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As we enter the last few months of 2017, I would like to take this opportunity to thank a number of parties that have assisted

in firmly establishing *Specialist Printing Worldwide* as required reading throughout the industrial, graphic and textile sectors since we launched a decade ago.

Thanks to our network of experts, every issue has analysed innovative advances in 'traditional' methods such as pad and screen-printing, in addition to detailing dynamic strides from the digital sector.

This educational content has influenced the decisions of our global subscribers as to where best to invest in new technology to meet the needs of customers who have faced unprecedented market conditions since our first issue. We are very grateful for the loyal support of our ever-growing readership, and if you don't currently receive a personal copy, you can subscribe now at [www.specialistprinting.com](http://www.specialistprinting.com). Selected articles can also be downloaded free of charge on the website.

Tremendous backing from all our sponsoring trade associations has been instrumental in entrenching *Specialist Printing Worldwide* in the industry's global and regional communities. It should be noted that ESMA's input during our conception was particularly valuable, especially from then-committee members Maurizio Fantato and Chris Whitmarsh. We also very much value our close relations with many exhibition organisers and in the coming weeks, we look forward to meeting readers at InPrint 2017 in Munich, the exhibition for industrial print technology, as well as at the GlassPrint and DCP conferences.

Finally, many thanks to all our advertisers that have reached existing and potential customers through our pages. If you're a manufacturer of machinery, equipment, software or consumables that doesn't feature in this issue, request your 2018 media information at [www.specialistprinting.com](http://www.specialistprinting.com) or contact us for a customised proposal. Over the last 10 years, I've consistently been told about high levels of response... so why not give us a try?

Here's to the next decade of progress, collaboration and prosperity!



**Bryan Collings, Publishing Director,  
Specialist Printing Worldwide**



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# SMALL PRINTER – BIG DECISION

Don Copeland raises some important questions to ask when choosing a small to mid-format UV-LED flatbed printer

The UV-LED small to mid-format flatbed printer market has grown immensely the last four to five years, and as the market has grown so have the number of offerings in regards to printers. Adding a UV-LED printer can be a great way to grow your business, but buying a machine that doesn't meet your current or future needs can be very frustrating and a waste of time and money.

As you begin your research into which machine is best for you, it is important to have some criteria to work from in order to make the best choice for your business. A little homework upfront will help to reduce the chances of making the wrong decision (keeping in mind that there may be more than one good decision!).

## INITIAL CONSIDERATIONS

Some fundamental questions to ask up front before you even start looking at machines would be:

- How large of an area do I need to be able to print?
- How tall/deep are the items I plan to print on?
- How much space do I have available for the machine?
- How much can I, or am I willing to, invest into the purchase?

By answering these questions you can quickly begin to reduce down the list of printers to choose from.

## SIZING UP THE OPTIONS

When determining what print size you will need it pays to consider not only the maximum single image you will need to print, but also look at logical multiples of that image. For instance, if your largest image is an 8.5 x 11" you will only be able to print one at a time on a printer with a 12" x 11" or 10" x 14" bed and two on a printer with a 10" x 24", 19" x 13" or 16.5" x 24" bed – while a printer with 24" x 17.7" bed will allow you to print four images at one time. When moving up from small format to mid-format machines you will find that you can print 10 at a time on a printer with a 23.8" x 48" bed and 13 on a printer with a 45.3" x 29.5" bed. If your business is about higher production and will involve larger runs of items then a larger print field can mean less user interface time with the printer and more time actually printing.

Another thing to consider is the height or depth of the items you will be printing. Take into account that many items will need some sort of jig or support mechanism to hold them in place while they are printed. In the case of



*The more versatile your printer, the greater its ROI*

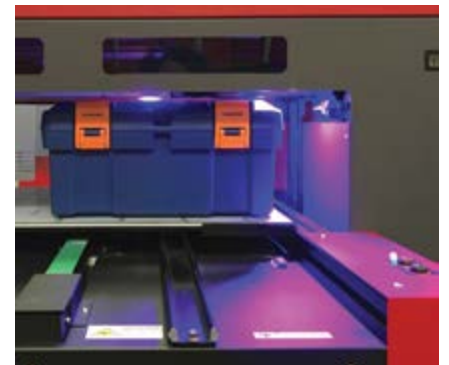
items like golf balls this could add an additional 0.5–1.0" to the height needed. If you are wanting to print on prefabricated items then you will find that the more depth the better. Print height can range from as little as 1.8" to nearly a foot, with the norm being around 5–6".

Having the ability to print 'taller' items can open up markets that the majority of UV-LED printers cannot touch. The more versatile your printer the greater the earnings potential.

A third concern is space. UV printers are not small items, for the most part. The general



*UV printers are not small items, for the most part*



*Consider the height or depth of the items you will be printing*



*Allow for the size of a jig or support mechanism if printing golf balls*



*A larger image bed allows more multiples to be printed simultaneously*

rule is the larger the print area, the larger the printer. With that in mind, space may be a real concern in your location, so it is important to determine how much space you have available and the width of the doors and hallways leading to where the printer will need to reside.

### NARROWING IT DOWN

By answering the previous questions you should have pared down your options to a few machines or maybe even less. So now you can start digging a bit deeper. Here are the next wave of questions to ask:  
 Software/RIP included? If not, how much?  
 Cost of inks?  
 Training? Cost?  
 Realistic productivity of the machine?  
 Machine cost with everything you will need to get started?

The questions of costs of inks and machine with everything needed should be pretty straightforward – most machines on the market today sell for between \$25–85,000. Some machines use bulk inks, some use cartridges or bags (to determine litre costs of inks in bags or cartridges, simply divide cartridge price by the millilitre count and multiply by 1000). Ink prices vary widely from \$250 [£184] per litre to over \$700 [£515] per litre. If one ink is \$250 a litre and another is \$500 per litre then it is safe to assume that costs per print will be roughly twice as much on the machine with the \$500 per litre ink as on the one with the \$250 per litre ink. If you are using two litres of ink per month (about average for most small to mid-format users) that can translate into \$6000 [£4415] per year in added ink costs!

Is training included with the machine? If so, is it at your location, online or at the vendor's location? If not, how much additional is training. What about future training – is it available? If so, is there a charge for additional training?

When it comes to software most printers will include a RIP (Raster Image Processor) to drive the printer, though some offer it as an option (although it is a 'required' option!). Questions to ask about the software include: what file formats does it support (PSD, PDF, TIF, EPS, PNG, etc.); does it

support or create texturing, variable data, serialization and bar coding? Lastly, about the software, does it support templates or do you have to set everything up in your design software properly spaced and aligned?

### PRODUCTIVITY?

Now, the hardest question to get answered with a direct answer. What is the realistic productivity of the machine? The best way to determine this is to have a representative cross section of images printed on the printer in realistic numbers (based on your expected order sizes). From these numbers you should be able to get a good idea of how many items you can print in a typical work day and be able to determine the ROI of the machine based on them.

There are other factors to consider but generally they are secondary to these and can certainly be used as 'tie breaker' if these questions have not led you to a clear cut winner in your search.

Happy researching! ■

**Don Copeland is Digital Products Manager at ColDesi, Inc.**

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# SCREEN FINISHING AND PRINT REGISTRATION

David Parker looks at some of the key elements in the final stages in screen making

Even though these are relatively straightforward processes, there are still a number of factors that you need to get right in order to produce a good screen for production.

## WASHOUT BOOTH

Screens should be developed in a dedicated washout booth that is separate from the screen cleaning booth. This will prevent potential contamination of the stencil from the decoating chemicals used to strip the stencil.

The washout booth should be positioned in a yellow safelight area to prevent the screens 'fogging' whilst waiting to be developed, but should be fitted with a white backlight to enable effective screen inspection during washout.

## WATER TEMPERATURE AND PRESSURE

The water used for the washout should be filtered to prevent particles in the water supply from becoming embedded in the soft emulsion surface. The optimum water temperature for developing direct stencils is 15–30 degrees C; too cold and it will slow down the washout and too hot and it may cause the emulsion to soften and swell.

The washout pressure should be quite strong (4–6 BAR) and with a good spray pattern. The object is to quickly dissolve and rinse away the unexposed emulsion without softening or damaging the stencil. For manual washout it is good practice to wet down the

squeegee side first and then conduct most of the washout from the print side of the screen, as that is where the bulk of the stencil is.

If you are tempted to use a High Pressure Gun (HPG) to wash out the stencil, select a diffuse spray pattern and make sure that it is held at least 0.5m from the stencil. Never use the gun from the squeegee side as it will most likely blow the stencil off the mesh!

For small screen development for ultra high definition applications, a compressed air accelerated washout can be used with great effect, as this opens up the fine detail with minimal risk of damage to very fine lines/tracks.

## AUTOMATED WASHOUT

For processing large screens in a busy shop, an automated washout system can help significantly. These 'tower' developers wash out the screen from both sides and often reuse the developing water for the first part of the washout to minimise water consumption.

## STENCIL WASHOUT FAULTS

**Stencil breakdown:** If screens break down during washout, this is often a sign of gross underexposure and/or insufficient drying of the stencil prior to exposure (See How to Guides on Exposure and Drying). Breakdown can also be caused by too hot water

temperature, or too high water pressure.

When developing ultra thick stencils (>100 microns) avoid the temptation to pre-soak the screens, as this will soften the stencil leading to breakdown during washout. It is best to use a strong water spray from the print side only as this will give the best result.

**Scumming:** This can be seen as a transparent glossy residue in the open areas of the dried stencil and is caused by incomplete washout from the squeegee side (also a sign of underexposure), or possibly emulsion build up in re-circulated washout water supply.

## DRYING

After washout, the screens must be dried thoroughly before printing. It is best to use warm air (max 45 degrees C) with a good air flow from both sides of the screen. You can speed up the drying by removing a lot of the excess water from the screen surface with a dedicated wet and dry vacuum cleaner, though take care not to damage the soft emulsion surface.

It is not good practice to dry the stencil with newsprint as you can leave paper fibres on the stencil surface that are difficult to remove later (especially if the stencil is underexposed).

Screens can be dried either vertically or

*Continued over*



Dedicated washout booth with white light backlight (Image courtesy of Natgraph Ltd)



Wash out with a strong water spray from the print side

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A near vertical light box makes inspecting large screens easier  
(Image courtesy of Natgraph Ltd)

horizontally, whichever is the most convenient for production, but it is recommended that a dedicated screen drier is used for this post washout drying. After drying it is good practice to let the screens stand for at least 24 hours before printing as they will continue to harden and this will maximise their durability, this is especially beneficial for photopolymer stencils.

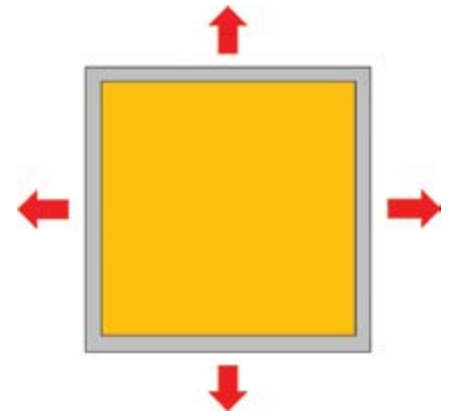
### INSPECTION AND SPOTTING OUT

After drying, the stencil needs to be examined closely to check for defects and to spot out any pinholes. For large screens, a near vertical light box is more practical than a horizontal inspection table.

The inspection must be with a backlight in order to pick up the smallest defects. Use a proprietary blockout filler, such as Regular Filler for all solvent based and UV curable inks. For water based inks, use a sensitised emulsion and remember to post-expose the screen to harden this emulsion. Large open areas can be blocked out using either an old credit card as a spreader, or a narrow coating trough. Spot out pinholes carefully with a retouching brush, but make sure that the surface is flat after application.

### POST EXPOSURE

There is considerable debate about the benefits of post exposure. Post exposing the screen to UV light after it has been dried is essential if you have spotted out with a sensitised emulsion, but it has little or no effect on single cure Diazo sensitised photostencils. Post exposure will slightly



A 20°C change in frame temperature can give a 500µ change in frame size

improve the water resistance of a dual cure photostencil, but will have the most noticeable effect on improving the resistance of photopolymer stencils. Post exposure is no substitution for the correct initial exposure and will have no effect on a grossly underexposed stencil as fundamentally you can't harden emulsion that isn't there!

### TAPING OUT

Most screens require some form of taping out for added security during printing. The type of tape chosen will be dictated by the inks you are printing i.e. water based or solvent based. It is important to avoid using thick tapes as this will affect the contact with the substrate and/or the squeegee travel. Take care not to overstretch the tape or flex the mesh when applying the tape as it can actually distort the image for printing. Taping multiple screens is a high cost, labour intensive operation that can be minimised by effective screen making in the first place.

### PRINT REGISTRATION

Poor registration between the positive and the print is one area that has caused screen printers problems for years. Unfortunately,



Use a dedicated drying cabinet to dry screens after washout (Image courtesy of Natgraph Ltd)



there are many factors which can affect dimensional accuracy/reproduction capabilities of the screen print process and often a mis-register in the print is caused by a combination of several factors, making it hard to track down the root cause.

There are three main causes of screen dimensional accuracy problems.

**Mechanical:** mesh is obviously flexible, therefore if there are any differences in mesh tension from when it was imaged to when it was printed, there will be a difference in size. For example, a thick, multi-layer film positive will cause the mesh to deform around it during vacuuming down for exposure, this will actually stretch the mesh when it is imaged which will then shrink back once the vacuum pressure is released. The same effect can be seen if the frame profile does not allow the mesh to lie perfectly flat against the exposure glass.

Unexpected mesh stretching can also occur if the vacuum blanket is very tacky. In some cases it can actually pull the mesh/stencil outwards as it is vacuumed down. This problem can be identified and subsequently overcome by simply placing a black cloth/card between the mesh and the blanket to break any seal. Although these effects are very small they can cause up to 0.5mm (500µm) distortion over a 1m image.

Mechanical distortion is also caused during the printing process itself, so unless you are printing on-contact then the off-contact distance will cause the image to grow slightly. In most cases for 'graphics' images this is not noticeable as long as the off-contact distance remains constant for all the screens used for the job. However, where really accurate image size and placement is required for 'industrial' applications, higher tension screens requiring lower off-contact are recommended.

Another possible cause of image distortion is the combination of squeegee pressure and ink characteristics. If the squeegee 'drags' across the mesh during printing, or the viscosity of the ink creates significant resistance, the mesh and stencil can become distorted during the print stroke. Careful set-up of the printing press and optimisation of ink viscosity and rheology will address this issue.

**Temperature:** temperature differences can have a noticeable effect on the size of aluminium frames, which can then lead to registration problems. For example; a 1m x 1m aluminium frame is coated, dried at 40°C and then immediately exposed. If it is then allowed to cool to room temperature (20°C) and printed, the frame will have shrunk by 500µm (0.5mm) in both directions. As the image was 'locked in' at the higher temperature size the image on the screen at 20°C will be noticeably smaller. The solution to this problem is simple; always expose and print at the same frame temperature. For critical applications maintain the same ambient temperature in the screen making area and the print shop, and allow the

frames to return to room temperature after both drying cycles to control this variable.

The film positive itself can be subject to temperature effects, particularly if left on a hot exposure glass before exposure. The changes in dimensions tend to be smaller than the frame but can become a factor for critical applications.

It is not just aluminium frames and positives that are affected by temperature, many substrates will change size when they are heated, so it is critical that temperature sensitive substrates are pre-shrunk prior to printing and drying. Even 'stable' substrates such as polyester will shrink if they are exposed to high enough temperatures.

**Moisture:** most substances absorb water, some a lot more than others. As a rule of thumb the more water that a substance absorbs, the more it will expand. Paper is a perfect example, changing size significantly as it picks up, or loses moisture, hence the need to pre-condition paper stocks before printing.

#### SUMMARY

As you can see, registration problems are typically caused by differences in tensions, temperatures or moisture contents and can be due to the screen itself or the substrate. There can be

differences between screens in a set or between stages in the process. Most of these effects are very small, but they can have an additive effect to cause a noticeable registration difference.

If you are faced with either a screen finishing or registration issue in your print shop, the first thing is to take a step back and look at the whole process, look for these differences and methodically rule out, or control the variables at each stage. ■

*These extracts have been taken from the How to Guide series of tutorials produced by MacDermid Autotype. This series includes over 60 invaluable guides to all areas of screen making and includes tutorial videos on the key stages (which can also be found on the MacDermid Autotype YouTube channel). For more information on how to get the best results for your screen printing facility, go to [www.MacDermid.com/autotype](http://www.MacDermid.com/autotype).*

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# BOX OF MYSTERY

Charles Facini explains why the computer is the heart of your business and your opportunity for success

Screen-printers spend their workday somewhere between applying traditional techniques and a fantastical world of Artificial Intelligence where computer systems perform tasks that require human intelligence, such as decision-making. And, it's a busy day given the number of efforts required to get from points A (the order) to Z (boxing it up). The A to Z remains the same as when I began my career in the early 1980s. It's the 'how we do it all' that has been transformed by technology over the past decades. Are you prepared to do business in a field that has embraced technology?

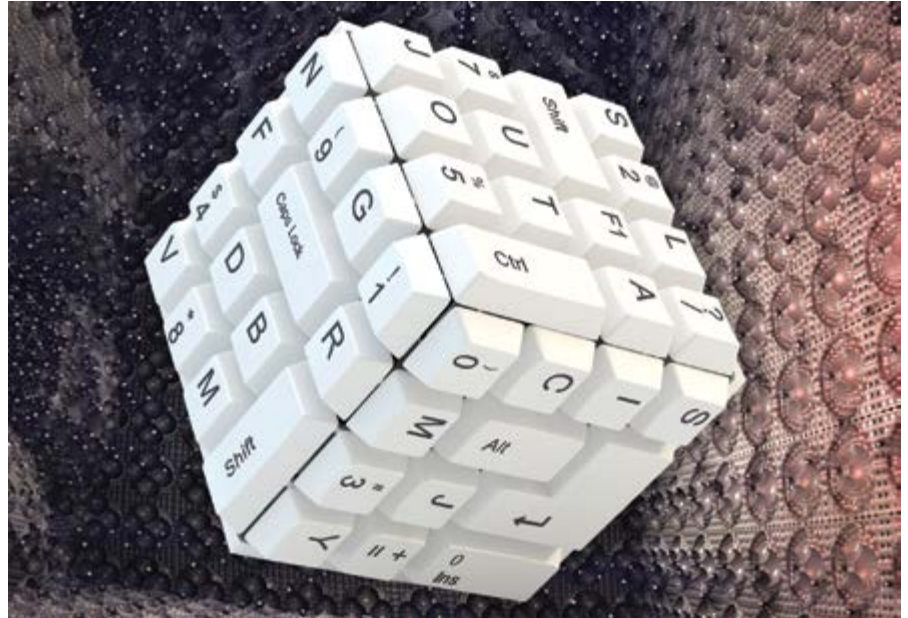
It's been nearly 40 years since desktop computing delivered the opportunity of speed and efficiency to creative processes. I say opportunity, because we are not in the Artificial Intelligence world quite yet. We still need the engagement of talented, thinking artists to use software and hardware. At Freehand we are also well over the 40,000 active user mark so our direct connection to real world screen-printers is uniquely strong. We recognise that a great many users still see the computer as a 'box of mystery' and much of our technical support provides understanding to this base.

## MAKING EXCUSES

As I am hitting the keyboard keys to write this article, I glance over at a framed sheet of 'presstype' on the wall. Maybe you remember using a tool to rub down letters one at a time onto media? Maybe you cut images with Xacto blades out of Rubylith? It's safe to say that the majority working in the industry today have no experience with the traditional techniques of the art department, or screen making by hammering cord into grooves to stretch a screen. Those days are long gone and screen-printers age 50-plus are not the norm. Is this majority building skills on the tech side? Are today's professionals struggling to produce a great



*Born to Design – an original Freehand design*



product and meet deadlines despite access to easy and affordable software and technology? We met our deadlines working during pre-computer Stone Age times and the finished work was professional; what's the excuse of today's screen-printers with a fantasyland of engineered programs at their ready?

Part of the cause for blame is that people self inflict pain. Yes, the 'money issue' is a favourite excuse too, but experience has shown that these pains are often behaviour- and not money-driven. After all, turning on the shop lights in the morning or watching the third shift start production will invariably reveal the same set of tasks and challenges day after day. We shouldn't be surprised about what the day will unfold. Not having the right tools to do a job is therefore self-inflicted pain born from a fear of the technology engineered to improve workflow, or some mental block that needs to be pushed aside.

