI and, of course, co-location with the world famous Hannover Messe. These opportunities give visitors extra value for their entry tickets as an InPrint registration gaining access to this celebration of manufacturing technology and its 4,000 plus exhibitors.

We simply believe that industrial print deserves a show if its own and the time is right for InPrint. So we invite leaders in technology to be part of it, to connect awesome print technology and processes to new markets, and educate and inspire new business. ■

Frazer Chesterman and Marcus Timson are directors of FM Brooks

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FESPA IN LONDON PROVES TO BE A GLOBAL DESTINATION FOR PRINT

2013 exhibition delivers both quality and quantity

According to the organisers, FESPA's move to London for 2013 delivered the event's most globally diverse visitor audience to date, with almost two-thirds of visitors to the flagship event coming from outside the UK.

The FESPA 2013 and European Sign Expo (ESE) audience was dominated by senior decision makers, with an unprecedented 71.3% of visitors having input to purchasing decisions, and half having ultimate purchasing responsibility. With more than 22,000 individual visitors checking in to London's ExCeL exhibition centre during the five days of the FESPA event, the turn-out exceeded Munich 2010. With almost half of those choosing to spend more than one day at the show, attendance totalled 37,460 visits.

London's global status as a business hub made for significant increases in long-haul attendance from Australasia (+66%) and North America (+45%) compared with the last main FESPA event in Munich, Germany in 2010. Visitors from sub-Saharan Africa doubled compared with 2010, reinforcing the strong rationale for the launch – announced the day before FESPA 2013 – of FESPA Africa to take place in Johannesburg, South Africa, in July 2014. Altogether, visitors from beyond Europe constituted almost 15% of the total event audience.

After the UK, the largest visitor groups were from Germany, Benelux, France, Italy and Spain, highlighting the continued significance of this leading wide-format event for print service providers from key Western European markets. London proved a particularly appealing destination for printers from the Nordic and Baltic regions, with an increase of more than 68% in attendance from these countries compared with FESPA 2010 in Munich.

György Kovács, outgoing FESPA President, cuts the ribbon at the official opening ceremony

FESPA managing director Neil Felton comments: "The exhibitors I've spoken to here at FESPA have been absolutely delighted with the breadth of international visitors, and stands throughout both halls here at ExCeL have been buzzing. Significant product launches in many areas have given visitors plenty of new technology to explore, while our visitor features have attracted printers looking for guidance on how to take their business in new directions." ■

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web: www.fespa.com


From the left, Specialist Printing Worldwide's Debbie Drewery, Sophie Matthews-Paul and Dave Fordham with Peter Buttiens of ESMA on their shared stand at FESPA 2013.

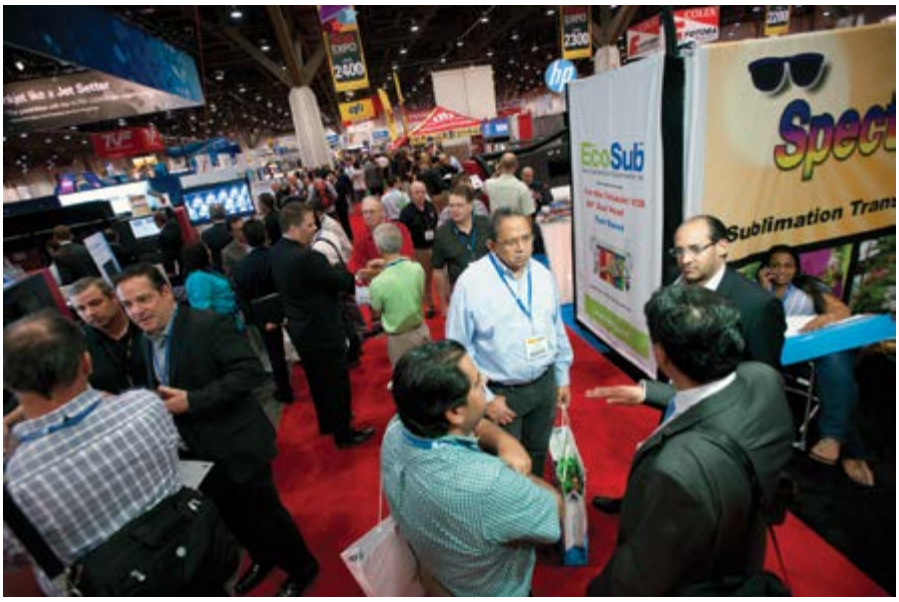
Crowded aisles in one of the halls at FESPA 2013