The key to success in this industry is not a dark kept secret. It's neither exciting nor sexy. It's the same as it has always been. Have the tools, and know how to use them well.

## THE HARD TRUTH ABOUT SOFTWARE

There are several departments in a screen-print company, but for this discussion we focus on art and pre-press, of which two thirds of my long career has been directed to. There is a hard reality to software. There are software programs and mainstream applications that need to be instituted, kept up-to-date, and operated by skilled artists. Demanding equal attention in your

art department, Adobe and Corel, although competitive brands, are go-to tools for every artist. Clients expect that you have these tools. With Cloud solutions, software license use is easier to manage. Lower entry cost combined with built-in progression help shops more than you can imagine overcome a natural desire to spend once and struggle with out-of-date tech.

Since the art department is the second stop along the route of an order, make sure the sales team has a clear directive of what can be done by your department, what you need to accept a file, and the costs associated with the work. I personally witnessed an evolution in the industry in the 1990s that disrespected the value of art and screens. It has never recovered. Art departments unfairly have the reputation as financially draining on a shop, as opposed to print production, but regardless it is a critical hub of your business.



*Freehand is a supplier of pre-press products and software for screen printers*

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As a software development firm and pre-press product manufacturer/supplier for the screen-print industry we work diligently to produce the best solutions for our user base. Interestingly, through our support process we learned that a lack of knowledge of the basics leads users to improperly use software for extensive periods of time. You might think that there is little flexibility with the use of an expertly engineered solution, but invariably users will find an alternate, less efficient way. I examined more art files improperly built in Adobe and Corel illustration and imaging editing programs than I care to admit. Users self-professing decades of experience as screen-print artists don't understand spot colours, how to achieve 100% black, and countless other file building basics. Their lucky day comes when being helped with a tech support issue we expose their lack of file creation understanding and set them on the proper path. Knowing this inspired Freehand to create a spot colour video called 'Wrong Way to Make Spot Colors in Adobe Illustrator/Corel Draw' and it remains our top viewed video. It was not viewed often when it was called 'Right Way...' suggesting that people believe they know what they are doing, but curious when challenged. Imagine the thousands and thousands of hours of lost productivity, missed deadlines, and monetary consequences doing a task wrong over and over again. A definition of insanity is doing the same task over and over again, but expecting a different result.

### KNOWLEDGE IS POWER

Knowledge is the first rung of your business ladder. Since graphic design fields are not created equal, screen-printers may learn about art for the WYSIWYG world (what you see is what you get) and not from the world of WTF-LOL (doesn't need translating). File output, screen-exposure and print production all benefit from a well-built file. I commonly use my personal quote, 'you are only limited by your present knowledge'. So where do you get the right information? With the Internet it is too easy to happen upon misleading information. Yes, screen-print art has specific parameters for file development, so if your gut tells you that output is more complicated or takes more steps than it should in 2017/2018 then you are likely doing it inefficiently. Seek out information specific to the industry, but understand there will still be those providing outdated, or inefficient advice.

Move from department to department to determine if you feel proficient or constantly racing the clock. Every process can be improved, every person more knowledgeable, and every profit greater. Business building takes time. Keep moving ahead. Tackle one thing at a time. I hold to the thought that the first aspect of screen-printing to improve is the art and screen department. It starts with art. When you do it well it will improve every process moving forward, and it will help the sales people that have first contact with the customer be better articulators of what your company can deliver.

The takeaway from this article is that you are fortunate. Be inspired. Access to tech and info has levelled the playing field. Many confidently enter the screen print industry each year because manufacturers and suppliers have neatly packaged starter bundles simplifying decisions and cost projections. That's nice, but not enough. Running a business should never be on a 'wing and a prayer'. Recognise that you are actually running a tech-based business that happens to produce printed pieces using the process of screen-printing. Your 'box of mystery' is the heart of your business and your opportunity for success. The days of being a screen-printer with a touch of tech knowledge are over. Success is in your hands, just now it's in the form of a mouse instead of a swivel blade. ■

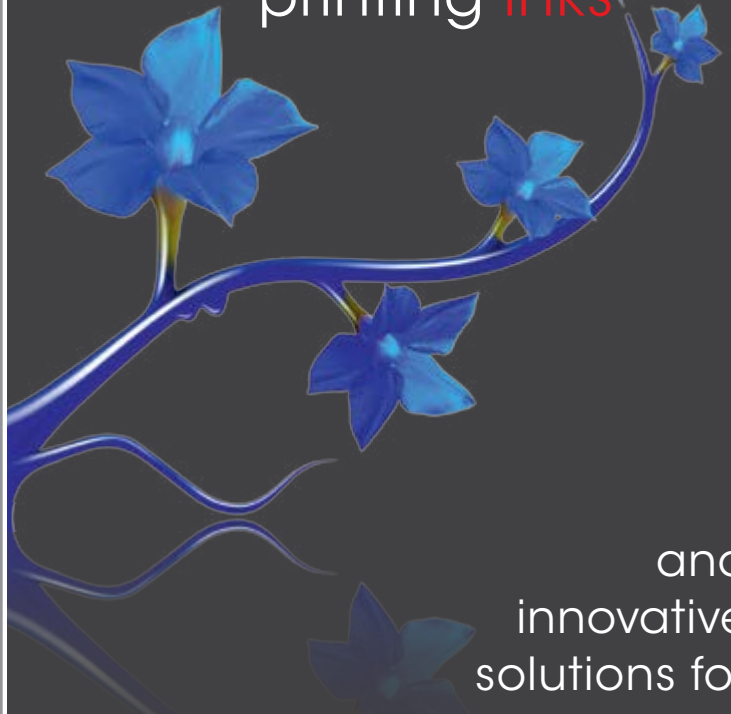
**Charles Facini is CEO of Freehand Graphics**

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# DIRECT TO GREATNESS

David and Taylor Landesman express their opinions about the direct-to-garment print sector and the importance of pre-treatment



Uncle and nephew: David (right) and Taylor Landesman

**Ever wonder why so many companies struggle with producing great DTG prints? Issues such as inconsistency from image to image, and poor wash-fastness from shirt to shirt, plague DTG operators, leaving many perplexed as to what is going wrong. The issue is not the printer! The issue is not the artwork! The issue is not the artist! The issue is the PRETREAT.**

The 'secret' to great DTG printing is not in the printer as there are many great DTG printers in the marketplace. For example, Epson leads the marketplace with the SureColor F-2000 – a 'plug-n-play' printer for a modest price. Kornit, Aeeon and Brother also make units capable of producing excellent prints as well. But too frequently we read in the forums, and hear from former DTG users, that the process is just too inconsistent, and the reject rate is quadruple that of screen printing. Again, the printing device is absolutely not the problem!

If a business is going to enter the rapidly growing, and profitable market of individualised/on-demand printing, it needs to get serious about investing in professional application equipment. The investment is not just the DTG printer, it also must include the pretreat sprayer as well. Do not be fooled by promises of 'wonderful results spraying by hand' and that a 'pretreat sprayer can always be added later.' If you cannot invest in a sprayer, hold off on buying DTG. The good news is, there is a wide range of sprayers in the marketplace now, ranging in price from \$1495.00 up to \$4995.00 [£1100–£3676].

Dismissing proper pretreat equipment, and pretreat standard operating procedures, puts you at a disadvantage as this is a critically important stage of the DTG process that can make or break your final print. To use a simple analogy of building a house: pretreat is your foundation; and the entire house relies on a

solid, stable foundation. Maximising your colour brilliance and achieving the best wash fastness starts with proper pretreat application.

Admittedly, pretreat can be an unglamorous portion of direct-to-garment printing, but done incorrectly nothing else goes right. To create shirts that mesmerise customers, start with a solid foundation of pretreat.

## THE APPLICATION IS YOUR FOUNDATION

To properly apply pretreat, avoid using any manual methods. Whether you use a spray bottle, roller, or spray gun, it is impossible to apply a consistent deposit of pretreat. Such inconsistency affects your final DTG print in two main ways. First, the colour of your print can vary based on the amount of pretreat applied to different sections of your t-shirt. For example, a more saturated part of the print could have a rich, bright blue, while an area a few inches over might be duller. This is due to a variance in appearance of the ink deposit applied by the DTG printer. Second, inconsistent amounts of pretreat on a garment will ruin wash fastness uniformity. Both too much and too little pretreat will cause areas of the print to prematurely flake or fade. An automatic pretreat machine avoids these issues and creates a strong foundation of pretreat.

## CHOOSE A QUALITY PRETREAT MACHINE

Having established that an automatic pretreat is the best choice, what factors are critical in determining which machine to get? Perhaps the most important factor in selecting a pretreat sprayer is the nozzle. Not all nozzles are created

equal! As of this writing, nozzles on the market are made from plastic, brass or medical-grade stainless steel. The differences between the three are dramatic. While they are the cheap option, plastic nozzles quickly and constantly clog as pretreat easily sticks to the plastic opening. A clogged nozzle stops production or creates an uneven spray pattern, which is the exact problem an automatic sprayer is supposed to alleviate. Brass nozzles are better at resisting pretreat build up but deteriorate over time. Additionally, plastic and brass nozzles are primarily designed for dispensing agricultural chemicals, not pretreat solution. A farmer in the field does not fret over the precise amount of grams sprayed on his crops. As a DTG printer, you need to be able to fine-tune the pretreat sprayed on a garment. Hence, these [nozzle] tips are not manufactured with the precision DTG printers require.

Only medical-grade stainless steel nozzles perform to the high quality standards required by DTG printing. This material performs the best in resisting pretreat build up and the nozzle opening is designed for precision applications, such as pretreat application. This control gives you a competitive advantage over others, as you can fine-tune the amount of pretreat applied. For example, you might determine 27g of pretreat is the right amount on a Keya, while 30g is better for colour brilliance and wash fastness on a Fruit of the Loom Nano shirt.

## PRETREAT MACHINE MAINTENANCE

Also, when selecting your machine, determine how easy daily and weekly maintenance routines will be. In simple terms, pretreat is salt-water glue. It inherently gums up and clogs

*Continued over*



Epson SureColor F-2000 DTG printer

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the components and the inside of any unit. Besides cleaning the lines with distilled water, you need to be able to easily access the spray chamber to clean the inside of the unit. This becomes especially important as you scale up your DTG production. The long-term build-up of pretreat deposit is bad for your machine's operation. Further, excess pretreat that has been neglected on the bottom of a sprayer can stain your garment as shirt after shirt is dragged through the overspray. Therefore, it is essential to have easy access to clean out the inside of your machine.

Finally, assess the manufacturer's service commitment and parts availability. Issues always seem to arise at the most inconvenient time, typically late in the evening or on the weekend. Access to 24/7 service can make

the difference between meeting a deadline or having to tell a customer you need an extra day because you could not get weekend service. Also, inquire about the warranty: what does it cover, what does it not cover. The devil is always in the details. In considering the manufacturer's reputation, read online forums with caution. There are people in the industry who get paid to pose as users and provide positive, and negative, feedback.

#### WHAT IS THE CORRECT AMOUNT OF PRETREAT?

The amount of pretreat solution to use in any particular run varies depending on many shop specific factors and preferences. This creates a bit of a learning curve at the beginning and can lead to a few early days of frustration who those

who like 'black and white' answers. If you understand that pretreating is a mix of art and science and are willing to invest the time experimenting, you will succeed. Keeping track of what works is vital for consistency. Being able to reproduce what you did, whether it was yesterday or six months ago, allows for consistency. Consistency creates success.

While experimentation is needed, there are some considerations and variables for determining how much pretreat solution to apply. A good starting point is 1.5–1.7g per inch (based on a width of 16 inches). For example, if you are applying pretreat to a 16" wide by 20" long area, the amount of applied pretreat will be 30–34g for an average weight garment.

The weight of the garment itself and its construction is, perhaps, the most important variable to consider. Heavier garments require more pretreat solution, while lighter garments require less. Likewise, darker colours require more pretreat than white and light colours. Ring-spun garments are the best for DTG printing because they have a tight-knit weave, creating a smoother and less porous printing surface. The ideal amount of pretreat also varies by manufacturer and type of garment. For example, a thin ring-spun shirt will require less pretreat than a hoodie. This is due to variations in the absorption properties of the material. The thin garment has less material to soak pretreat, leaving more on the surface to interact with the DTG ink. As the hoodie absorbs pretreat, more needs to be applied to keep the surface properly saturated.

#### PROPER PRETREAT CURING

Proper pretreat curing depends on your production needs. For smaller runs, a heat transfer press is a good option. The time and temperature can vary depending on your situation. A good starting place is to set the heat transfer at 330 degrees F [166 degrees C]. Using light pressure for 5–10 seconds, put a piece of untreated parchment paper (not a Silicone or Teflon sheet) between the garment and the heat press. Then, lifting the transfer platen, quickly remove the parchment paper, and press again for an additional 15–20 seconds with heavy pressure. You want to use



Zoom-AE pretreatment sprayer

heavy pressure at the end to help mat down the shirt fibres and ensure a smooth printing surface.

### SCALING UP PRETREAT CURING PRODUCTION

Curing pretreat with a conveyor dryer is the best way to increase production rates and times. There are two essential elements necessary for choosing a conveyor dryer. The first is choosing how you want to heat the garment. Conveyor dryers are either infrared electric panels or gas powered. Choosing one over another typically relates to utility cost and power requirements. For example, some people simply do not have enough power in their building to power a large electric dryer. Bringing in enough power to your building could be prohibitively expensive. While a gas dryer requires a gas pipeline, much less power is required to run the auxiliary components. Another consideration is the utility costs of electric versus gas as they vary widely depending on your area of the country.

The other major consideration for a conveyor dryer is the airflow. For DTG use, you must have a significant amount of airflow. This is measured by CFM (cubic feet per minute) and related to the volume of air pushed into the heat chamber. Proper pretreat and DTG use will require at least 1,500CFM. You always want the

air to have a strong pressure when making contact with your garment. Like when blowing out a candle, a gentle breeze just flickers the flame, while a stronger force extinguishes it. You want a strong force to quickly cure the pretreat. Inquire about the impingement of the airflow. Impingement described to how the air is circulated within the dryer. Does the conveyor dryer just rudimentarily use a blower to force air straight down? This method can cause 'dead zones' where no air is directly hitting the garment. More sophisticated dryers use universal live-air or an air-knife system to evenly distribute air in one continuous zone. This ensures the garment is always receiving a steady stream of air while curing in the heat chamber. Finally, how is the air exhausted from the heat chamber? Moisture laden air in the heat chamber must be evacuated to maximise curing efficiency. A powered exhaust helps this process and speeds up the time required to cure pretreated shirts.

### STORING PRETREATED SHIRTS

Whether you use a heat press or conveyor dryer, shirts can be pretreated and stored in advance of printing. Always re-press the garment for approximately 7–10 seconds before printing to remove any moisture in the shirt and to re-flatten the fibres. When storing pretreated garments, take care not to degrade

the pretreated application on the shirt by excessive folding, bending or scraping the print area where the pretreat solution is applied. Damage can occur to the thin film of pretreat solution and you will be able to see variations where the pretreat application has been damaged. Remember, you want to print on a moisture-free, smooth image area.

### CONCLUSION

Ensuring quality DTG prints is multifaceted but starts with a solid pretreat foundation. Invest the time up front to experiment with the garments you offer so the right amount of pretreat is applied. Automatic pretreat sprayers provide the consistency and repetition to achieve the results you want. As your production requirements increase, a conveyor dryer speeds up production time and provides economies of scale that help lower costs. ■

*David Landesman and Taylor Landesman are Co-President and Vice President, respectively, of Lawson Screen & Digital Products*

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# GREY MATTER

## Tracey Brown examines the importance of greyscale implementation in industrial inkjet printing

**Greyscale is a topic which attracts a great deal of interest from industrial print system developers. The trend toward high-speed, single pass printing in industrial applications often makes greyscale a critical requirement.**

The native resolution of an industrial inkjet printhead is generally expressed in dots per inch (dpi) and is directly related to the physical spacing of the nozzles. With the implementation of greyscale, the effective resolution can be significantly higher than the native resolution. Using binary inkjet, drops of a fixed size are dispensed and 'pixels' on a substrate are either covered with a drop or not. In contrast, greyscale inkjet produces drops of varying sizes, resulting in advantages such as clearer text with sharper edges, colour matching using fewer inks and, crucially for single-pass printers, high-quality printing without sacrificing throughput.

### MODES OF OPERATION

Fundamentally, there are three modes of operation (See Figure 1).

**Binary:** Also known as 'Native', this mode of operation requires 1 bit per pixel (1bpp). A pixel is either 0 or 1 drop. All the nozzles of a printhead fire the same sized drop on every cycle.

**Adjustable Binary:** Also known as 'Binary Multi Pulse' or 'Variable Binary', this mode of operation requires 1 bit per pixel (1bpp). Multiple drops are dispensed and coalesce on or before the substrate to create the desired drop size. Printers can be configured to deliver the required amount of ink without having to change the type of printhead.

**Greyscale:** Also known as 'Multi Bit', this mode of operation requires either 2 bits per pixel (2bpp) or 3 bits per pixel (3bpp). Variable

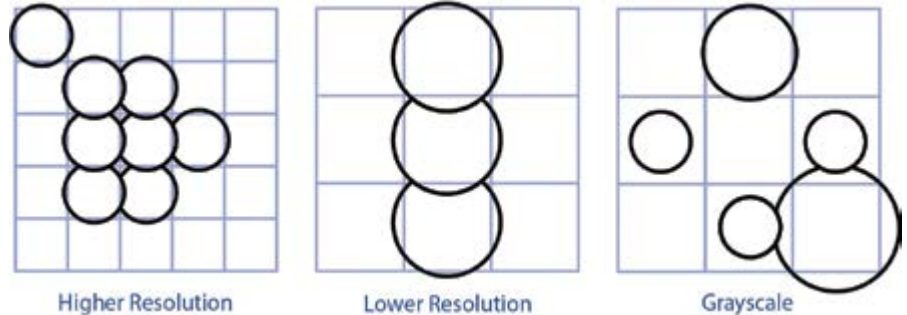


Figure 1: Printing Modes (©2011, Fujifilm Dimatix, Inc.)

drop sizes for each pixel are created by ejecting a certain number of drops which then coalesce either at the nozzle plate or in flight resulting in different sized drops at the substrate. Individual nozzles can be programmed to fire different drop sizes on demand. 2bpp corresponds to four grey levels and 3bpp corresponds to eight grey levels. In practice, industrial inkjet printheads don't go beyond eight grey levels (seven individual drop sizes).

### METHODS OF EXECUTION

Most industrial inkjet piezo drop on demand printhead manufacturers have an explicit greyscale product offering but actual methods of execution differ from manufacturer to manufacturer. For example, Ricoh's implementation, named Multidrop, ejects sub-drops (drops of the smallest native size for the printhead) in rapid succession which then merge in flight to create a larger drop before reaching the substrate. Fujifilm Dimatix pumps metered amounts of fluid into a single drop before the ligament detaches from the nozzle in a technique they call VersaDrop. Thermal inkjet printheads do not enable

greyscale in this manner since drops from a thermal printhead are of a fixed size. To address this limitation, HP has developed a method, referred to as High Definition Nozzle Architecture [HDNA], whereby nozzles of different sizes are closely situated and controlled as a single element.

In a piezo printhead, drops are produced by the non-resonant excitation of the piezoelectric element using precisely timed waveforms of variable amplitude.

**Binary:** In binary mode, the printhead requires a single, optimized, typically trapezoidal pulse to produce the basic native drop size for which the printhead is designed.

**Adjustable Binary:** In adjustable binary mode, the printhead requires successive pulses to produce drops that are some multiple of the size of the native drop. Any jet is either OFF or ON, in which case all pulses in the waveform are used so that there is no choice of drop size. A multi-pulse amplifier is required.

**Greyscale:** In greyscale mode, the printhead jets can be commanded to produce drops of various sizes in any fire pulse cycle. Drops of the desired size are produced on

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demand. Both a multi-pulse amplifier and multi-bit code/decode functionality is required.