ORLANDO PLAYS HOST TO SGIA

Good turn-out expected at this year's expo

From 23 to 25 October more than 450 exhibitors will be heading to Orlando for this years SGIA Expo, intending to bring the full spectrum of imaging technologies and applications to the community. This event, as always, is supporting leaders of digital and screen-printing, plus the many other processes used both today and in the future. These are designed to create new products and to enhance existing ones including point-of-purchase, printed electronics, membrane switches, signs, advertisements, garments, containers and vehicles.

The Printed Electronics and Membrane Switch Symposium is once again joining this year's SGIA Expo, and interested parties can register now. This year, the this event will open a day earlier, giving participants an extra day to explore the 2013 SGIA Expo. This symposium features high-end educational programming delivering relevant, near-future technical information. Session topics include surface mount technology (SMT), light guide panels (LGPs), mesh selection and stencil preparation, and finishing with dimensional forming.



This year's SGIA Expo will feature more than 450 exhibitors

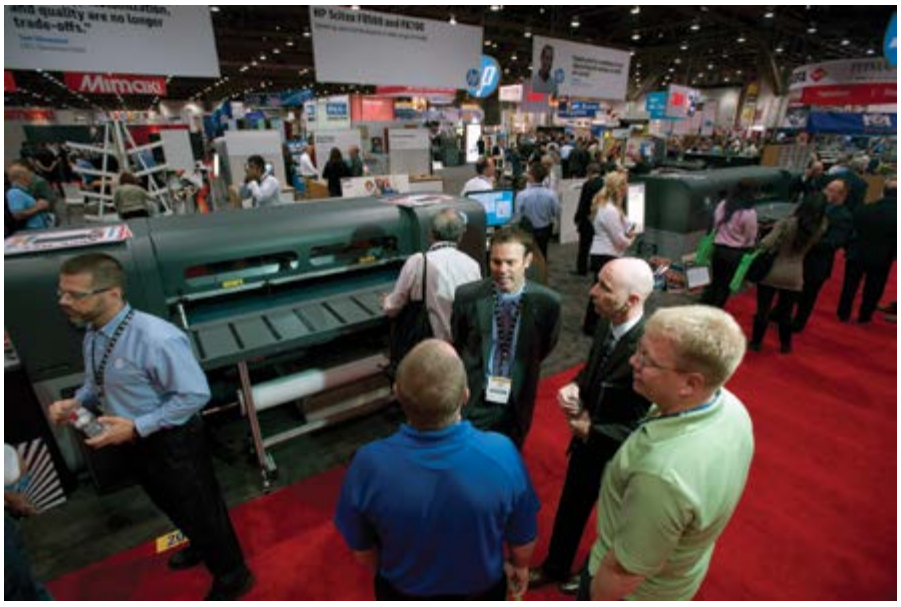
SGIA'S ZONES

For visitors looking for more information about the latest digital technologies for garment decorating, colour management, or installation, or hoping to find the exact way to become profitable through sustainability or adding digital signage options, there are the SGIA Zones. These have the free educational programming and include the Digital Apparel Production Zone and the PDAA Graphics Application Zone which features live demonstrations of vinyl installation to a variety of objects and surfaces that go beyond vehicle wraps. In the Color Management & Workflow Solutions Zone there will be full focus on tools and techniques, as well as RIP and third party software solutions. Attendees can expand their capabilities and develop new relationships by joining any of the presentations during show hours.