In some cases, waveform generation and grey level mapping, also known as fire pulse decoding, happens within the printhead and in other cases, external electronics are required. While there are some exceptions, printheads offered by Xaar, Kyocera and TTEC perform grey level mapping and waveform generation inside the printhead using a downloaded waveform file. Konica Minolta and SII Printek offer heads which do internal mapping based on timing signals provided by the external drive electronics. Ricoh heads internally map grey levels but require the external drive electronics to generate analogue waveforms. Fujifilm Dimatix heads require external drive electronics to handle both grey level mapping and analogue waveform generation. There are advantages and disadvantages to each approach which balance the trade-offs of complexity, cost, heat dissipation and flexibility.

### OPTIMISED ACCURACY

The design of printhead electronics, whether internal or external to the head, is a complex task. To enable greyscale, the electronics must produce suitable high voltage waveforms which have good quality pulses over a range of jetting loads, the electronics must support

several pulses of different amplitudes within a single waveform and these waveforms must be programmable such that they can be optimised for individual applications/fluids. Additionally, the datapath electronics must time updates of switches in the driver chips to occur just prior to each pulse within the waveform.

To ensure all drops are of the correct size and velocity, accurate waveform shapes are required. In generating these waveforms, a number of complications must be considered:

- drops emerge from the head earlier if driven by a pulse in the early part of the waveform
- small drops take longer in flight than large drops (during which time the substrate has moved)
- some drops are faster than others due to different waveform pulse sizes
- drops may collide and join with other drops in flight
- printers have varying distances between the head nozzle plate and the substrate surface
- different ink types require different waveforms

Ideally, the drive electronics will have a power amplifier for each nozzle row allowing waveform shapes to compensate for differences in the nozzle rows. To get the best

results, waveform pulses for each sub-drop may need to be different shapes. For example, the first drop typically needs more energy than the second drop because the piezo is already oscillating. This means that preferably, the waveform generation hardware should support analogue pulse shapes. By implementing independent timing of each pulse and matching any segments to a particular drop size, greater control is achieved over simple multi-pulse operation. Application specific tuning is important for accurate drop placement and high velocity jetting.

The ability to integrate digital print engines onto a variety of existing transport systems coupled with momentum toward high-speed, single pass printing means that inkjet is increasingly able to compete with mainstream analogue solutions in industrial applications. Greyscale is a powerful enabler in support of this trend. ■

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# THE PACKAGING CHALLENGE

## Dr Kai K. O. Bär looks at how to overcome the limitations of inkjet printing for packaging

Since inkjet in book printing has almost reached the benchmark of offset printing, including the reproduction of process color photographs, the technology has widely established itself in most all sectors of graphic print applications. So what is different in printing for packaging, especially flexible packaging?

Flexible packaging uses mostly plastic based substrates, which are non-absorbing and can be highly temperature sensitive. While PET allows approx. 80°C (175F), before thermal deformation, OPP and LDPE only allows processing up to 50–55°C (122–131F) before substrate damage.

### CHALLENGES FOR WATER-BASED INKJET PRINTING FOR PACKAGING

- Sufficient adhesion to the low surface tension of plastic substrates.
- Low to very low applicable thermal treatment during the drying process of the ink.
- Sufficient rub resistance of the ink on the non-absorbing substrate material.
- Acceptable coverage with white pigmented ink.
- In addition to its major application for food, cosmetics and other human contact product applications, the special compliance of the printed product with direct skin contact is a 'must have' and may even require FDA approval.

### INKJET PRINTING SOLUTIONS FOR PACKAGING

UV-based inkjet inks with UV-LED pinning to avoid intercolor bleeding with a final UV-curing at low(er) speeds of 50 to a maximum of 150m/min (164 to 492 f/min) and narrow widths of less than 1,000mm

(40 inches). But all that is limited to maximum non-direct contact (when low migration inks are applied!).

Opaque white inkjet inks on clear films are difficult to achieve and may need to be produced by conventionally printed white inks before or after the inkjet printing.

Recently some companies have opted for inkjet printing with electron-beam curable inks. However, in addition to the costs for these inks and the electron-beam curing equipment, the potential damage risk – especially for thin flexible packaging substrate material – has limited its application potential. Additionally, the safety conditions for the printing press operators (to shield them properly from the high energy electron radiation, as well as the consumers, in the case of not fully cured inks) have to be considered.

Water-based inkjet printing on plastic cards, labels and plastic substrates, mainly as hybrid imprinting press solutions, have been proven for several years with adphosNIR drying technology, including in combination with printed electronics applications (for smart packaging solutions).

### OVERCOMING THE LIMITATIONS

With today's available water-based and food compliant inkjet inks, a general process configuration is outlined below which allows process colour inkjet printing on temperature-sensitive plastic films.

To ensure sufficient adhesion of the inks to specific plastic substrates, an inline pre-treatment process is needed. For full application flexibility this should include corona treatment and a primer-based coating with adphosNIR drying afterwards.

After pre-treatment, a four to seven-process colour inkjet and interstation drying



An adphosNIR module

arrangement with adphosNIR drying technology can be applied on a temperature controlled support surface (cylinder or transport belt).

To allow a complete flexibility of all relevant packaging application scenarios, a white pre- or post-coating should be also integrated as the first or last print-head position.

To reach a very robust, scratch/rub-resistant printed product, a final clear overcoat can be applied, allowing the substrate to be rewound or further processed inline depending of the specific application.

Outlined in the diagram are process configurations for speeds of 150m/min with representative size requiring. All presented processes for these concepts have successfully been proven in production lines up to 300m/min for both narrow and wide web widths.

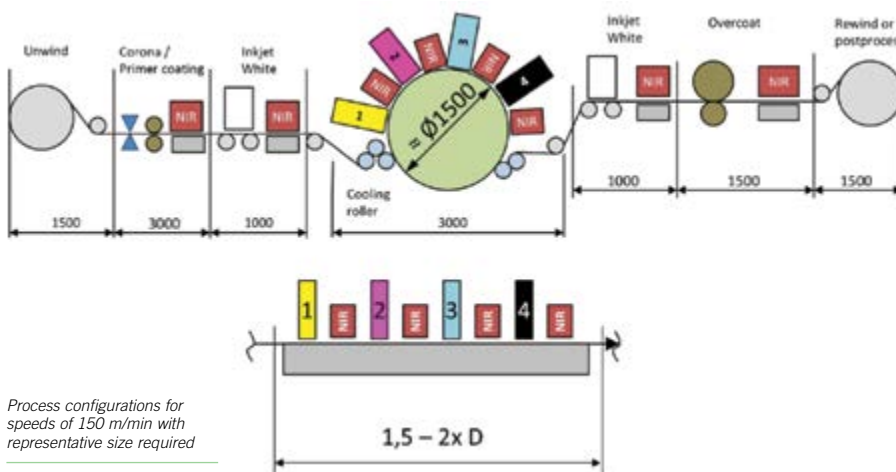
While today, water-based process colour inkjet printing is possible, with further ink development to improve adhesion and rub resistance on a wider range of plastic substrates, pre and post substrate treatments will be simplified or eliminated altogether. However, current coating and water-based inkjet ink costs limit the broad adoption of digital printing for packaging. ■

Footnote: adphosNIR is a registered trademark of adphos Digital Printing

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Process configurations for speeds of 150 m/min with representative size required



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# THE ADDED VALUE OF LASER FINISHING

Christine Klinke and Michael Garstenauer discuss the advantages of laser technology for printed products

Unusual shapes for displays or signs make an end product more interesting and unique. Print service providers and sign and display companies, who offer contour cutting of printed materials as a service, are able to expand their business. The creative finishing gives a competitive advantage and leads to higher margins and additional sales. A printed acrylic sheet only becomes a polished and saleable product with proper finishing.

Conventional cutting systems and milling machines have been established for a long time in the manufacturing environment. In recent years, more and more laser systems are used for finishing.

## FINE DETAIL WITH PRECISION

With the universal 'tool', fine details designs can be realized and printed materials can be cut precisely. Signage and display manufacturers using laser cutters stand out from the masses with creative display ideas or new branding approaches. When it comes to producing soft signage applications such as flags and banners, the laser cut leads to a sealed edge of the fabric, eliminating labour intensive manual seaming.

The laser cut is unbeatable on acrylic, as no material post processing is necessary. To achieve brilliant edges with conventional milling technology, they must be polished with a machine or manually in a second processing step. The laser achieves a crystal clear finishing in half the time in only one processing step. Even the most intricate contours show



Acrylic letters

perfect finishing, which is hardly possible with conventional polishing techniques.

## ANY SHAPE, ANY SUBSTRATE

Laser finishing enables higher productivity and thus more profit. All shapes can be cut from a wide range of materials including acrylic, wood, paper, cardboard, MDF, polystyrene, textiles and foam.

With laser technology, there are no costs for new tools, as the laser beam is not worn out by the material processing. Fine details can be cut with accuracy in the range of tenth of millimeters.

Printed displays, letters or branding can be cut very accurately using an optical recognition system. With other methods, small deviations in print lead to unsatisfactory



Cardboard temporary display



Acrylic interior sign

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Trotec CO<sub>2</sub> laser cutters are designed for fast and precise processing of large-format materials



results. A camera system recognises all distortions in print and regardless of whether they are linear, non-linear, rotations or offset the cutting path is adapted automatically and dynamically. Therefore, cutting lines always fit perfectly to the printed image.

**MORE PRODUCTS – MORE VALUE**

Everything is possible from simple rectangular signs to complex contours, displays and illuminated signs:

- Printed displays in exceptional shapes
- Contour cut of illuminated acrylic signs
- Acrylic letters, with and without backlight
- Large-format engraving and marking of acrylic plates for LED panels and backlit applications
- Printed and cut card displays
- UV-printed, contour-cut signs made of high quality acrylic
- Printed advertising materials of acrylic, illuminated letters and logos
- Flags and banners

**PROFIT POTENTIAL**

The following examples highlight the economic benefits of using a laser cutter for two jobs: first an interior sign, second acrylic lettering.

**KEY FIGURES INTERIOR SIGN:**

- Dimension: 700x500mm
- Material: 10mm thick acrylic
- Volume: 10 pieces
- Production costs per sign
- Material: €5.00
- Printing: €2.50
- Handling: €10.00
- Laser cutting: €10.00
- Total cost: €22.50
- Retail price: €75.00
- Expected margin: 70%

**KEY FIGURES ACRYLIC LETTERS:**

- Dimension: 1000x700mm
- Material: 20mm thick acrylic
- Volume: One piece
- Production costs
- Material: €150
- Data preparation: €50
- Handling: €10
- Laser cutting: €75
- Total cost: €285
- Retail price: €980
- Expected margin: 70%

**BUILT FOR SPEED**

The more powerful the laser cutter, the more productive the signage and display manufacturer will be due to higher cutting speeds. Trotec's SP Series are highly efficient flatbed laser plotters and ideal for demanding cutting applications in plastics, wood, textiles and many more. Trotec CO<sub>2</sub> laser cutters are designed for fast and precise processing of large-format materials. Features to ensure maximum productivity include high laser cutting speed and four-side access. Other factors to consider include the exhaust system, which is crucial for ensuring perfect edge quality. The multi-functional table concept meets the broad range of requirements when engraving and cutting many materials of different sizes and thicknesses. In addition to enabling larger products to be handled, bigger bed sizes, such as the Trotec SP2000 (work area 1680x2510mm) can offer increased productivity over a midsize flatbed laser (work area 1000x700mm) by reducing the amount of loading and unloading time for multiple smaller items.

**SOFTWARE TO WORK SMARTER**

As highlighted above when finishing printed materials a camera system is recommended to ensure accurate cut to print alignment. Trotec laser systems can be equipped with the JobControl Vision, a camera system that recognises all distortions in print – thus, the perfect contour cut of printed materials can be achieved quickly, reliably and easily for operators.

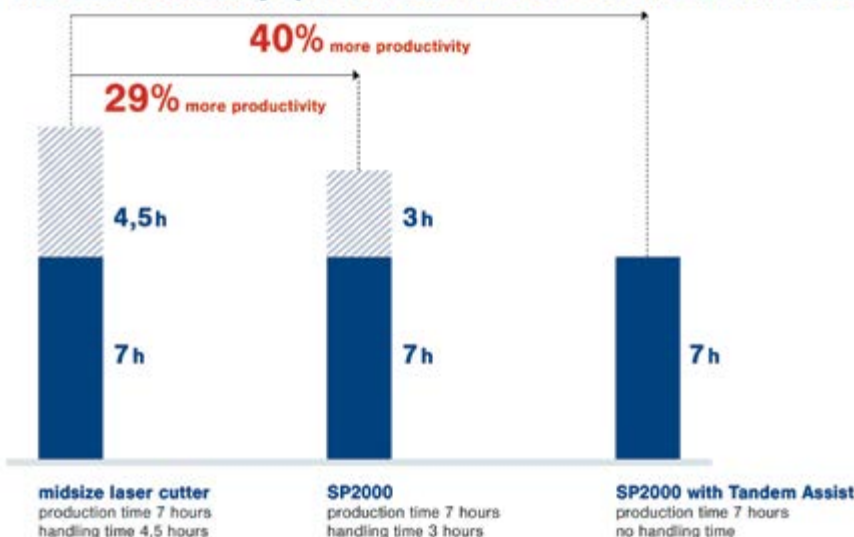
A further productivity advantage can be achieved when working with Tandem Assist, a function of the JobControl software that virtually splits the cutting area into two zones, A and B. While the laser is in zone A processing the material, finished parts can be removed in zone B and the area can be reloaded with the next job. This eliminates idle times improving productivity by 40%. In the case of a job for 500 temporary displays produced on 6mm thick cardboard, that created an additional three hours of cutting capacity (see graphic on left). ■

JobControl is a registered trademark of Trotec Laser GmbH

**Christine Klinke is Product Marketing Manager and Michael Garstenauer is Product Manager of Trotec Laser**

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 tel: +43 7242 239 7777  
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# QUANTUM LEAP

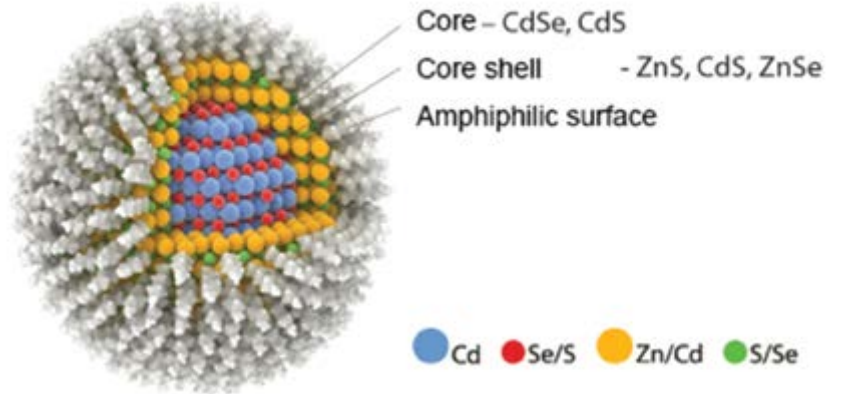
Oleg Markov explores the use and applications of quantum dots in inkjet printing

Quantum Dots are semiconductor nanoparticles 2–10 nm in size, with luminescent properties, i.e. absorbing light in UV spectrum and emitting it in the visible area. There are several types of quantum dots depending on their chemical structure and composition. Quantum dots may have a multi-layered structure, where the core is made up of one compound, but inner and outer layers are made up of another.

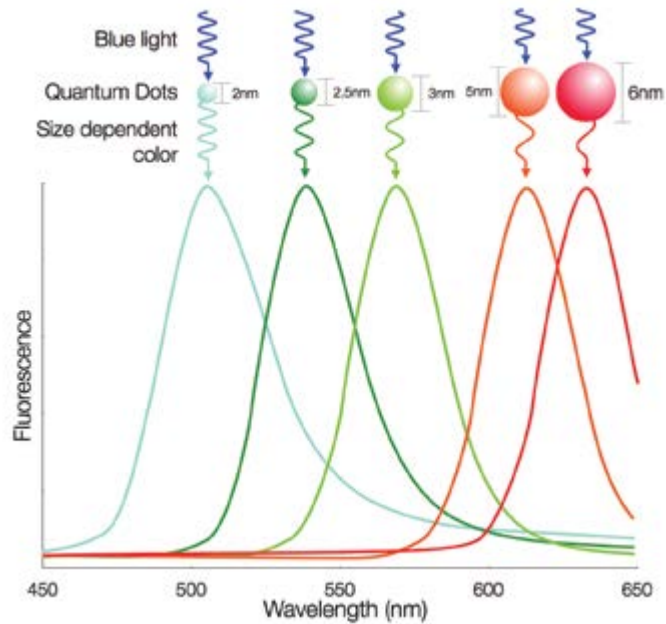
By changing the size of quantum dots themselves, it is possible to get different colours, i.e. peak luminescence in the entire range of all visible and infra-red areas.

## QUANTUM DOTS VS LUMINOPHORES

Quantum dots are an alternative to luminophores, which are traditionally used in various types of poligraphy. However, there are almost no inks with luminophores for inkjet printing sold in the market. Luminophores of non-organic origin have particle sizes from two to several dozens mkm, and they are pigments. Particles of such large size do not fit for use in inkjet inks, but if the particles are minimised to an acceptable size, then the intensity of luminescence will fall significantly. Some organic luminophores can be minimised to a required size for use in inkjet applications, but



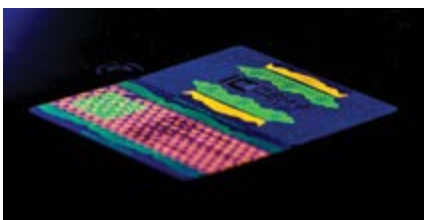
Quantum dot structure



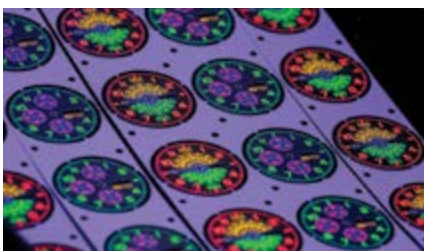
Quantum dot size and colour



Sample 1



Sample 1 under UV light



Watch dials printed with Quantum Dot inks



Excise labels



Excise labels under UV light



such luminophores have a short life-span and degrade quickly.

Quantum dots have several significant advantages when compared to luminophores:

- Their lifetime period is 10–100 times longer (photo stable, resistant to direct light exposure).
- More intense light emission (quantum output up to 99%)
- Light emission with a narrow output track (Half-peak width is 10–40 nm)

As seen from the drawings, quantum dots have monochromatic luminescence properties, i.e. emit pure colours. Luminophores, when compared to quantum dots, have several peaks in various spectral ranges, as well as some parasitic light throughout the entire spectral range. As a result, luminophores do not provide pure colours. Under the same quantum output conditions, quantum dots will have more intense luminescence than luminophores, because their light emission is concentrated in one area, and in the case of luminophores it is spread over the entire spectral range. When degrading, luminophore's peaks do not change proportionally, which over time causes the colour to change. This is not the case with quantum dots. So, the light intensity of quantum dots will decrease with a lesser speed.

### DIGITAL PRINTING APPLICATION

Due the nano-size of the particles, quantum dots when added to the inkjet inks are not visible to a human eye. It looks like a transparent dispersion, with a small gradation in the luminescence area. As the concentration of quantum dots in inkjet inks is about 1–3%, the resulting images are almost colourless and fully transparent. Such ink properties significantly widen the areas of application with quantum dot inks in digital printing. For example, it may be possible to print with transparent quantum dot inks on top of a coloured image, and the inks will have a different colour in UV light, which will be different from the image.

Due to the fact that quantum dots is a relatively new technology, the pricing for this component could also be quite high (from 10 to 10000 \$US per gram). This in turn dictates high pricing for quantum dot-based inks. Only inkjet allows the control of ink consumption and limits any technological losses.

Currently there are two types of inks with quantum dots that are commercially viable: UV curable inks based on acrylic monomers and water-based inks. UV-curable inks can print on all types of rigid and flexible media. Water-based inks have low viscosity (2–3 cP) and are designed for piezo inkjet printheads with a drop size of 1–5pl (Epson L312 and L800 models were used for tests). They are well suited for printing on absorbing media, for example, papers which do not contain optical bleaches.

Inkjet inks with quantum dots, considering their advantages, can be used in security polygraphy, as an additional feature together with luminophores, or instead of them for printing banknotes, excise labels, passports, and so on.

The lifetime of technologies in the security printing sector is 5–7 years. After this period, new types of security elements need to be developed as the current one ages and becomes obsolete. The use of quantum dots is a promising new trend in this field, as some of the security features with quantum dots are much more difficult to counterfeit than luminophores.

Apart from security printing market, our laboratory is actively involved in research and design of quantum dots inks. The areas of application are bio-printing, photovoltaics, display monitors, light-modifying coatings for agricultural industry. ■

**Oleg Markov is Project Leader at IQDEMY Chemicals**

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- bio inks and machines for 3D Bio printing to print skin and organ tissue;
- 3D inkjet printing machines;
- inks with quantum dots for security purposes and counterfeit prevention and so on.

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# LIGHTENING THE LOAD

Annalisa Colombo and Francesco Tassone explain how a new nanostructured light-diffusing ink can benefit screen printing

**EPTAINKS offers a new ink for glass and plastic that promises an improved LED light diffusion and a smart (and fun) way of managing the light.**

The increasing demand for energy-saving solutions, also supported by EU legislation via dedicated directives and new energy efficiency targets (see the European Commission web-page about Energy Efficiency), is causing an acceleration in the research and development of new materials and technologies for a smart energy management.

Switching from the traditional incandescent light bulb or from the fluorescent lamp to the long-lasting efficient Light Emitting Diode (LED) source is one of the faster and simpler ways to cut the global CO<sub>2</sub> emission, the production of pollution and toxic waste, and the energy bill. Moreover, while the conventional white light sources have reached their physical limit of efficiency, the LED developments and performances are just at the start.

Besides the outstanding improvement that could be achieved by the research at the LED chip level in terms of efficiency, a smart

management of the LED operating conditions could allow an increase in the luminous efficacy of the light source. In particular, given the point-like nature of the LED chip and the risk of eye-damage due to its high-brightness, the need to develop efficient light diffusers is quickly emerging.

Within this context, two new inks (SERINK LDI FOR PLASTIC and SERINK LDI FOR GLASS) implement optical diffusion over glass and plastic to allow the light coming from a LED strip to be managed in an efficient way.

## OPTICAL LIGHT DIFFUSERS

Two distinct types of optical diffusers are typically used – namely, surface-relief and volumetric. Surface-relief diffusers are made of micron-sized structures on the surface, while the volumetric ones are based on micron-sized beads that are uniformly dispersed inside the matrix, to scatter the light. In both cases, the use of micron-sized objects results into a loss of transparency in the optical device and a loss of efficiency in the light source. Moreover, diffusion occurs in the Mie regime, which requires an over-

control on the homogeneity of the micron-sized beads' distribution within the matrix. Conversely, the use of optical diffusers made of nano-sized beads allows diffusing the light according to the Rayleigh scattering [the dispersion of electromagnetic radiation by particles that have a radius less than approximately 1/10 the wavelength of the radiation – a process named after Lord Rayleigh], that is simpler to manage and provides an optically transparent and efficient solution.

In an industrial process, it is difficult to achieve the dispersion of diffusers at a nano-scale level into a matrix. Moreover, the complexity of the subsequent production steps, including the optical characterisation and integration into the final lighting device, restrains the diffusion of these devices into the market.

Here we describe a new approach for brand new highly efficient optical diffusers, based on a nanostructured ink – developed both for glass and plastic substrates. The main advantage of this solution, developed for screen printing processes, is the versatility in terms of choice of the substrate (material and shape) and the design to be printed (writing, graphic artwork, and so on).

## HOW IT WORKS

The aim of the developed ink is to implement the diffusion of light coming from a linear array of LEDs. In order to achieve this optical functionality, the ink has to be printed on an optically transparent substrate, such as Polymethylmethacrylate (PMMA), Polycarbonate (PC) or extra-clear glass. Figure 1 shows the working geometry of the offered solution. In the scheme, the light coming from a LED array is injected in the

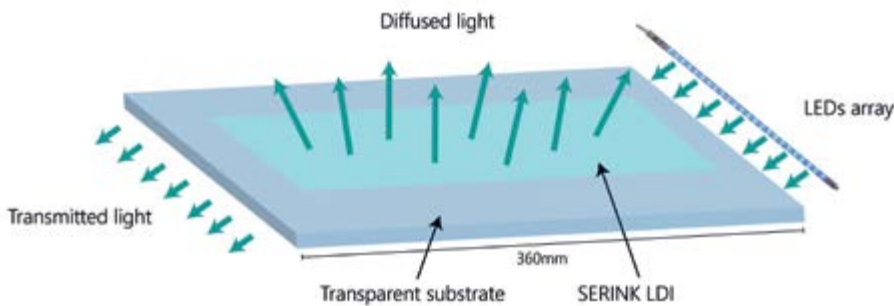
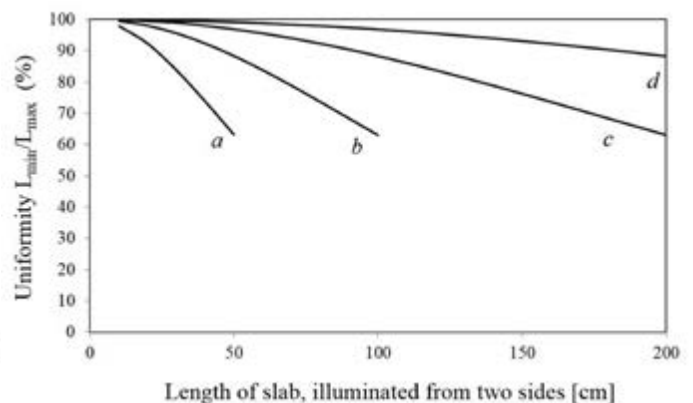
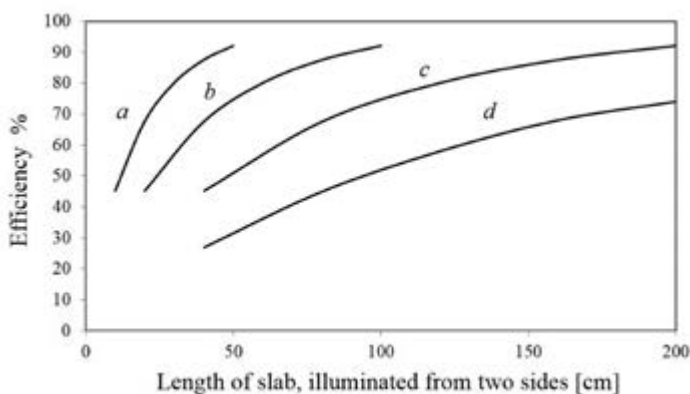


Figure 1: LED light is injected into a transparent substrate, on which the diffusing ink is printed



Figures 2 and 3: Measurements taken when SERINK LDI FOR GLASS ink is screen printed through a 120th/cm frame on extra-clear glass

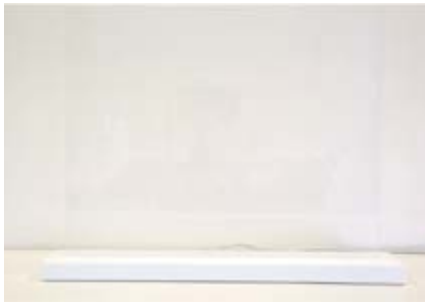


Figure 4: Prototype printed with the light diffusing ink



distances and provides for a more homogeneous luminous appearance. Alternatively, by changing the printing parameters (such as the frame threading), but keeping the ink dilution fixed, the light path within the substrate can be smartly managed. From this point of view, it is important to remember that the human eye perceives the luminosity logarithmically and, therefore, is not able to recognise emission differences lower than 30%. Figure 4 shows a prototype printed with the light diffusing ink introduced in this work.

This research activity is currently being conducted from the engineering point of view for the development of the optical device, in collaboration with Saint-Gobain.

**SUMMARY**

A new light diffusing ink for optically transparent substrates has been developed. Starting from the legislative directives from EU about Energy Efficiency and taking advantage of the market demand, the offered solution represents a tangible improvement of the already outstanding performances of LED sources. ■

**Annalisa Colombo is an R&D Specialist at EPTAINKS and Francesco Tassone is Team Leader at the Italian Institute of Technology**

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edge of an optically transparent substrate, on which the diffusing ink is printed. The injected light is reflected over the parallel surfaces of the transparent plate, and thus guided along it, until it reaches the printed diffusing layer. Here, it partially diffuses out of the plate, making the printed artwork visible thanks to light emission.

Using an ink instead of a more conventional diffusing bulk panel allows a huge flexibility: it introduces the possibility to tune the amount of extracted light and to print arbitrary shapes such as characters or artwork. Moreover, when the light source is switched on, the printed artwork diffuses the light of the same color as the selected LED.

**SCREEN PRINTING APPLICATION**

In order to perform the optical characterisation of the developed ink, it was processed on an optical device by screen printing a 30cm long stripe. An ad-hoc optical set-up was realised in EPTAINKS R&D laboratories to properly measure the light diffusion. A light source consisting of a linear array of white LEDs with a 0.5 cm spacing was then aligned close to the polished edge of the device. The diffused light was collected and spectrally analysed with a fibre-optic coupled spectro-radiometer (Ocean Optics, USB 2000+ UV-VIS). The

optical fibre was terminated with a cosine-corrected fibre head, placed almost in contact with the surface, at a known distance from the edge illuminated by the LED source.

The optical parameters that describe the diffusion and allow achieving the desired effect are efficiency and uniformity. Efficiency describes the amount of light that comes out from the printed artwork compared to the light injected into the edge of the substrate. Uniformity describes the ratio between the minimum and the maximum intensity that are emitted by the artwork printed on the substrate.

Figures 2 and 3 show the efficiency and the uniformity of the ink (SERINK LDI FOR GLASS) when screen printed through a 120th/cm frame on extra-clear glass. Measurements were taken by using an input source of 3600lm/m. The diffusing ink was appropriately diluted (1/2, 1/4, 1/8) with the specific blank ink to characterise the optical performances. Using this information, it is possible to appropriately dilute the product to obtain the desired performance, such as a specific light spreading on the whole printed artwork. Indeed, a higher ink dilution (while keeping the other printing conditions unchanged), allows the light to travel through longer

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# UNDERSTANDING DIRECT-TO-GARMENT PRINTER FUNCTIONALITY

Jerid Hill explores the importance of maintenance routines

**With anything in life, there is struggle. Oftentimes, getting back to the basics in any given situation will provide you with a solution to that problem. The direct-to-garment (DTG) market is no different. Being in this industry since 2004, there have been major changes in printing equipment but the basics of direct-to-garment have remained the same. Understanding how your printer functions is a crucial element in operating a successful direct-to-garment printing business.**

One common concern direct-to-garment manufacturers, suppliers, operators and owners have is maintenance. Most maintenance procedures include cleaning a wiper blade, capping station, spit station, encoders, cleaning around the print-head, oiling the head rail and shaking your white ink. Some of these are performed daily and others weekly or monthly.

Effectively performing your maintenance will ensure continual and uninterrupted performance of your equipment. At the beginning of your day, operators are encouraged to shake their white ink, initiate a head cleaning (performed by the system itself) and print a nozzle check. The nozzle check will help determine whether your system is functioning properly and, as simple as it sounds, can help diagnose where there could potentially be issues. We'll go a little deeper into this when discussing the ink delivery system, but the first and simplest diagnosis comes by cleaning your encoder(s).

**Encoders:** There are many types of encoders but, with direct-to-garment systems, there are usually two optical encoders used. An optical encoder is either a strip or a disc that appear grey in colour. The colouration actually comes from printing extremely thin black lines in a row, usually beginning at over one thousand across a span of one inch. The first is typically called an encoder strip, encoder scale or linear encoder. This is the strip that is behind the print-head carriage and runs left to right. There is an encoder sensor behind the carriage that reads these lines so it knows the position of the head at all times and when to fire a nozzle.

## THE LIKELIHOOD OF PROBLEMS

A dirty or scratched linear encoder will cause problems during printing. These could include unwanted lines being printed, misregistered prints, the print-head carriage travelling further



A linear encoder (left) and a rotary encoder

than its allowed distance and other strange issues. In these cases, the system is not able to understand where the positioning of the head is and where the nozzles need to fire due to a miscount of these lines. Cleaning this strip off throughout normal maintenance procedures will prevent many of these types of issues occurring.

The second optical encoder is almost always a disc and it keeps the positioning of the platen movement correct. Most of the time this disc is hidden and not exposed so cleaning is not necessary. If it can be seen, then chances are cleaning it would be necessary. The linear encoder effects prints from left to right, whereas the rotary encoder effects prints from top to bottom. If there is an inconsistency with prints in this manner and you can see the rotary encoder, cleaning it off with a lint free cloth with isopropyl alcohol should fix the issue, if it doesn't contact the manufacturer or distributor for additional assistance.

Outside the various features offered, all direct-to-garment equipment has five basic areas in the ink delivery system – a supply source, ink lines, dampers (or cartridges), print-head(s), and capping station/pump. Some may include filters or degassing systems that need to be taken into account. But most operate with the five basic areas mentioned here. Understanding the cause and effect for each area will give you the ability to quickly diagnose and overcome the issue(s).

**Ink Delivery System:** When direct-to-garment first exploded on the market, companies offered a bulk ink system. Even though consumers consider this type of system to be a money saver, the problems that can be

associated with an open system often outweigh the perceived savings. An open or bulk system is simply containers into which you pour ink. If your system is used infrequently, water-based inks can evaporate, causing the ink to change its viscosity or thickness. The inks for your system are designed to be used with the associated print-head and any change in the inks can cause persistent issues.

Another concern for an open bulk system is when ink bottle caps are opened. Dry ink around the bottle rim can fall into the container, causing issues for your dampers. If your printer has an open ink system, it is imperative that in addition to your maintenance procedures, you must be sure to clean around the openings on your containers with a damp cloth. This simple step can help avoid dried ink from falling into your ink supply.

## THE IMPORTANCE OF INK POSITIONING

Positioning of your ink system also has a tremendous effect on the performance of your system. If your system allows for a change of positioning of your ink supply, finding the correct height can be a case of trial and error. If you have an open container system that is 15 to 20cm high, as the ink is being used so the amount of ink in the container changes and causes a difference of pressure in your system. This causes you either to need to constantly change your ink system positioning or continuously maintain a certain amount of ink in your system at all times. Bagged ink is much simpler to find this position with, since a bag lying flat doesn't change the height of ink

*Continued over*



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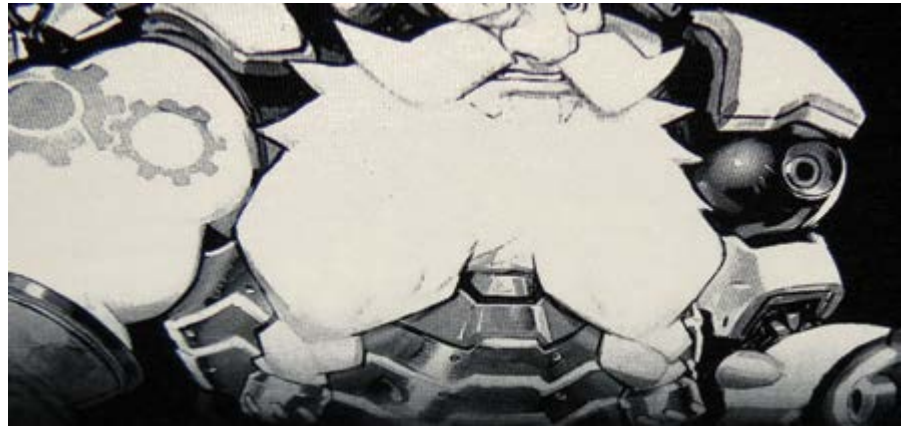


An example of printed vertical lines caused by a dirty encoder strip

remaining.

To find the correct position, a good starting point would be to level out your ink supply so it is even with the bottom of your print-head or the top of your platen. The reason your ink system may be adjustable is because your elevation to sea level can have an effect on performance. The higher your elevation, the less pressure internally there would be; so your ink supply may need to be higher to force more pressure into the system since most are gravity fed. Very rarely do we see the need for your ink supply to go above the bottom of the print head. Some of the newer systems on the market are pressurised and this may not apply. Be sure to talk to your manufacturer or supplier about proper ink supply heights.

If your ink source is too high, as your system is printing there could be drops of ink on your shirt. This is almost always an indicator of too much pressure in your system which would most likely be attributed to this scenario. Even though there may not be any unwanted drops, too much pressure could also cause the system to appear to be clogged or show



Ink starvation causes white channels to drop out

nozzles dropping out, resulting in a banded or print where the colour is not correct. If you are fighting this issue, the first thing to do would be to move the print-head to the centre and look at the bottom surface of the head. If you see ink build-up on the head surface or specifically on the row of nozzles, then your nozzles are being blocked from a build-up of ink. Performing a system head clean should bring this back to 100% but, without adjusting your ink delivery, this would be a constant struggle.

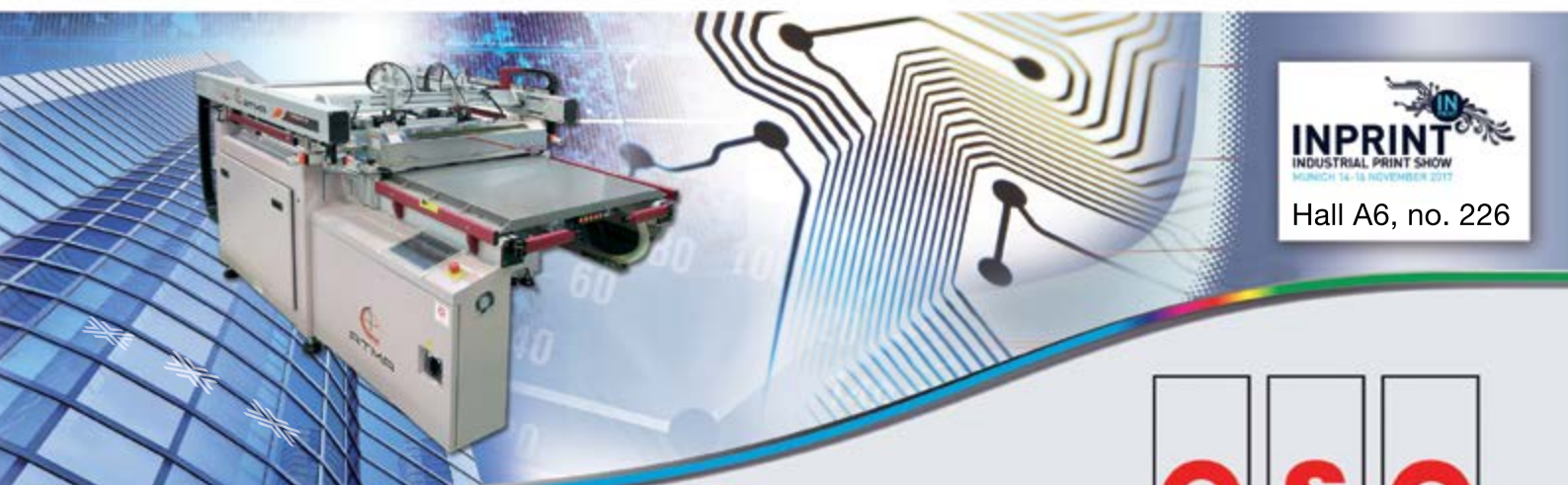
If your ink source is too low, then more force is being pulled backwards and not allowing the ink to flow into the dampers properly. This would cause what is known as ink starvation. The effect is similar to the nozzles being blocked when your source is too high – but, looking at the bottom of the head, should show a clean surface. If this is the case then chances are, as the nozzles drop out and the head is firing ink, it could be drying out your nozzles leading to head clogs that can be difficult or time consuming to work out. Each manufacturer or distributor may have a different method for recovering nozzles and it's

suggested to contact them in these cases.

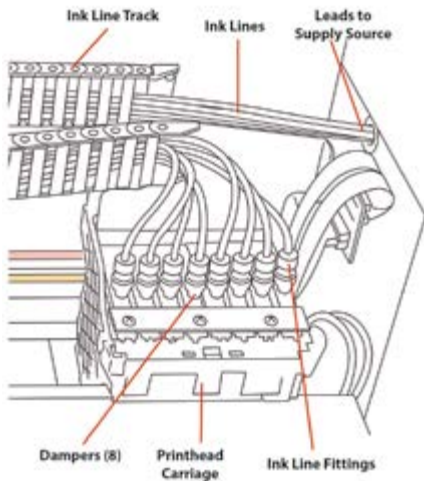
Now that we know the cause and effect of the ink source positioning, depending on which direction you need to move the source's position, it's good to work in small increments. If there was dripping, then I would move the ink source down about 6.6mm and try again. Continue to do this until the dripping and/or build-up on the head's surface disappears. Of course, the same goes for dropped out or clogged nozzles from the ink source being too low. If your system has an ink source where the height cannot be changed but you have an open cartridge, then it would be good to invest in closed or sealed ink cartridges. Chances are, this would increase the performance and reliability of your printer.