Being announced is the first-ever SGIA educational Zone to focus on sustainable business solutions. This is a place to learn from industry leaders, increase understanding of best practices through great success stories to inspire sharing with teams, customers and prospects. The Digital Textile Printing Zone will provide a wealth of information including technical and design requirements, recommended work-flows, colour management tips, finishing techniques, and recommended best practices for a variety of ink and fabric combinations.

The Screen Printed Apparel Training Zone features industry experts who will be on-hand to demonstrate the latest garment special-effect techniques, while the Digital Signage Innovation Zone gives visitors the change to learn about digital signage work-flow, ask questions about this emerging technology and discuss how to position business to take advantage of the growing opportunities.

SGIA says not only is the show floor mostly sold out but there has also been exceedingly high pre-registration. Moving to Orlando this year, the new rotation schedule based both on attendee and exhibitor feed-back indicated that Las Vegas, where the event was held in 2013, proved to be a particularly popular location for the event. This initiative was approved overwhelmingly by the SGIA board of directors, and this will be the venue for SGIA Expo 2014. ■



The full spectrum of imaging technologies and applications is on show to the community

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This year's Labelexpo is set to be the largest yet

BRUSSELS HOSTS THE BIGGEST LABELEXPO YET

September's show attracts more than 500 exhibitors

Set to be the largest in the show's 33 year history, Labelexpo Europe 2013 returns to Belgium between 24 and 27 September. Attracting a record breaking 28,636 visitors in 2011 from 123 countries, Labelexpo Europe is aimed at label and package printers/converters, general printers, brand owners, designers and industry suppliers. Covering seven exhibition halls, more than 550 exhibitors are set to display the latest systems, demonstrate cutting edge technology and show visitors solutions and materials to improve business efficiency and increase profitability.

With many big name exhibitors increasing their presence at the event, Arjowiggins, Aslan Schwarz, Atlantic Zeiser, Avery Dennison, Cham Paper Group, Durst, EFI, Encres Dubuit, Epson, Esko, Folex, Fujifilm, Gallus Ferd Rüesch, Grünig-Interscreen, HP Indigo, Intercoat, Kodak, Lüscher, Mactac, Marabu, Mimaki, OKI, Phoseon, Ritrama, Roland, RUCO, Scodix, Screen Europe, Sihl, Spandex, Spartanics, Stork Prints, Sun Chemical, X-Rite and Xeikon are just some of the industry's companies that will be showcasing their latest innovations and solutions.

The only place to see the latest innovations in digital printing, multi-substrate presses, in-line decoration systems, RFID/smart labels and pre-press and plate making, Labelexpo Europe 2013 will also run several feature areas. The Package Printing Workshops will highlight new ways of adding value to businesses and demonstrate how to produce folding cartons, flexible packaging and tube laminates.

The latest technologies and their applications will also be put under the spotlight. A brand new show feature called The Inkjet Trail will demonstrate the different available ink-jet technologies and compare their results when producing identical label designs on the same label stocks.

Gathering together six of the industry's leading ink-jet press and printer manufacturers with Domino Printing Sciences, Durst Phototechnik, EFI Jetrion, Epson Europe, Heidelberg Linoprint and Stork Prints, they will produce a selection of food, pharmaceutical and industrial labels using the same sets of origination, on the same range of substrates. Origination, colour and die-cutter files for the different jobs will be prepared by Esko, while UPM Raflatac, FLEXcon and Herma will provide common paper, film and foil substrates for the range of printed labels being produced. For comparison with toner technologies, Xeikon will be producing the same label designs.

With no separate entry registration or entry fee, this exclusive opportunity will allow show visitors to compare each of the manufacturer's outputs at the same time in the same place. Visitors can simply follow the trail around the exhibition floor throughout the event's duration. Brochures including full technical details will be available for collection on entry to the show, while samples of all the sessions' printed products will be available from each of the participants' stands.

Print Your Future, packaging innovation by HP Indigo and partners, will demonstrate how to transform businesses with new solutions for labels, folding cartons and flexible packaging that differentiate packaging and products and add value for brands. ■

Further information:
web: www.labelexpo-europe.com

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BIG DATA IN THE RETAIL MARKET BENEFITS SPECIALITY IMAGING

Michael E Robertson reasons why this phenomenon is good news for graphics producers

Michael Robertson

Wikipedia defines 'big data' as the term for a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications.

For retailers, big data translates into data collection that identifies customer Internet actions, mobile shopping preferences, in-store buying patterns, order and fulfillment specifics, customer traffic patterns, financial transactions, social media opinions, product placement, up-to-the-minute sales reports (by location and time of day), production reporting, GPS shopper locations (they need to be careful with this one) and competitor analysis… The list goes on and on.

But make no mistake. Big data is being collected, manipulated and analysed to support all types of decision making as retailers battle for market share. The intent is to save time, save expense, and most importantly, maximise sales opportunities through a better understanding of the market-place. Major online companies like Yahoo and Google have been pioneers in the use of big data. Today, brick and mortar retailers have taken a page from the on-line retailers' big data book to improve and streamline their own decision-making processes.

Retailers are still learning how to maximise the effectiveness of big data, and they've suffered a few bumps and bruises along the way. Although big data presents some challenges, the value of data in the decision process will increase as retailers enjoy the benefits; but retailers need to capture pertinent data without over-stepping privacy boundaries.

The alternative to big data is mass marketing, but mass marketing doesn't allow personalisation or finite market segmentation. And, with customer interests changing faster than ever, mass marketing isn't a solution that will propel many retailers to the forefront of a competitive market-place.

The success of big data in the retail sector is great news for graphics producers. Big data equals customisation, and customisation means additional business opportunities for graphics producers. The use of big data is resulting in customisation from store to store and more frequent roll-outs of redesigns in general.

Big data strengthens the relationship between mobile, on-line and in-store shopping. And it underscores the value that entertainment brings to the in-store experience. By understanding the data management goals of your retail customers, you'll be able to better serve their graphic needs.

To see the multitude of opportunities available to graphics producers first-hand, the 2013 SGIA Expo will offer the full spectrum of imaging technologies and applications related to the speciality imaging industry, including how to offer retailers the ability to maximise the big data they're collecting. Attendees will find the highest level of expertise on the show floor, in the educational seminars, at the exclusive speciality zones and in the community-building receptions. Visit SGIA.org today to register for your free expo pass, and experience more exhibitors, more face time, and more answers. ■

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

SGIA
Specialty Graphic Imaging Association

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INDEX TO DISPLAY ADVERTISERS

AXYZ Automation (UK) Ltd 55
BELTRON GmbH 67
Brother International Corporation 57
Caldera 73
Chromaline Screen Print Products ..... Front Cover & 31
ColDesi 17
Easiway Systems 29
EFI 19
Encres Dubuit 34
Extris 45
Fimor 39
Gallus Ferd Rüesch AG 79
GlassPrint 2013 ..... 2 & 3
Global Graphic Equipment Ltd 72
Grünig-Interscreen AG 5
Hollanders Printing Systems 15
InPrint 2014 79
ISIMAT GmbH Siebdruckmaschinen 11
J-Teck3 Srl 25
KAMMANN Maschinenbau GmbH 21
Kiian SRL 71
KIWO, Kissel + Wolf GmbH ..... Outside Back Cover
MacDermid Autotype Ltd 43
Marabu GmbH & Co KG 65
Murakami 23
Natgraph Ltd 47
Nazdar 7
NovaCentrix ..... Front Cover & 35
Pad Print Machinery of Vermont 51
Phoseon Technology 13
Power Industrial China 33
SGIA Expo 2013 69
SignTronic AG 5
STAHLS' International 17
Sun Chemical 49
Technigraf GmbH 59
Trelleborg Applied Technology 45
Trotec 63
Ulano .. Inside Front Cover & Inside Back Cover
Ultraflex Systems Inc 27
Vastex International 9