**Ink Lines:** Most of the direct-to-garment printers available today were designed as paper printers with no ink lines. When ink lines were added to the systems there was no provision for a circulation of white ink. Colour inks tend to not be an issue but, if white ink sits unmoved in ink lines over a period of time, it could harden in the lines causing that channel to not print. This is

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A common style of ink delivery system

lines directly connect to the dampers or cartridges, determining if the issues are either the ink lines or dampers takes a little trial and error. Most of the older converted direct-to-garment systems have a cartridge with ink lines attached to them. The cartridges sit on top of the print-head itself. These types of cartridges have an electronic chip on the end. A damper would not have this chip and will perform much better than a cartridge. When the print-head moves, the internal pressure increases and decreases rapidly, a damper equalises this pressure since the source is coming from the damper itself. As ink flows into the damper, it goes through a filter, a reservoir then the print head. If the ink is not properly filtered or has dried ink from an open system, these filters can clog quickly causing nozzles or full channels to drop out. This is why a proper ink source using high quality and properly filtered inks makes a tremendous difference with performance.

At the beginning of your day, if a nozzle check is performed and a channel is not printing, use the proper procedure from your manufacturer to recover your nozzles. If, after they have been recovered and the channel drops out shortly after you begin printing, chances are the damper is not performing correctly. Recover the channel again and if the same results are seen, then change the damper.

**NOZZLE CHECKS**

Most of these types of systems have either three or four channels of white ink printing. In a four-channel system, it's possible to print three channels of white ink at 100% and achieve solid and bright white ink. If a nozzle check is not performed and one of these channels is not printing, the damper may not be functioning. This would not allow the ink to flow through the ink lines causing a clogging in the line itself. Performing a nozzle check will allow you to know if the ink is flowing properly and aid in preventing a costly repair.

**Print-head(s):** There are several types of print-heads on the market but the most widely used systems utilise a single head with eight channels of ink. The top portion of the print-head is called the manifold. This is where the spikes push into the dampers allowing the ink to be released into the head. As the ink travels through the manifold, it passes through a filter before it reaches the head itself. If the ink lines and dampers are not clogged, but you cannot recover the ink channel or most of the nozzles in that channel, there is a good possibility the manifold filter is clogged. There are methods to recover the manifold called back-flushing but, if this doesn't solve the issue, changing the manifold itself should solve the problem.

*Continued over*

one reason we do nozzle checks daily

What we refer to as a channel of ink is the nozzle rows for that colour. If a channel drops out then, technically, that colour isn't printing. This drop out could be related to a clogged ink line, which is very difficult to break free and almost always results in changing your ink line(s). This is why most companies advocate that the operator print daily even if it is a sample shirt. Once again, check with your manufacturer or distributor for proper procedures.

**Dampers or Cartridges:** Since the ink



If a channel drops out then, technically, that colour isn't printing

the same nozzles have dropped out, it would indicate a head clog. If the nozzle is now firing, but others are dropped out, chances are it's an air bubble travelling inside the head.

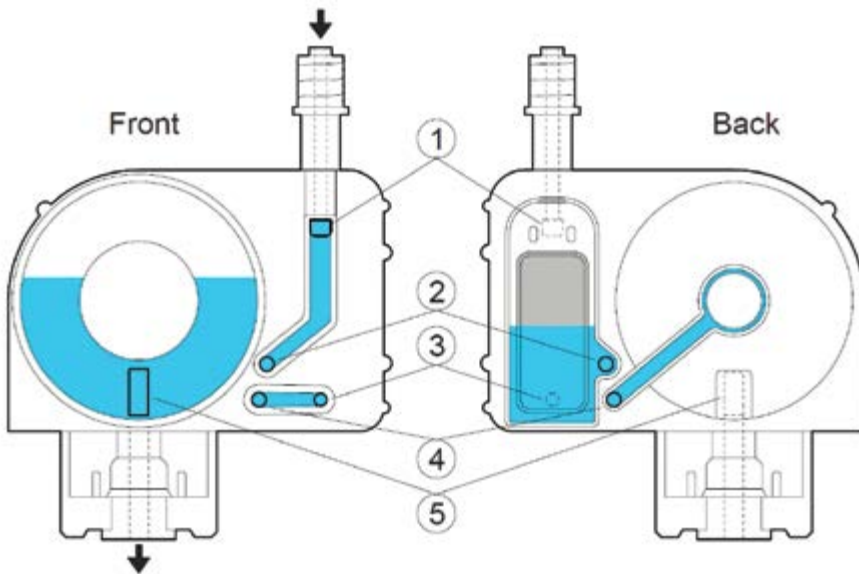
**KEEPING IT CLEAN**

Most of the time a head clean will address this issue but try to refrain from doing too many consecutive head cleans. After around the fourth head cleaning, you could be creating a foaming inside the head which would make it appear worse than before. Often you can let the head sit for 30 to 45 minutes and the foam would dissipate and perform as normal. Since all systems could be slightly different and they may not use the same type of print-head, contact the manufacturer or distributor for proper procedures.

**Capping Station/Pump:** Capping stations typically are comprised of three elements, the cap top, wiper blade and pump. They may all be contained within one unit or they could be separated. The function of the capping station is to pull ink through the lines during cleaning, to keep the head surface clean from ink or debris and to stop the head from drying out. Part of the maintenance could also include what is called wet capping.

At the end of the day, placing a little cleaning liquid in the cap and parking the head over the station can also aid in keeping the head from drying out. Be sure to check with the manufacturer or distributor to ensure this is a proper procedure to use. Not all dampers will stop a backflow of ink or prohibit the ink from flowing into a waste container.

The cap top has hard rubber or polymer seals and should be free from any nicks, cuts or ink build up. Clean this daily with a foam swab and cleaning solution to avoid nicks or ink build-up. When the head sits on the cap



As ink flows into the damper it passes through a filter, a reservoir and the print-head

Of course, if the manifold isn't the issue either, it may be time for a new print-head.

Most print-heads have more than a thousand nozzles on the surface of the nozzle plate. Each nozzle is the thickness of a human hair, so it's no wonder improper ink handling during processing can cause ill effects. It's not always the ink itself but air bubbles entrapped

between the nozzle plate and the inside head cavity that causes the blocked nozzles. To determine if you are experiencing a print-head clog or an air bubble, print a nozzle check and then perform a basic system head clean. Perform a second nozzle check and compare the two. If the nozzles are now printing, it could have been air bubbles or a clog. But, if

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top but the seal is compromised, the pump may not pull properly and/or the nozzle plate could be exposed to air. If the head is exposed for prolonged periods with no use, the nozzles can easily dry out, once again causing clogs. During your normal maintenance procedures, be sure to examine and clean the cap top thoroughly.

Cleaning the wiper blade takes very little time, but a dirty blade can wreak havoc on any direct-to-garment system. If the blade is not cleaned properly, dry ink will be pushed back into the nozzles. The effect would be packing dried or thickened ink into these nozzles and

possibly not allowing for recovery. A dirty wiper blade could also leave the surface of the head with ink build up blocking the nozzles from firing properly. If the wiper blade is in this condition, it may be simpler to replace it.

The pump, as mentioned before, pulls ink through the system. With inkjet systems, head cleans are necessary to keep the ink flowing and the nozzles firing properly. If the pump is not pulling correctly but everything else seems to be functioning, then the effect is the entire head will have poor performance. The pump is usually not the first thing looked at as the cause since they have a low failure rate, but it is something to

keep in consideration when determining printing issues. It's important to note – a pump will not affect a single channel in a multi-channel head. When a single channel is not performing properly, it's better to start from the ink source and work your way towards the capping station in diagnosing the problem.

**QUICKER TROUBLESHOOTING**

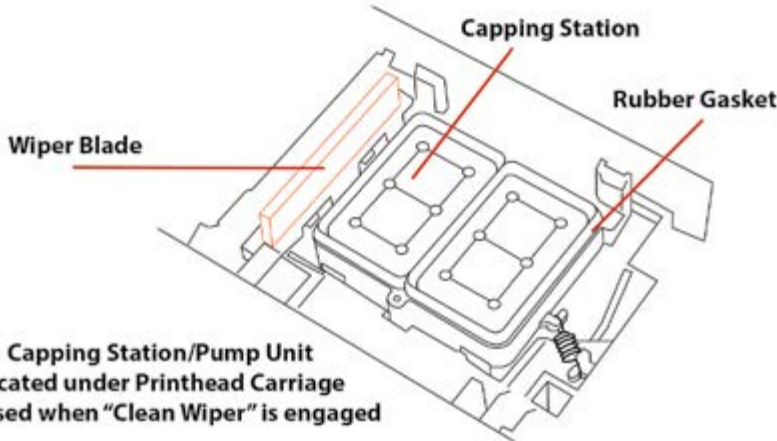
If at any point in your ink delivery system there are additional filters, an ink circulating system and/or degassing units, you would want to check these areas as well. But, again, beginning at the ink source itself and working your way through the system will allow for quicker troubleshooting.

Understanding the basic principles of how an inkjet system works, specifically direct-to-garment, can simplify your printing process. This simplifying can lead to more confidence in printing and far less down time resulting in higher profits and happier employees and customers. ■

*Jerid Hill is Sales Manager for BelQuette*

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# BREAKING THE TEXTILE BARRIER

Mustafa Okanovic outlines why digital printing is coming of age

There is significant interest in the world of textiles and apparel in taking advantage of digital printing, not only for sample making but also for economical production of the smaller lot sizes that are becoming increasingly common. Until now, a significant barrier has been ink – digitally printed textiles need to feature vibrant colours with a broad colour gamut, good washability, durability over time, and a nice feel to the fabric. There is also a requirement to print on all types of textiles with minimal impact to the environment. This is the Holy Grail for digital textile printing, and although we are not all the way there yet, progress is being made.

Mimaki began building inkjet textile printers in 1998 with the TX-1600S and, for more than 18 years, has worked hard to move the technology ahead. Today, our TS300P-1800 and TX300P-1800, with their accompanying inks have advanced the field significantly, with the ability to print vibrant fabrics at high speed, with a durability and washability that meets market needs. And we continue to fine-tune both our printers and our inks.

Most notably, Mimaki is investing in technologies that will deliver even more environmentally friendly inks as well as faster printing with smaller droplet sizes on a broader array of fabric types. We are also working with pre- and post-treatments that will extend the number of fabric types and the durability of the print.

## DIGITAL TEXTILE PRINTING TODAY

With the demand to print on a wide variety of fabrics, there is also a requirement for a variety of different types of inks, as shown in the table below, which reflects the most commonly requested fabric types and the inks best suited for them. We'll discuss each ink type in detail.

	Polyester	Cotton	Silk	Nylon	Wool
Sublimation Dye	X				
Reactive Dye		X	X		X
Acid Dye			X	X	X
Dispersion Dye	X				
Textile Pigment	X	X	X	X	X

## SUBLIMATION DYE

Sublimation inks are designed to work best with polyester-based textiles and can be used in two ways – directly on the polyester material or by printing on a sublimation paper and using a heat press or calender to transfer the inks. Through the application of heat and pressure, the dry ink on the sublimation paper is converted to a gas, which is absorbed into the polyester fibres. Unlike conventional dyeing, no washing is required, thus reducing



Mimaki's TX300P-180

both water usage and contamination. With specially designed Mimaki inks, this process results in deep blacks, excellent durability and a broad colour gamut. Inks are available in CMYK, light black, light cyan, light magenta, as well as pink and yellow fluorescents that are ideal for sportswear applications.

The primary difference between direct-to-textile and transfer sublimation inks is that direct printing requires a dense black. Adding light black also contributes to increased quality.

New applications being developed include sublimation of inks on hard substrates with a polyester coating.

## REACTIVE DYE INKS

These inks are suitable for printing on natural fibres such as cotton, silk and wool. This also requires a printer with a belt transport system that flattens the fabric, making it possible to print more easily on material that stretches. Our reactive dye inks are designed to produce deep,



Some of the textile examples shown at ITMA in Milan



Fluorescent ink is a popular addition to standard colours



Fluorescents are ideal for sportswear applications

bright colours in the complete gamut of shades which are required for the home and outdoor segments and meet automotive lightfastness standards. Textiles must be pre-treated when using reactive dye inks, and pre-processing is a must when printing direct to textiles to prevent ink bleed-through and faded colours. Pre-treatment creates an acceptance layer on the fabric that enables sharper images, better bonding and little or no bleed-through. A steamer is required for post-processing to fix the dye. Washing the fabric removes the pre-treatment and softens the fabric.

**ACID INKS**

Acid inks are very similar to reactive inks. Pre-treatment and after-treatment are both required. The process is the same, but these inks require a different pre-treatment liquid. Acid inks from Mimaki offer good wet-fastness and lightfastness, delivering the broad colour gamut and brilliant colours that the textile industry demands.

**DISPERSION DYE**

These inks are designed for printing with excellent lightfastness and outstanding build-up on polyester and micro-polyester. They are ideal for sportswear, curtains, home and outdoor textiles and the automotive industry. A heater or steamer fixes the dye, and is followed by a reduction cleaning process that creates the deep shade. Following a chemical bath, first hot air and then cold water are applied.



Examples of fashion and textile applications produced using Mimaki printers

**TEXTILE PIGMENT INK**

The advantage to this ink is that there is no need for steaming, washing and cleaning, reducing the cost and environmental impact. But the technology is not quite there yet to achieve the same results that can be achieved with other inks. We are working to develop a binder or primer that will improve the durability and colour gamut.

**LOOKING AHEAD**

Mimaki is dedicated to applying its extensive knowledge and expertise to providing the best solutions for digital printing on textiles. We are focused on developing new inks for each application that will reduce costs, maintain or improve quality and make

digital textile printing more environmentally friendly. This, we believe, will speed the adoption of digital textile printing and open the market to a variety of new applications and opportunities. ■

**Mustafa Okanovic is Product Specialist at Mimaki Europe**

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# SCREEN MEETS DIGITAL

## Daniel Gandner explains how to harness the best of both worlds for industrial printing

**Input systems are the interface between man and machine. These products are slim, durable and versatile. And above all they are user-friendly and long-lasting. While function is paramount, form and appearance are also key.**

Marabu, the German manufacturer of printing inks, is unique in offering a way to decorate input systems by merging screen and digital printing. This approach helps customers cut costs and enjoy efficient production processes.

### DECORATION IN LINE WITH SPECIFIC NEEDS

Touch user interfaces – e.g. touchpads and screens – are found in many scenarios, including harsh industrial environments, high-tech healthcare, and consumer electronics. The inks and technologies used to print them must therefore meet a wide variety of requirements, and deliver the right visual results. Against this background, ink formulations are continuously being improved and tailored to unique customer needs. New products are being developed and, equally important, printing technology is evolving. This includes finding novel and unconventional ways to produce high-quality prints, shrink costs, and streamline production.

### MARRYING DIGITAL AND SCREEN PRINTING

Recently, Marabu has focused strongly on solutions for a specific type of touch user interface: membrane switches. A central element is the PET film substrate, printed on via a combination of screen and digital – an approach that exploits the advantages of both methods to achieve synergy.

With screen printing, project-specific designs and frequent changes in decoration entail high effort and expense in terms of pre-press tasks and machine set-up. Digital processes enable the very short, highly customised production runs that are increasingly popular in today's age of just-in-time delivery. However, digital printing has its limits when it comes to opacity and creating precise layer thicknesses. In certain cases, chemical and mechanical resistance can also prove difficult. This is where screen printing comes into play. First, the desired image is applied digitally onto a primed PET film using a suitable inkjet ink and the CMYK method – there is no need for analogue pre-press work. Then, a blocking layer is added



*An image is applied digitally onto a primed PET film, then a blocking layer is added by means of screen printing*



*Each product undergoes extensive testing by Marabu and the customer.*

by means of screen printing. Screen complements digital very well: it can be leveraged to produce highly transparent, brilliant colours, as well as opaque white or black. It can also achieve attractive metallic effects, or form a blocking layer with a nonconductive ink to avoid disrupting the operation of the capacitive touch interface. Additionally, diverse UV-curable screen printing inks can be applied for the transparent display window, or to create textured effects. In all, the synergy of screen and digital opens up new possibilities in industrial printing, while curbing costs and enhancing efficiency.

**THE RIGHT INK FOR PERFECT RESULTS**

Input systems not only pose challenges in terms of electronic circuitry – printing inks must also meet specific requirements for decorations. No matter what type of ink (solvent-based or UV-curable) is leveraged for screen or digital printing, each product undergoes extensive testing by Marabu and the customer.

Currently, most inks employed for membrane switches are solvent-based. They can enable a broad spectrum of stunning colours, shades and even metallic effects. Moreover, they dry quickly without clogging

mesh screens. The resulting, flexible printed ink film enables reliable downstream processes. In particular, it is important to select an ink that is compatible with popular adhesives and primed PET materials. Recently, however, solvent-based inks face competition in the membrane switch segment: UV-curable products are gaining traction as an attractive alternative. They create an extremely elastic, adhesive-resistant ink film, paving the way for simple downstream processing. Additionally, they adhere to common spacer materials without the film dissolving.

UV-curable inks are also a preferred choice for digitally printing decorations on input systems. The inkjet inks must be easy to process. Furthermore, they should have very good adhesion, and high-quality pigments. The result is reproducible, photo-realistic prints that are highly durable in outdoor environments.

Digital printing has opened up new possibilities for decorating input systems. And screen printing in tandem with digital generates synergy and adds value – delivering benefits such as cost savings, efficient production, and truly exceptional results. ■

**Daniel Gandner is Director of Marketing and Communications at Marabu**



Membrane switches feature PET film substrate printed on via a combination of screen and digital

**Further information:**

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# OPPORTUNITY FOR INKJET ON AN INDUSTRIAL SCALE

Dr Jim Taylor explains the importance of finding new potential applications for the technology

Over the last few years, we at Inca Digital have seen the possibilities for inkjet technologies to grow in the industrial printing space. More and more companies and industry commentators are recognising the real versatility and potential of inkjet printing technology, and the economic argument for a technology that can offer a high quality and customisable output in low volumes when required is starting to be understood.

In the point-of-purchase and graphic arts markets, inkjet pioneers like Inca have worked hard to refine its proposition and it is now commercially-proven as a highly versatile, robust, quality-led print production technique. The industrial print markets – from packaging to décor, wood panelling to automotive, metals to glass – represent the next exciting challenge for the inkjet industry. At Inca we are geared up to take on this challenge via our Inca Genius industrial print partnership.

We firmly believe that each of the industrial markets will have commercial and production requirements very specific to that application. But they also share many of the inherent challenges of the graphics printing sector – the need for more cost-effective, faster turnaround and personalised industrial printing solutions without any compromise on quality or delivery. And this is where inkjet can be and is delivering and where it can make a real difference.



An Inca engineer building an Onset X print carriage

## WHY INDUSTRIAL AND WHY NOW?

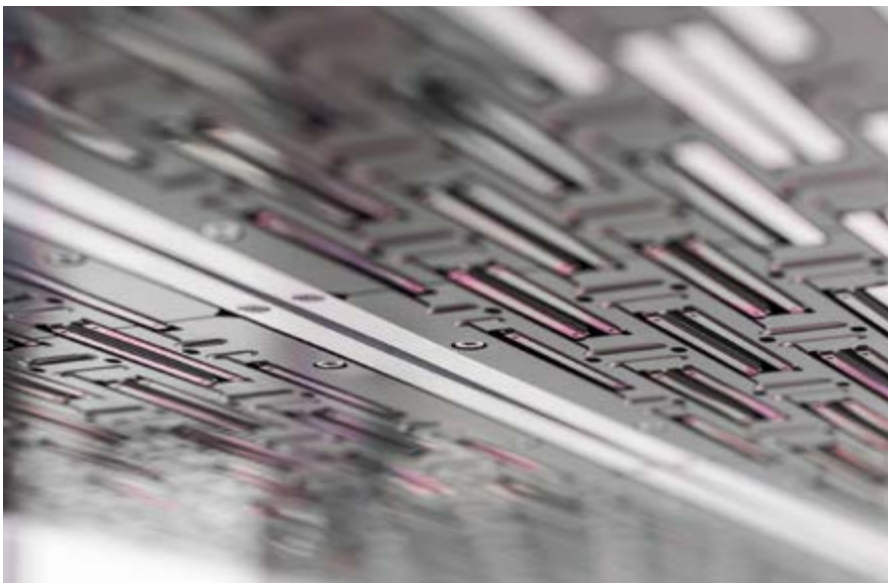
We see a dual economic argument for inkjet in industrial printing – firstly by freeing up production capacity on the larger conventional presses by taking away the lower run length, lower profitability jobs. Secondly, using inkjet's quick turnaround and cost-effective low volume abilities opens new markets and revenue streams that otherwise don't make economic sense.