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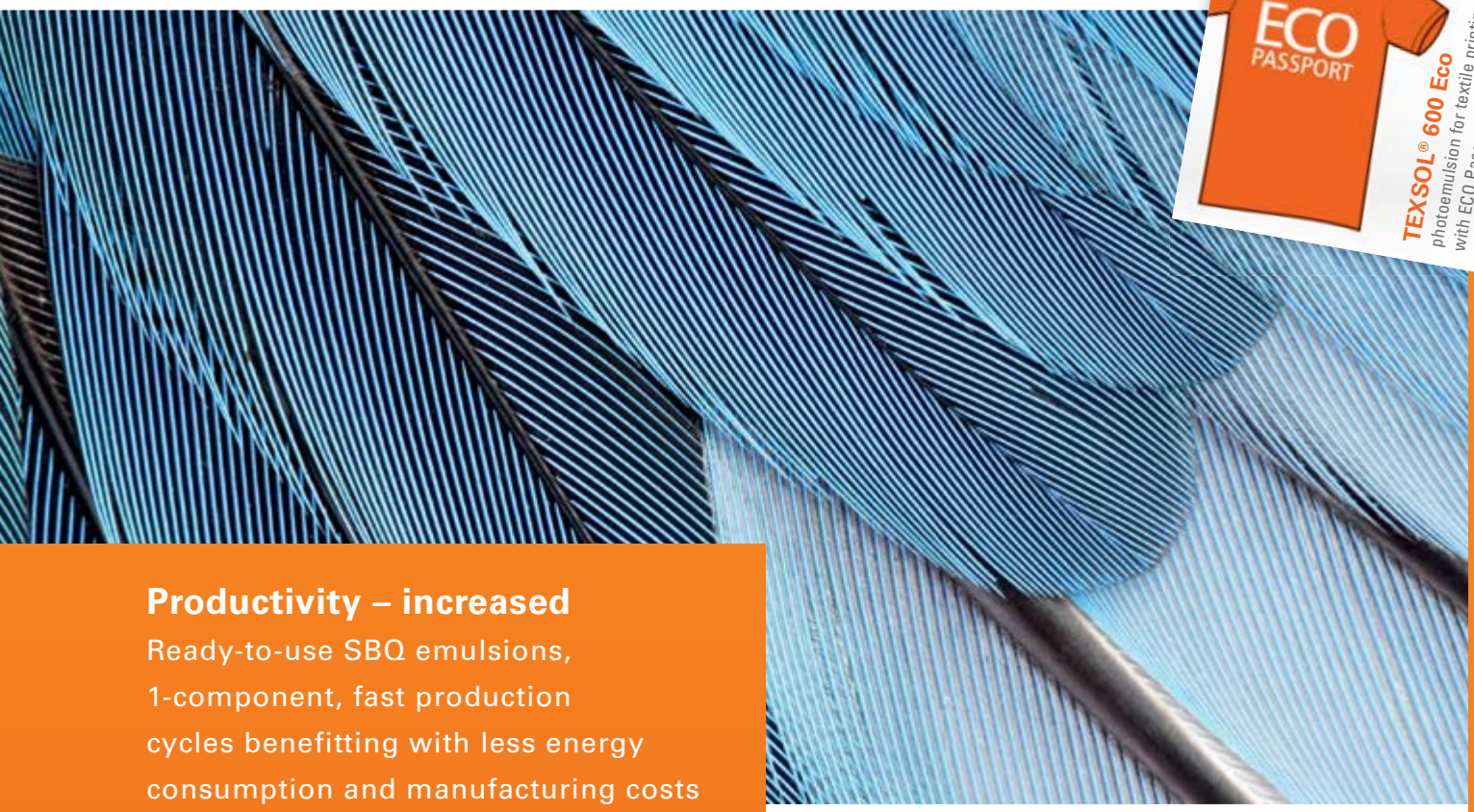

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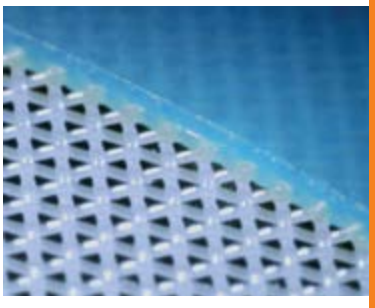

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