Inkjet's recent success for the industrial print sectors is largely a result of the significant evolution of three elements – robotics, printheads and inks.

The recent integration of robotic material handling systems into the industrial print production chain around our Onset X series has dramatically changed the game. An example is US plywood flooring giant, North American Plywood (Naply). It is the latest industrial customer to install an Onset X series machine, complete with two robotic arms managing the on- and off-loading of all the plywood sheets. Naply has launched a new product range, DesignPly, on the back of the installation, digitally staining and customising plywood flooring on demand.

## CONFIDENT AND CONSISTENT QUALITY

Inkjet printhead reliability, speed and performance have also increased to the point where they can compete with conventional industrial printing technologies. Inkjet can now offer a confident and consistent quality print-on-demand as a complement to existing print technologies. With print quality playing a lead role in many industrial printing markets, progress in the reduction of drop size is providing for ever-more detailed graphics, imagery and text, to the point where the quality across most applications is becoming



A close up of Inca's full-width array print carriage on the Onset X series



A front view of the Onset X series with a fully automated press in action

comparable to offset.

Single-pass technology is becoming practical because of the introduction of the latest high-speed, high-resolution printheads, such as Fujifilm Dimatix Samba heads. Once commercially proven, single-pass technologies will dramatically transform what inkjet can do, and the speed at which it will be able to do it. In addition, intelligent software and electronics can detect failing nozzles and compensate in real time to maintain production without affecting quality. These and other sophisticated methods will minimise costly downtime, and solve one of the recurring issues facing all industries that require high productivity.

Ink is the other key component driving inkjet's success in industrial sectors. Recent advances in UV ink chemistry have improved gamut, adhesion and jettability. Machines like the Onset X series can now jet ink onto a wider range of substrates because of these advances. And, with the development of true aqueous UV inks now becoming a reality, there will be new applications and materials that inkjet can address.

**AN INKLING OF THE FUTURE**

Perhaps the most exciting thing about inkjet is that we are only at the start of its possibilities. The more we open up new industrial markets, the more we will find new potential applications for the technology. Some of the trickier applications – flexible packaging is a good example – may not be possible with inks available today, but there is so much investment and development going into inks, it is only a matter of time before they become viable. Recent developments in application specific aqueous inks, combined with rapid advances in single-pass printing, will open up new industrial markets for inkjet that were inconceivable just a few years ago.

In line with the quote from the famous English poet John Donne "No man is an

island, entire of itself", we believe the quickest road to developing industrial markets is to form strategic partnerships with companies that share a common vision and commitment to innovation in those markets. In a world where competition is relentless and the speed of technology evolution is often staggering, no one company can be all things to all people, or have all the expertise or resources to do everything well.

This is the basis of the collaboration between Inca's parent company, Screen, and BHS Corrugated on an inline digital printing solution using Inca single-pass technology for the corrugated board industry. Another example is our partnership with Marabu GmbH, which has developed combined screen and digital printing inks for the manufacturing of touch panel input devices.

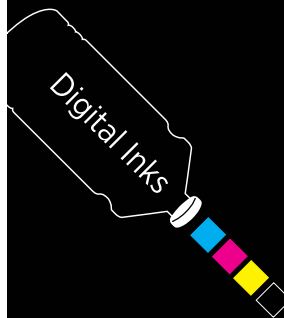
So, for inkjet companies entering the industrial printing space, the focus must be on educating decision makers about the extent of inkjet's potential in their specific market. In order to do so effectively, the first stage is to witness the technology in action and understand its true potential to fulfil and even exceed expectations. Then companies can work in partnership to filter that wealth of choice and opportunity that inkjet offers into an inkjet solution that meets their specific needs. That is our industrial printing challenge. To demonstrate inkjet's relevance, reliability and rich source of opportunity is a challenge we relish at Inca. ■

*Dr Jim Taylor is Business Development Manager at Inca Digital Printers*

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# THE HEART OF INKJET PRINTING QUALITY

Angus Condie, Mark Crankshaw and Adam Strevens describe the importance of ink recirculation

**Ink recirculation is today an essential feature of industrial inkjet printing, having transformed the industry when it was first introduced a decade ago. Its advent made it possible to jet highly-pigmented, viscous inks reliably for the first time, opening up numerous exciting new applications to the field of digital inkjet printing, including ceramic tile decoration.**

In an ink recirculation design, the ink passes through the ink inlet into a sub-manifold, where ink flow is divided before ink enters the actuator chamber. After the droplet is fired, ink flows into a further sub-manifold, from where it then returns to the ink system.

The trail-blazer in ink recirculation was the Xaar 1001, introduced in 2007, which featured Xaar's patented TF Technology – an enduring and essential component of the company's later advances in printhead technology. These advances have culminated in the company's current Xaar 1003 and Xaar 2001/+ printhead families, which represent new benchmarks for industrial inkjet printing.

## BEFORE INK RECIRCULATION

The inner workings of the early piezoelectric inkjet printhead were simple. Its key component was a ceramic material that

became longer and thinner when subjected to voltage; this expansion then pushed or bent a membrane, forcing a drop of ink out through the nozzle. The actuator chamber had one ink inlet and a straightforward flow of ink from inlet to nozzle. All that was required was sufficient ink flow to satisfy printing and appropriate pressure at the meniscus of each nozzle.

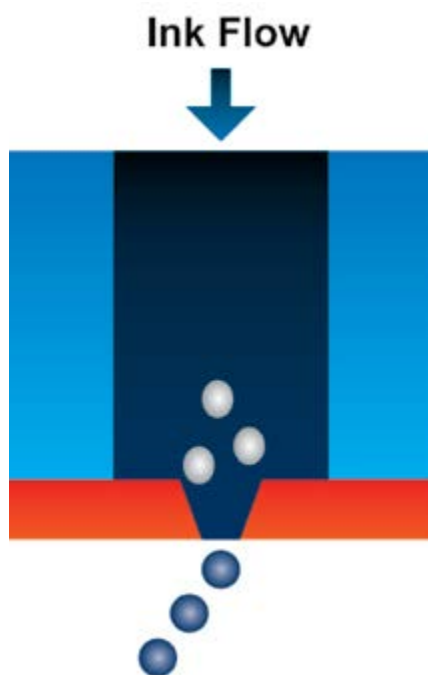
For all its pleasing simplicity, however, there were challenges with this design. When the nozzles were not ejecting ink – either because of the nature of the image being printed, or because the printhead was idle – the ink not only sat in the printhead for long periods of time but, also, for varying times, dwelt in different channels. This would cause unpredictable changes in the ink's properties that led to printhead reliability issues when printing. Among the areas affected were temperature and settling, as well as degassing, the minimisation of which leads to less downtime, less waste of expensive media and ink, and more high quality print runs per day. Furthermore, volatile compounds were apt to be lost wherever there was a free surface – for example at the nozzles, affecting reliable nozzle start-up when

printing recommenced, something referred to as nozzle latency. In addition, there was also the constant risk that, particularly in challenging industrial environments such as printing dusty ceramics tiles or corrugated board printing factories, debris would enter the printhead. If the particles of debris were large enough, they could block the nozzles or clog the filters that were designed to protect the nozzles.

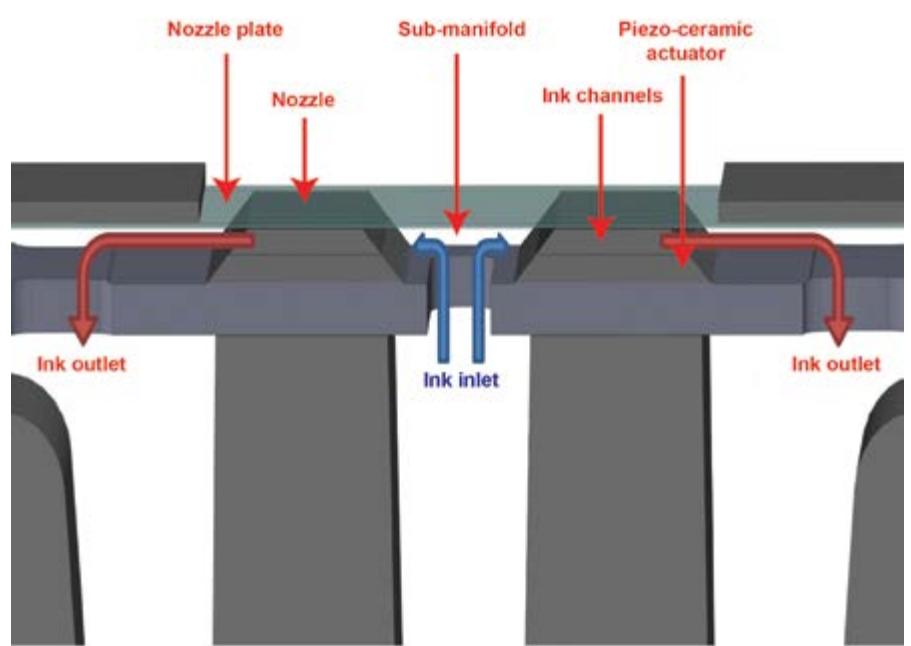
These characteristics can be overcome with a number of methods, such as agitating the fluid in the channel, and intermittently ejecting small drops from the nozzles.

## XAAR'S TF TECHNOLOGY

The Xaar 1001 incorporated Xaar's patented TF Technology, a world-first innovation. This continuously recirculates the ink through the complete fluid path, right up to the nozzle inlet and, crucially, past the rear of the nozzle. This perpetual movement removes debris and bubbles from the actuator, making jetting more reliable and enabling nozzles to self-recover from any blockages. In addition, because ink dwells in the printhead for the shortest possible time, it is far easier to control and regulate



End shooter architecture showing ink flow and drops ejecting from the nozzle



Cross-section of Xaar 1001 two-row printhead

Cross-section of the Xaar 1001 two-row printhead



temperature and ink, solid and gas composition, improving printing uniformity and nozzle latency.

The simple open architecture with short actuator channels of Xaar TF Technology ensures that ink can easily access channels and nozzles in the printhead. In combination with its double-ended architecture, in which two acoustic waves are focused on the nozzle, this enables the repeated generation of sub-drops without starvation and additionally enables higher viscosity fluids to be printed. This allows the most recent Xaar printheads, such as the Xaar 1003 and the



The Xaar 1003 printhead features TF Technology

Xaar 2001 GS12, to print up to seven sub-drops at a sub-drop operating frequency of 126kHz, and the Xaar 2001 GS12 to achieve maximum printhead productivity of up to 360 $\mu$ l/s/inch in a three-cycle operation, offering a wide choice of greyscale sub-drops for excellent print quality.

#### THE CUTTING EDGE

Only in Xaar printheads using TF Technology are all the benefits of ink recirculation fully realised. In the cutting-edge Xaar 1003 printhead, the ink flow is simple and uncomplicated – a contrast to other designs in which the path is more convoluted, taking the ink through various ascenders, descenders and recirculation passages, as well as sub-manifolds. Furthermore, ink in the Xaar 1003 recirculates past the back of the nozzle during printing – as opposed to other designs, in which the actuation of the piezoelectric materials takes place on the roof of the chamber, pressing downwards to push the ink down and out through the nozzle.

In addition, other printhead designs feature narrow ink inlets and outlets, as opposed to the much more open sub-manifolds of Xaar printheads. This restricts the overall flow path, in turn limiting the recirculation flow rate. The ink in Xaar

printheads, conversely, enjoys immediate access to the channels, increasing the flow rate considerably. Its pressure chambers, situated both upstream and downstream of the nozzle, prevent pressure loss without resorting to narrow inlets and outlets. This means that, with just one head, a wider range of drop volumes can be jetted, enabling a wider range of inkjet applications to be addressed.

Ink recirculation is an essential feature of industrial inkjet printing. Xaar's TF Technology has led the way and delivered the reliability and print quality results demanded across today's digital print markets. ■

**Angus Condie is Actuator Development Manager, Mark Crankshaw is Principal Scientist – Printhead Applications, and Adam Strevens is Lead Technology Analyst at Xaar**

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# GETTING THE RIGHT GUI

Joey Kim looks at how large format printer manufacturers can give PSPs more help through their choice of graphical user interface

**The investment involved in purchasing a large format flatbed printer can potentially rival the cost of a small flat in some areas. So the need to find the right printer, operating system and support is imperative.**

Granted it is a complex decision as to which flatbed printer to opt for, but while you might be thinking about why you need the printer, what you are going to use it for or what its upkeep will end up being, an important additional aspect is the GUI (Graphical User Interface). In this day of IT, there is no need for PSPs to struggle with some of the complex challenges of large format printing as a lot of these can be easily simplified through the choice of GUI. So, while it's important to consider the most prevalent jobs you work on to identify the best machine, some thought should also be spared to consider what the GUI can deliver for you too.

Manufacturers take time to ensure that the GUI they choose to offer will bring out the very best in their printer. But is this enough? Surely it is about what is the best one for the user to achieve the very best printing jobs. So, yes manufacturers should help PSPs explore not only the printer options, but also what is available from a GUI perspective.

## COST-SAVING

Most are now specifically developed with the operator in mind (or claim to be!), with the very latest software offering an enhanced user experience. Central to this is making operators' lives easier, such as offering the ability to slow down or pause the printing process. The beauty of which is that the printer can then be restarted from exactly the same point without any loss of quality or avoiding the costly implications of needing to discard the job or material printed on to at that point.

As pricing of jobs is so critical and could help you win or lose the business, any cost saving ways a GUI can help with are sure to be of interest. Look for GUIs that can help maximise the use of the media and eliminate what is the equivalent of 'dead space' or unusable media. This ensures media is used in the most effective way possible and reduces the amount of unworkable stock being simply thrown away. Systems that aid the most productive use of media enable the operator to



*Nesting capability of JETRIX GUI*

easily map and move images around. The important element to stress here is 'easily!' You are looking for tools that effortlessly make the most efficient use of the printable space on the media, which in turn lead to the minimum amount of media being used for the job.

## TIME FOR CHANGE

Another critical element in any print production job is time. Which is where the latest GUIs can really help, such as delivering practical applications which nests images enabling duplication without the need for massive rip files every time. This decrease in RIP time also means less time spent in pre-production. Likewise, the ability to flood a white or black layer without the need to create a separate layer in the artwork file will also reduce the production time.

If you are considering entering the realm of UV printers, then the extent and variety of media further broadens, but so too does what can be achieved from a printing perspective. The varieties of which can be extensive for an operator to learn and know, but again here an effective GUI can step in and actually create potential new revenue streams. Such as the GUI

giving the option to introduce layers of ink which create unusual 3D effect textures, adding a completely new dimension to projects. This technique is also ideal for spot varnishing, if you are frequently using this printing technique.

As Joey Kim, MD of InkTec Europe says, "For us the GUI on the JETRIX printer range has been an integral part of their research and development. We are constantly looking at ways to evolve and improve it, including with the latest version on our LED UV printers featuring the ability to set the lamp power level. The result is the right temperature is used for the right substrate. But for us, using the right GUI is more about focusing on delivering the ultimate, user friendly experience, while specifically focusing on areas which will deliver a direct, positive financial impact for the PSP." ■

**Joey Kim is managing director of InkTec Europe**

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# COMPULSORY TRAINING

Gabriele Heller discusses how new measures proposed for the handling of di-isocyanates could affect screen and pad printing



Gabriele Heller

**When screen and pad printing applications require high resistance of the printed ink film against external influence (light, weather, chemicals) this can be achieved by using two-component ink systems. The binder of such systems contains a resin that can be cross-linked if a reactive component (hardener) is added. The cross-linking of the system is the reason for higher resistance compared to one-component systems.**

For most of the resins, isocyanate hardeners are used as cross-linking agent. Such hardeners consist of a polymer manufactured from di-isocyanates that contains reactive isocyanate groups. Most of the free di-isocyanate used to synthesise the polymer is used to build up the polymer, however, after the synthesis reaction has been completed, there is still a residual amount of free di-isocyanate left.

## PROTECTIVE MEASURES

In February 2017, German REACH competent authorities submitted a restriction dossier related to di-isocyanates to ECHA. This dossier requires mandatory training for workers handling di-isocyanates, or mixtures containing di-isocyanates in amounts  $\geq 0.1\%$ . The target is to reduce the number of occupational asthma cases resulting from inadequate handling of di-isocyanates. It is not intended to ban the use of this kind of products, but to improve awareness and application of protective measures.

The dossier requires manufacturers and importers of di-isocyanates to develop and maintain appropriate training material to be used for the mandatory training of workers in the whole supply chain. Downstream user organisations like CEPE will provide input for establishing the training material to the manufacturers and importers on request. The training will differ depending on the time and type of activity. Ideally, once the material is developed by manufacturers and importers, it should be disseminated online, e.g. on the websites of the manufacturers and importers, and/or websites of concerned trade associations, and/or websites of EU or national authorities, in different languages. The training may also be provided through e-learning in different languages, thus giving 'foreign' workers the opportunity to get the necessary information in their mother language.

It will be the responsibility of companies selling di-isocyanates and di-isocyanate containing mixtures to ensure that their customers get access to the training material and thus enable them to fulfil their training obligations. To ensure that the training in fact is carried out, however, is the employer's responsibility.

## IMPLEMENTATION TIMELINE

Should this restriction be decided to come into force, a transition period for implementation will be necessary, as it will foreseeably take some time until the training material will have been put together and then passed on through the supply chain.

After the restriction has come into force, enforcement activities will be related too (e.g. compliance check). Such activities should stay with the national authorities and not be passed on to the supply chain. However, bureaucracy related to the provision of the training and ensuring implementation of the restriction should be as low as possible.

ECHA's public consultation on this restriction dossier was open from 22 March to 22 September. The final decision can be expected in 2018 earliest. ■

*Gabriele Heller is Chairman of ESMA's Health, Safety and Environmental Protection Committee and Senior Manager Product Safety at Marabu*

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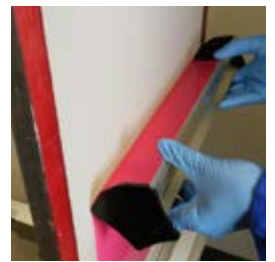
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# CLEANING UP THE TEXTILE INDUSTRY

Dr Simon Daplyn explains why digital printing is a positive step towards sustainability in textiles

**Fresh water is fast becoming a finite resource and globally, conservation of water, alongside reducing the polluting impacts of large industry, are critical areas being discussed and addressed. In one key example, it is widely acknowledged that today, textile processing accounts for 20% of all fresh water pollution.**

Not only is the textiles industry the biggest polluter, it is also one of the biggest consumers of water, using billions of litres per day within treatment, processing and decorating of fabrics. These issues are intensified when considering that many of the major textile production areas of the world such as India, Bangladesh, Brazil, and China face an acute scarcity of water.

Whilst not the biggest contributor to this pollution and water usage, textile printing is a targeted area of concern. The textile printing industry is increasingly under fire from lobby groups and particularly the DETOX campaign of Greenpeace. The campaign target is to get leading garment manufacturers and brands to commit to the elimination of toxic and harmful chemicals from the supply chain by 2020. Many leading brands have already signed up to this or have their own programs with the same end goal. These programmes and guidelines restrict the use of certain materials both from an environmental and customer contact point of view. Examples of such guidelines and organisations include Oeko-Tex, Bluesign, Inditex Clear to Wear and ZDHC. Compliance to such requirements can be complex but more clarity is offered as some organisations start to recognise each other's standards and certified partners.



*Sensient's Alpha technology reduces water, chemical and energy consumption without compromising the quality and performance of the printed fabric*

## DIGITAL DETOX

Many brands are implementing digital printing technologies, a more environmentally friendly process that doesn't compromise cost or performance. By switching from analogue printing processes to digital, data already shows a huge impact, not only in reducing water consumption and pollution, but also in decreasing energy use, CO<sub>2</sub> emissions, waste materials and time. Many complementary studies show an average reduction in water consumption of 60%, energy consumption of 55% and a 95% reduction in CO<sub>2</sub> emissions.

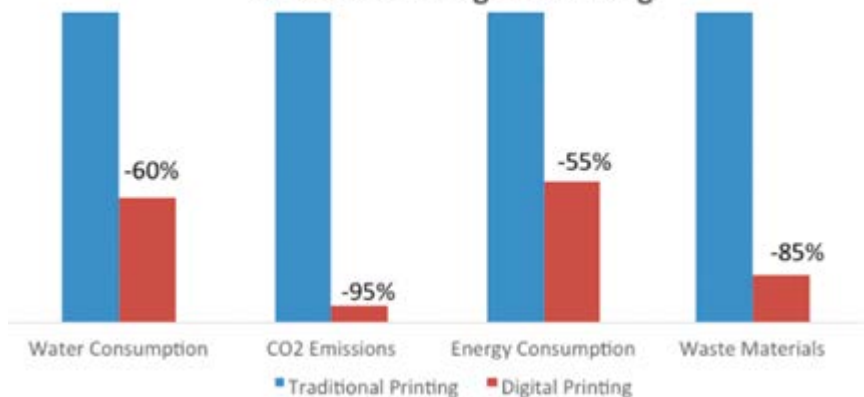
These clear environmental benefits are further enhanced by studies showing lead-time for printed goods reducing by 80%; waste reduced by 85% and a reduction in the use of chemicals in excess of 90%.

## FURTHER IMPROVEMENT

Despite these significant benefits, it is clear that the textile printing industry can do more to drive a further improvement. Many printing technologies require the fabric to be pre-treated with chemicals, with the printed design then fixed to the fabric in a steaming process. The energy consumed and CO<sub>2</sub> produced by heating water by coal or oil furnace to create the required steam is significant. A subsequent washing cycle (often involving multiple stages) is applied to remove any chemicals and unfixed colour from the textile. It is legally required to treat the effluent water resulting from such processes before release back into the water system requiring energy, time and cost.

There are some strong initiatives in water recycling with the first zero-discharge factories emerging where 100% of water from each process is recycled and re-used. Today this is expensive, but as more factories adopt such schemes, the price is expected to come down considerably. Limiting the reliance on water supply and treatment opens up the possibility

## Traditional vs Digital Printing



*Impact of digital printing technology on reducing waste and emissions*



Printed cushions on sofa

to locate textile mills and print houses in more urban areas, closer to the consumer. This in turn can drive down the requirement for long haul transportation of goods, lowering the CO<sub>2</sub> emissions and carbon footprint. Digital printing further supports any transition to more localised production with the ability to print on demand, short runs of any design. Adopting digital printing technologies offers clear environmental and financial benefits allowing the transformation of businesses and represents significant, but not total, progress today. There are opportunities for digital printing to go further and deliver water- and chemical-free solutions.

Ink producers and specialty chemical companies can offer significant value in the supply chain and open dialogue with brands and suppliers to ensure compliance to their standards and create innovative solutions to ensure a more sustainable process. An example is Sensient's pioneering Alpha technology which allows for a large reduction in water, chemical and energy consumption versus direct disperse printing, without compromising the quality and performance of the printed fabric. This is key to driving change. For businesses and brands to adopt more sustainable technologies and chemistries, they cannot compromise their final product. Further developments in pigment printing offer a significant chance to reduce the environmental impact in producing home fashion and Sensient leads the way in developing high colour strength pigment inks meaning no compromise in product visual impact. ■

**Dr Simon Daplyn is Product Manager of Sensient Imaging Technologies**



Close up fashion image

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# INDUSTRY INSIGHT

## Ford Bowers reports on the SGIA's survey on branding and messaging



Ford Bowers, President & CEO of SGIA

**As many businesses do, SGIA has launched a study on branding and messaging to better serve the communities represented in our Association. We surveyed more than 1,200 member and non-member printers across different print segments including commercial, packaging, graphics and sign, garment/apparel, and industrial. The results, as they concern the Association, are still being compiled, but there were some industry insights that are worth sharing now.**

Overall the survey respondents had a great deal of optimism about their company prospects, with nine out of 10 answering that they expected their business to grow over the next five years. That said, they also reported a host of challenges they face in three broad areas: keeping up with the pace of change in technology and product types (such as media, inks, etc.); human resource issues (hiring qualified employees, employee retention and attracting millennials); and increased competition (lower barriers to entry with digital production, industry consolidation and online printers).

How the various respondents would like these issues addressed also falls into very broad and well-established mechanisms, though the impression is that there is room for improvement. At the top of the list were more robust industry research, trade show and regional or local meetings (e.g. networking opportunities), case studies, and eNewsletters highlighting industry trends, best practices, news and technical updates. The channels identified for where this information is currently obtained were (in ranked order): online searches and websites, publications and magazines, eNewsletters, and experts in the field (suppliers, consultants, etc.) – with eNewsletters and experts ranking equally. Online resources ranking highest may say something about how habits have changed, and about how well traditional channels, such as printed publications, address what is conveyed principally in writing.

Networking was rated as a high-value proposition by both suppliers and printers, but, no surprise here, suppliers were primarily looking for business engagement opportunities, while printers were looking for an opportunity to learn and get advice from peers – an important perspective for suppliers as to how they address networking opportunities. Without doubt, networking opportunities are still a critical method for learning and gaining insight among various segments.

Many of the respondents have multi-technology approaches to printing, be it offset and screen, or screen and pad, etc. But nearly four out of five had adopted some form of production inkjet, by far the most ubiquitous method among the respondents. The concern that barriers to entry have diminished as a result of digital is also supported by what we see anecdotally in the marketplace, as businesses cross over into adjacent markets and product lines based on digital technology adoption. The feeling that competition is more intense and changing is well-founded.

### A WORD ON MILLENNIALS

We have heard testimony from many business managers and owners for several years that reaching out to millennials, to attract them to the industry and engage them on their terms, is a challenge. The study highlights a few specific areas of divergence in perceived value of certain types of services.

When asked about the desirability of a 'youth leadership group,' the responses were inversely proportional to age, with younger respondents weighing this more favourably than older. Likewise, the same held true for 'interest in online communities.' While we should be careful not to extrapolate too much beyond the specific context of this study, it would make sense that suppliers wishing to cater to millennial printers, or printers wishing to the same for millennial print buyers, would also hold true. Interest in targeting specific communities with events was more valued by older respondents than younger. If we wish to attract more millennials, supporting their careers specifically and incorporating mechanisms that reflect their preferred method of interaction is critical.

### INDUSTRY PERCEPTIONS

When asked to describe the printing industry with a single word, the highest incidence across all respondents leaned towards 'creative, innovative, changing.' Interestingly, the younger a respondent, the less likely they were to correlate printing to these qualities (though 'artistic' was attributed more highly by the 35-and-younger group). Industry affinity scored high across the board, with more than four out of five agreeing with each of the following statements: 'I am proud to be a part of the printing industry'; 'I find my job/work rewarding and meaningful'; and 'I have a chance to do what I do best every day.' Three out of four were both optimistic about their career path and, if given the opportunity, would choose to enter printing again. This is a good indicator of industry health and engagement and should be trumpeted as often as possible. ■

Ford Bowers is President & CEO of SGIA



Specialty Graphic Imaging Association

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# SPECIALIST IN SAVING TIME

Stephanie Rohn gives an insight into how a long-established wristwatch company diversified into making printheads

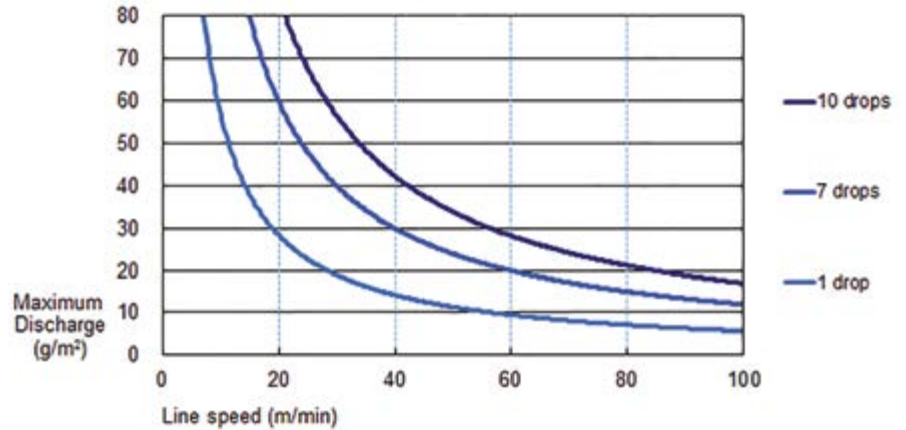
Founded in 1937 as an independent company for wristwatch manufacturing, Daini Seikosha, known today as Seiko Instruments Inc (SII), achieved the respectable annual wristwatch production figure of 1 million in the year of its establishment.

Entering the 1970s, the dawn of the electronic-age provoked keen competition in the watch industry. SII, therefore, tapped into new business fields using precision technology know-how on a parallel with streamlined production and the development of new watches. The business environment changed due to saturation of the watch market in the 1980s, and SII focused on information equipment and electronic components to increase its sales; it undertook a diversification strategy to achieve a new leap as a general mechatronics company.

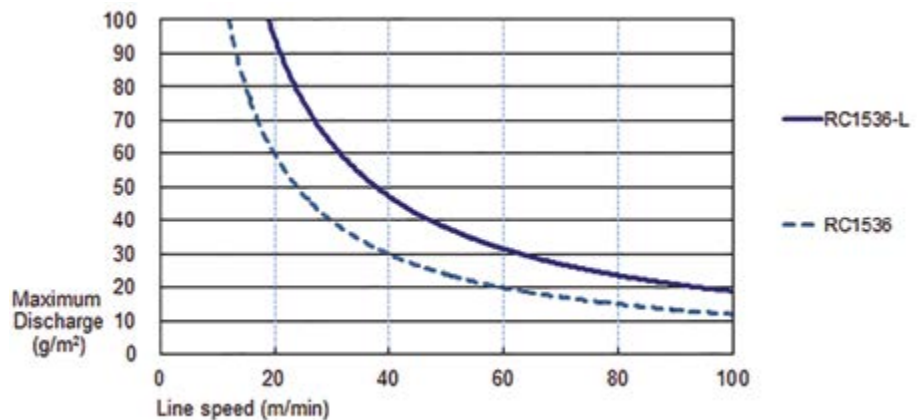
## PRODUCING PRINTHEADS

In 2001 SII Printek Inc was founded as a division of SII to produce piezo electrical industrial inkjet printheads which are robust and precise at the same time. The newest additions to its product range are the recirculation printheads RC1536 and RC1536-L.

Key to both printheads is the high flow ink circulation structure which means that ink circulates constantly and directly behind the 1536 active nozzles at high speed. The constant ink stream within the circulation structure removes bubbles and impurities and prevents sedimentation of ink containing large pigments. These printheads can accept a wide range of viscosities in comparison with conventional printheads.



Line speed vs maximum discharge of RC1536



Line speed vs maximum discharge of RC1536 and RC1536-L

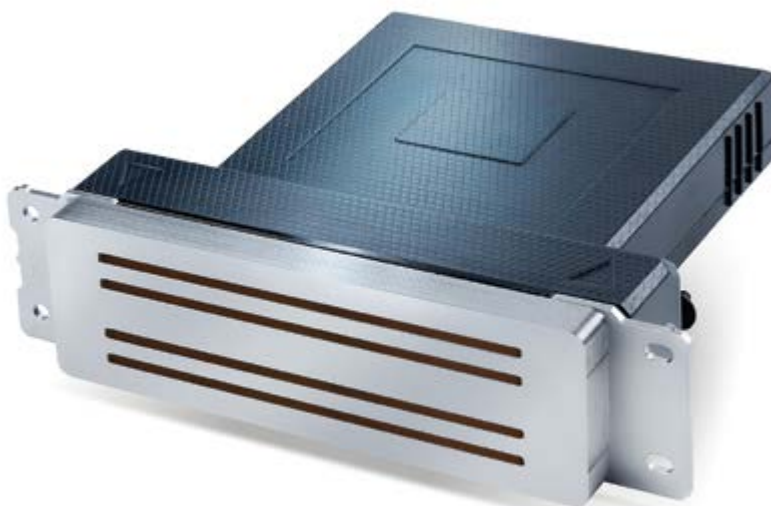
RC1536 and RC1536-L are interchangeable, sharing identical physical properties and electrical connections, providing access to RC1536-L's discharge of

70g/m² at 25 m/min line speed (35g/m² at 50m/min). The bigger distance between printhead and object up to 7mm, and the possibility to choose from a drop volume range of 13 to 150pl or 25 to 225pl offers enhanced scope for creativity. A maximum of 2.200 microlitres/sec and 2.477 microlitres/sec at 10 drops provides highest productivity.

## ADVANTAGES

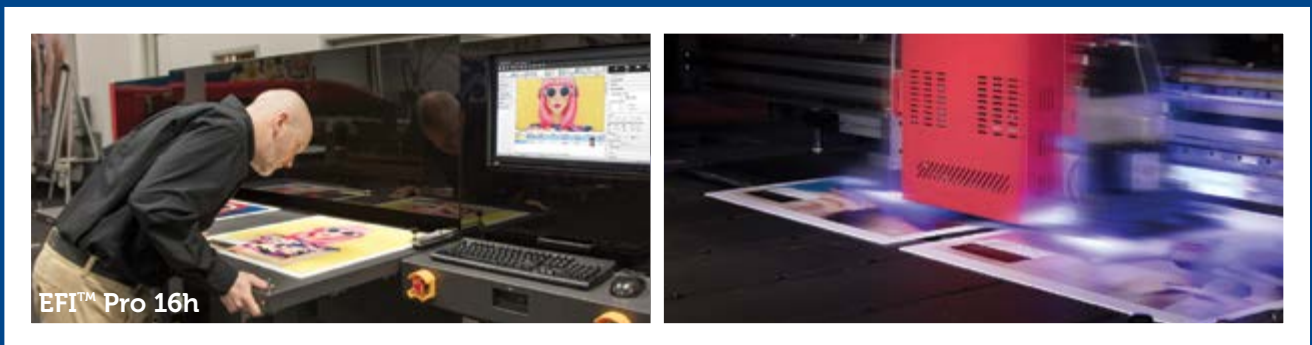
- Print bars are extremely robust and can be configured with a small number of printheads due to the extra wide print width of 108mm.
- Designed to work at low-voltage, this reduces initial investment in driver electronics with the additional benefit of low energy consumption. Isolated channel technology allows the printhead to operate at high frequency up to 37kHz.
- Automatic self-recovery of drop-out nozzles caused by air bubbles or impurities ensures long-term sustainability.

Continued over



Printhead RC1536-L with Reptile Skin Surface

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- Recirculation priming minimises ink waste, and low maintenance makes the printhead easy to handle.
- SII Printek's two models can cover the diversity of production lines required for surface decoration such as ceramics, wood and glass; corrugated, cardboard, apparels and home textiles, coating and varnish, coding and marking and additive manufacturing.

**NEW TECHNOLOGIES**

A central company structure with a modern logistic centre located next to Frankfurt Rhein-Main international airport in Germany as well as a very advanced laboratory located in Paris, France, makes the SII a highly skilled and

most flexible business partner with an dedicated service concept within EMEA. A team of three engineers supports customers, eliminating any difficulties they encounter, but it is also involved in developing current and finding new technologies.

To achieve these goals, the SII team is working with two machines:

On a drop watcher a stroboscope linked to a camera with a resolution of 1292 x 964 pixels calibrated at 1 micron accuracy allows to catch the drops in flight. Thus measurements can be taken such as: velocity, volume, trajectory, visualisation of drop formation, ligament length and quantification of satellite drops.

From these results, work on the

optimisation of the drops' behaviour can be done by working on the waveforms. In this case, it will be mainly an optimal drop formation with the targeted velocity of 7m/sec, a stable fly, and reduction of the satellite drops together with the mist.

The second machine is an internally built test printer which allows simulation of the printing defaults encountered by customers to be done and then quantified with an external measurement tool such as a spectro-densitometer. The waveforms' modifications conducted on the drop watcher are tested in printing conditions to see the quality improvements.

SII's French laboratory is growing in order to fulfil customers' requests in a timely manner. The lab has been recently assigned the function of screening the new ink requests, accelerating the actual process. For this, it has been equipped with new tools: ovens to accelerate the aging process of the materials submerged in the ink; a microscope to check if there is a shape deformation after the aging process; a high precision balance to verify there is no weight loss of the material – this new function will be fully operational by the end of October. To accelerate the development work, a further drop watcher will be built internally to complement the first one. ■

**Stephanie Rohn is Marketing Manager at Seiko Instruments**



Drop watcher with a stroboscope (resolution 1292x964 pixels) calibrated at 1 micron catches drops in flight



An old Seiko movement



Internally built test printer

**Further information:**

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 web: www.seiko-instruments.de

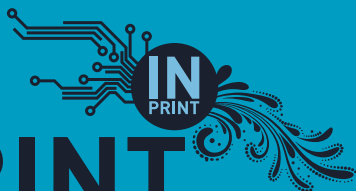
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# CUTTING A DASH

Elitron America's first industrial digital cutting system enables a web-to-print specialist to offer new products easily and efficiently

**GotPrint's strong commitment to innovation led to it installing the first Elitron Kombo TAV-R in the USA. The investment in automation aims to meet today and tomorrow's challenges through non-stop productivity, easy management of short runs and the possibility to achieve mass customisation.**

The industry is quickly changing. Companies need steady business volumes to achieve profitable economies of scale; however, market trends are increasingly pointing towards smaller production batches and quick turn around applications in order to provide end users with the level of customisation that they demand.

This shift poses challenges that are often hard to figure out for many print service providers because of the underlying characteristics of many traditional finishing solutions, which represent a bottleneck in the production workflow. Die cutting solutions, although capable of producing in high volumes, are not versatile enough to make short runs profitable. On the other hand, digital cutting solutions, while a solution for short runs, are not suited for industrial workloads because of the lack of automation and workflow integration.

## VOLUME AND VERSATILITY

That was the case until drupa 2016, where Elitron launched Kombo TAV-R, the only digital cutting solution capable of seamlessly handling an industrial volume of short run jobs totally unattended, and designed to perfectly integrate into every company's workflow. The most striking feature of Kombo TAV-R is its innovative materials handling that allows 24/7 unattended multi pallet management.

The Kombo TAV-R includes two breakthrough patented innovations; the Seeker System, a dual camera system that automatically loads the cutting files and allows the machine to run unattended 24/7, and the Airo Panel unloading system, which eliminates the need for attachment points. Other unique



Mass customization including special shapes is now possible



Kombo TAV-R uses twin gantries controlled by TwinCut software

features include independent double gantries, whose workload is smoothed, balanced and shortened by software called TwinCut.

These features led GotPrint, one of the most forward thinking commercial printers in the USA, to opt for two Kombo TAV-R machines as its digital cutting solution of choice.

## RAPID GROWTH

GotPrint started as a family business in 2001 in California, and over the next decade grew to serve the whole of the USA. Key to its rapid growth was a strong commitment to provide fast, economical, and convenient service without sacrificing quality, which is based on on-going investment in the most advanced technologies

The company specialises in the production of visual communication and promotional materials meeting the marketing and communication needs of thousands of businesses every day. This commitment brought along the challenge of coping with huge volumes that are highly fragmented as every company demands customised and tailored communication tools. It works on each and every 'paper-based' media plus synthetic materials typical of the sign & display industry. The wide product range spans commercial print products including booklets, brochures, business cards, flyers, stickers and folders; and sign and display items including banners, corrugated boards, and window decals.

## WIDENING THE PRODUCT RANGE

"Thanks to Elitron's technology GotPrint has been able to offer new signage products to its customers with ease and efficiency" says GotPrint California Digital Department Manager Hermand Hakopian. "Kombo TAV-R allows for mass customisation when the customers

require special shapes; moreover, it is a cutting solution that works on almost any size and thickness, as well as cutting through a variety of materials such as foam boards, corrugated plastic boards for yard signs, self-adhesive foam boards, cardboards, canvas and more."

GotPrint believes that production automation and seamless workflow integration are the key drivers of competitive advantage that it required to be at the forefront of an industry that is ever more demanding. Elitron was the only manufacturer of digital cutting solutions who could provide the level of automation along with the easiest way of integrating its machinery into GotPrint's workflow, which was why the choice to begin the partnership was a no brainer. ■



GotPrint has been able to offer new signage products on a wide range of materials

## Further information:

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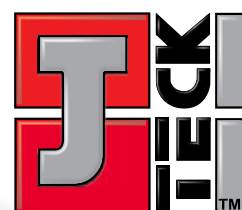
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# END TO END EFFICIENCY

## Slick sheet plant benefits from tightly integrated and customised business software

**Running many different grades of corrugated fibreboard to meet all of its customers' needs with a range of flute and score types sets CorrBoard UK Ltd apart from the competition.**

The company was created in 2014 as a collaboration between multiple companies. Its shareholders are UK-based sheet plants and Corrugated Synergies International, a US-based company that is experienced at setting up collaborations of this nature in the US and South America. In the beginning, CorrBoard only serviced its business partners, however, as the business grew, so did its customer base. Working closely together with another large manufacturer in the UK, CorrBoard is now also servicing the Single Face market and provides custom and bespoke rolls to satisfy this market's needs.

### LEAN AND GREEN

It operates out of a 30,000 square metres (320,000 sq ft) factory purpose-built to manufacture corrugated packaging and designed to be as efficient as possible. This includes 40% better energy efficiency than older Corrugator installations in the UK and offering 'pallet-less' deliveries for a 5–10% better use of transport. The next stage of its efficiency drive is the construction of an anaerobic digester to generate all the

electricity and gas required to run the plant, which will effectively make it the most environmentally efficient sheet feeder in Europe.

### COMMERCIAL EFFICIENCIES

Key to its efficiency is the software controlling operations. The company installed CTI (Corrugated Technologies Inc.) software modules for planning and shop floor data collection and CTI's Plant Manager module to handle commercial areas including estimating, costing and order processing. The system provides many functions which were deemed necessary for the business to run efficiently. It provides electronic ordering, shipment planning, finance management, paper grade management and forecasting solutions.

"We switched from another WMS system as there were functions which we required," says Corrboard UK IT Operations Lead Matt Green. "CTI fitted the bill perfectly and it was, and still is, able to service all of our needs very well."

### PULLING IT ALL TOGETHER

Specifically, the Plant Manager module succeeds at integrating and transmitting customer data into production and flexibly assigning customised supply chain processes. It does so without appearing

as a separate software to the user, or in Green's words: "One of the great aspects of EFI's Corrugated software is that it does everything and that it has also been possible to integrate it with some of our other systems. Be it financial, billing, logistics, business forecasting – you name it – there is a solution in the package."

The company is the only customer in the UK to use this software with a truly seamless integration between the manufacturing modules of the system and the business-oriented Plant Manager. The system has been customised due to the array of different equipment running on the lines and it is far from a standard installation.

### TWO BECOME ONE

In the autumn of 2015, EFI acquired CTI and merged it into its Productivity Software business unit, which develops the EFI Corrugated Packaging Suite that is redefining business and production efficiency with true Manufacturing Execution System (MES) innovation and gives corrugated production businesses the ability to reduce waste, increase productivity and efficiently manage their entire supply chain in complex production environments.

The Corrugated Packaging Suite combines CTI corrugated production management technologies with EFI's expertise in print workflow software development. The one vendor, one system Suite solves the real business needs of corrugated companies: cost reduction, throughput optimisation and increased profitability.

### UNINTERRUPTED SERVICE

"Since EFI has taken over, there has not been much change in the excellent support levels that we receive, all the systems are patched and kept up to date and well maintained," says Green.

In fact, Green is so pleased with the EFI system that, although there are no immediate plans to upgrade it, he has spoken briefly about setting up a testing network, in order to trial the new versions of the software. "That new version looks very intuitive and has had a nice upgrade to the GUI," he says. ■

### Further information:

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CorrBoard UK IT Operations Lead Matt Green





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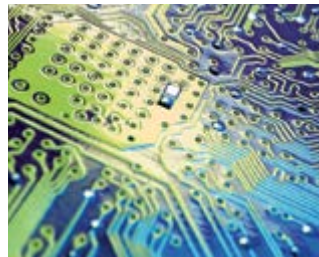
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# FESPA EURASIA 2017

Daring visitors to 'be different' FESPA Eurasia 2017 has increased stand space to accommodate growing demand

Over the past five years FESPA Eurasia has grown its visitor audience by 18% and the event has now been recognised in the category of 'International Trade Fair' by the Turkish Union of Chambers and Exchange Commodities (TOBB) due to the increase in its international visitor and exhibitor base.

The 2017 exhibition for the wide format printing and garment decoration markets takes place from 7–10 December 2017 at the CNR Expo in Istanbul, Turkey. The event will once again provide graphics and signage professionals as well as textile decoration specialists the chance to discover new opportunities and to see the latest product innovations and applications for the screen, digital and textile industry under one roof.

Through the exploration of new technologies, products and solutions FESPA is encouraging visitors to be different so they can take their businesses to the next level. "All of FESPA's exhibitions this year have had a unified 'Dare' theme," explained Michael Ryan, Group Exhibition Manager, FESPA. "We want to encourage our global community, whether they're in the Eurasia region, Africa, Mexico or visitors to our Global Print Expo, to explore and identify something that has the potential to expand the boundaries of their existing business offering. By daring visitors to FESPA Eurasia to 'be different' we are challenging them to discover new ideas and routes to market."

FESPA Eurasia 2017 will cover two halls of the CNR Expo and feature many leading international and regional manufacturers and distributors. Exhibitors confirmed to date include: Aleph, Canon, Eray Reklam, Folpa, HP, Inka Teknik, Mimaki, Optimum Digital Planet and Pigment Reklam.

Textile printing will once again have a substantial presence at FESPA Eurasia 2017, with a number of exhibitors showcasing solutions as well as a dedicated textile feature. "An increased focus on textile is a trend we're seeing globally," noted Ryan. "There was a 23% increase in textile printing exhibitors at FESPA 2017 in Hamburg and we're now seeing this reflected at FESPA Eurasia. Textile printing and garment decoration have always been a big focus in the Eurasian print industry and as our Print Census in 2015 demonstrated, textile is one of the biggest opportunities for print service providers today. We're certainly not seeing this trend slow down for FESPA Eurasia 2017."

Visitors to the exhibition will also have access to a host of free content at the show including textile printing and signage workshops and FESPA's vehicle wrapping competition, Wrap Masters Eurasia, which will return to this year's show.

FESPA Eurasia 2016 attracted 8,232 individual visitors, with total attendance over the four days reaching 9,774 visits. Based on their successful participation in 2016, 10% of exhibitors have increased their stand space for the 2017 event. Ryan commented: "The increase in stand space that we're seeing for this year's show emphasises exhibitors' high regard for the FESPA Eurasia event, not only due to the number of visitors, but their seniority and purchasing authority."

Visit the website to register for free entry to the exhibition using code EURM701 ■

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#### Further information:

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# THE IJC GOES TO AMERICA

The inaugural US edition of The Inkjet Conference will take place over 12–13 April 2018 in The Westin O'Hare hotel in Chicago.

The first European edition of TheIJC was launched in 2014 and since then the conference has experienced a continuous growth in both individual attendees and the number of companies who come to learn and network about the advances in industrial inkjet. Currently over 40% of the exhibition space is already booked for this first American edition and 300 attendees are expected: OEMs, suppliers, developers, engineers, chemists, researchers and brand owners.

"TheIJC had to build its reputation but it proved very quickly that the 'platform' concept worked very well – it combined the networking arena populated by exhibitor tabletops with two presentation tracks," explained Peter Buttiens, CEO of ESMA. "Now approaching 500 participants, we are prepared for the expansion of the concept. The key strength of the conference remains the education about all aspects of inkjet technology combined with excellent networking and business opportunities."

Attendees to TheIJC US can expect expert presentations – from both industry and academia – that explore how inkjet technology affects the manufacturing processes of today and tomorrow. "For inkjet engineering and inkjet chemistry, it's TheIJC", says Steve Knight, Co-founder of TheIJC. "We aim to broaden the understanding of the wide range of topics that make up inkjet and our guidelines to exhibitors are to cover a technical topic to an audience of a different technical or scientific background. We will hear about the latest printhead developments, about ink components and finished ink, lab equipment for measurement and analysis, curing and drying systems, software electronics and integration, vision systems for inspection and verification of digitally printed images. It is really a wide focus at TheIJC. As manufacturing industries from packaging through to 3D printing adopt inkjet, the requirements to understand the core technology become paramount to the successful implementation of this disruptive technology."

Over 20 companies have already booked a presentation slot and a stand in the conference networking arena: Adphos, Agfa, Allnex, Amazon Filters, ColorGATE, Crown Van Gelder, Digital Direct Technologies, Fujifilm Inkjet Technology, Global Graphics Software, Global Inkjet Systems, HAPA, ImageXpert, Integration Technology, Kao Collins, Marabu, Matsui, Meteor Inkjet, NTS Group, ProPhotonix, Sun Chemical, Xaar.

Registration for exhibitors and call for papers are currently open. All interested companies and research institutes should contact the organisers. ■

#### Further information:

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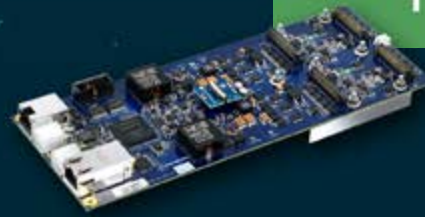


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# SURVIVAL DEPENDS ON EFFICIENCY AND AUTOMATION

Bruce Ridge interviews Mike Ruff, Owner of Mike Ruff Consulting and Academy Chairman



Mike Ruff, President and G7 Expert Trainer at Mike Ruff Consulting, LLC

**BR:** Early in your career, you were a sign painter and brush lettering artist. Did that experience help you relate to printing and signage companies?

**MR:** I think it gives me a grass roots concept of what we were before we began to automate any of the processes we do today. This was a way for me to express my art talent after I realised very few people could make a living doing art. As I got more into this graphic manufacturing as a career, and I started to see things change very quickly, I formed an attitude I still have today which is to keep an eye on the future and never say something will never change or this or that will be impossible. One of the things I would say as a hand lettering artist was, "they will never replace hand painting signs on the side of a brick wall." Of course, today this can be done with a special vinyl decal. Things change and faster than you think. So early on in my career, I went into the screen printing industry because I knew that was the future. Now I see a great future for both screen print and digital print providers. A more important lesson I have learned over the years is to stop using the name of a print technology to define a company. If I were to start a new print company today, I would focus on defining myself as a graphic communication providers. Not a screen printer or a digital printer or even a printer at all. I wouldn't want to defend any specific process but just use whatever process is best for each individual customer. A graphic communication provider is change-proof.

**BR:** When you started in the sign industry, did you have a mentor in the industry?

**MR:** Not really just one mentor. I had a lot of

people that taught me important things along the way. I was always interested in learning from professionals by watching, asking for advice and forming a style after the best of the best. After I thought I knew how to do hand lettering at a high level, then I met someone that could 'really' do hand lettering. That is when I realised I didn't know how to hand letter. I just thought I did. It was a good life lesson.

I knew that I wanted to make a career in the graphics business and I was reading everything I could get my hands on about how to do things properly and what was good and what was bad. I was careful to only study technical information written by successful, proven industry professionals. Some of the information that was out there in the 70s was way off base. It was like many of the technical public forums today. Anyone can give advice but some of it is very bad advice.

I got into sales part time while still working as a lettering artist. I was selling fire alarms door to door at night after working in a sign shop all day. I did have a mentor in sales. Jay Martin in Memphis Tennessee taught me how to sell. He taught me how to accept rejection and to sell in a consultive way. I made more money at night than I did in the daytime. So I took this new-found ability into the graphics industry.

**BR:** You may have done more travel than anyone in our industry in the last 15 years. With all the headaches associated with travel today, what makes all that worthwhile?

**MR:** First of all, you have to learn how to deal with all the small things a professional traveller adapts to, which is how to survive and how to deal with the frequent unexpected events that occur in travel. But think about what kind of a job could be worse. For me it would be doing the same thing all day, day after day.

What really made travel worthwhile was I met some really interesting and intelligent people I would never have met working in one location all those years. I believe I learned something new every week. Travel is worthwhile if you are open to learning; you don't think too highly of yourself and you really listen to the people you are working with. You will learn as much as you teach unless you think you know it all. Then it's time to retire.

**BR:** You are a strong advocate of the efficiency associated with the screen printing process. What are some of the ways a company can be more profitable?

**MR:** Becoming as efficient as possible is not a choice today as it was in the 80s and 90s. Being a local provider meant something. Customers were customers because they liked you. But today it's different. Today we are seeing a lot of mergers and acquisitions in the industry involving big fast-growing companies gobbling up small inefficient, non-profitable companies. I worked with many of these large companies when were small companies. I saw what they were and I saw what they did. I noticed that these fast growing companies regularly made the investments in training, people, software and equipment. I personally attempted to educate some of the other companies that are now out of business to do the same thing. They just did not see the value in reinvesting training or efficiency software and hardware. Not wanting to improve is a deadly attitude. This is a common problem even today. I have witnessed first-hand companies that ignore improving efficiency and then get so far behind their competitors they can't make the turn. I noticed that the growth companies all did four common things.

1. They stayed in close touch with other business owners. Even their competitors that would allow them to. They helped each other and they learned from each other.
2. They joined their associations. They used the SGIA, ISA and IDEAlliance resources.
3. They spent money on training their managers and technical people.
4. They demanded that suppliers do more than sell them product. They expected their suppliers to help them improve their product and efficiency.

Today's trends and demands did not start today. They started a long time ago. There is still time to pull out of a death spiral if a company will listen to advice in this magazine and begin to change now. If they don't they will be a victim to three trends we are now seeing.

1. There is massive overcapacity in our industry.
2. Competitors are getting more efficient through automation.
3. Professional print buying services are driving prices and profits down.

The only way to survive is to quickly start behaving like the profitable companies and become more efficient through every resource available.

**BR: Do you think that digital printing is inherently more efficient because you can generally do it with fewer people?**

**MR:** Yes but it is not the only benefit of grand format digital. Digital presses require a lot less people and take a lot less time for people to be trained to run [one]. The labour rate for a digital press operator is lower. For good colour reproduction, one digital colour management person can run a large shop. You can quickly make a press sample that is exactly like the customer will receive on the production job. Quality of digital prints now are incredible.

But wait, don't sell the inline yet. A shop with screen and digital has a huge advantage. A well calibrated screen press with a high-tech squeegee can average 300 large format sheets an hour. More than double that of the fastest digital. The screen press can change inks for exotic substrates in minutes. Screen presses can change substrates and be ready to print with the same screens in minutes. Screen inks lines can have customised chemical characteristics that adhere to anything and last over seven years outside, reflect, glitter and even look like metal. Screen ink also costs about half as much as digital. So, the perfect situation is to let digital and screen complement each other.

**BR: What are the current hot topics people are asking for consulting help now?**

**MR:** I see more and more of the well established companies with very good colour management capabilities now. This doesn't mean they cannot improve but for the most part colour accuracy is much better than it was even five years ago. So, colour management consulting is not a critical need like it was in the early days of screen print and digital.

Companies are now looking for consulting on automation. Gaining efficiency through automation is the lowest hanging fruit that can be quickly amortised. Today we can take a file from the customer and have it automatically be set up for printing, then go all the way to the imaging device in screen or to the press in digital without being touched by humans. This includes writing orders. Automation in production is now replacing press crews with one pressman. Robots are packing and finishing. I believe the shop of the future will produce double what we do today with half the people at a lower cost and better quality. Survival in this industry will demand we automate.

**BR: Will this type of automated file handling automatically eliminate the need for prepress people?**

**MR:** The prepress people are not being let go, they are now doing different jobs. The different jobs are now managing the software, and not the files. There will be prepress people that will not adapt to learning new software, and they may indeed lose their job. So the more progressive companies are moving toward managing the system and not necessarily the jobs. I know prepress people today that spend all their time creating automated file handling functions using software like Switch. They see someone manually doing something, and they just build an automated workflow that does the work on the fly. It's fun to see these young automation guys in action.

**BR: You have a long history of providing training education through training to this industry. What do you find to be the most effective training methods today?**

**MR:** The best way to train someone is to give them a clear overview of what you are going to teach in the beginning. This helps them understand why some of the basic training is important. Then give them an outline beginning to end that they can follow and see the progress. The person being training should never wonder why they are reading or doing something during training. There should always be a connection to the objective.

*Continued over*

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Software training should be done hands-on but with the instructor teaching during the training. Don't show them how to do it. Let the person do the work. Guide them through the process multiple times until that can go through the steps without forgetting any of the important actions along the way. Finally follow up with incredible support. I love software companies that are always checking on me. Good trainers should do the same thing.

**BR: Maximising profitability has been a key to your success in consulting. What are some of the more predictable ways a company can be more profitable?**

**MR:** Three 'P's. Predictability leads to Productivity which produces Profitability. I have said this for over 20 years. In graphic production the number one profit killer is not being predictable. Predictability is knowing what you are producing meets the requirements of the customer the first time, every time, and on time. Not being predictable makes every job an experiment. You cannot make a living experimenting and changing things on every job. Get the processes nailed down.

**BR: What is your opinion on how trade shows have changed in the last 20 years?**

**MR:** I think increased costs are the major factor on how shows have changed. In the past companies would show up at the show and look at it as somewhat of a social event. But today since it is so expensive to go, the companies are there to do business. Buy and sell. They have cut back on the people working at the show. The shows are shorter. Most are down to three days now.

The hosts of the shows are more efficient with software and apps to help us find what we want and have cut out many non-profitable events. Attendees do their homework and come with an agenda. They get their business done. Do a little social and networking time. Then they get back to work. I don't see much wasted effort on parties and useless time wasters as there was in the past. The mix of attendees are also different. There were more new first time attendees at the show last year than repeat attendees. Who says we aren't growing!

**BR: Where are your favourite places to go to find new information on the industry?**

**MR:** Being involved in trade organisations is probably the most valuable and current. The information you get at SGIA for screen and digital printing is really cutting edge and it is mostly well vetted and accurate. A decade ago you could go to archived articles at SGIA written by the giants of the industry and learn a lot. Today, articles in trade magazines that are current are still a great resource but they quickly get outdated. To advance, we have to have current information. I go to SGIA for current information in screen and digital. I go to IDEAlliance for a more global view of the total

graphics industry and international standard education. I also use the Color Management Group because they make a living selling the latest software and products. I try to participate in print forums but I tend to see too much group ignorance [there]. The content can be embarrassingly wrong. It is frustrating when you want to help someone and they want to argue with you. So the key to information is get it current, accurate and written by experienced and documented professionals

**BR: What is your general sense of the state of the screen and inkjet industry? In our last interview, Rich Hoffman pointed out how both technologies are growing. What is your perception?**

**MR:** There is no doubt that the industry has changed. The majority of large orders have moved to fewer printers. But big companies now are slammed with work. Many screen small-to-midsize printers have either stopped printing or moved entirely to inkjet. However, I still see a healthy screen printing industry. The objective is to make screen and digital efficient then use the technology that best fits the customer to produce the job.

**BR: At the last SGIA Congress of Committee meeting, all the printing companies attending indicated that their biggest challenge for 2015 was attracting, training, and keeping good employees. What do you think the reason for this challenge is?**

**MR:** I think there are two reasons this has happened. Both are related to the deterioration of our next generation's work ethic, and recreational drug use.

1. There are a lot of qualified people that cannot keep their hands off of recreational drugs, so they cannot pass a drug test. Legalising marijuana has made this worse.
2. The second challenge is that potential workers we could train do not want to work at a job that pays typical starting salaries. It's like in the movie *Christmas Vacation*. Eddie hasn't worked for years because he is holding out for a management position.

Read the book 'Top Grading'. Take time to find the best then hire the best. When you

find a good one, (and they are out there), these 20-somethings that are not drugheads are fun to watch. They learn fast, they are not intimidated by any app or program and they get things done fast. We just have to look harder and pay those that are high quality more to get them and keep them.

**BR: Do you work with education industries for graphic arts?**

**MR:** Yes, Mostly through SGIA and IDEAlliance. I support colleges that focus on the graphic arts when I can. Some of the best graphic professionals I know came from Cal-Poly, Clemson, RIT and others that have great graphic programmes. They do a fantastic job with a small budget.

**BR: What are the key ways you provide education in the industry?**

**MR:** I have done a lot of industry trade shows seminars and presentations, I support industry standard development and have been active in TC 130, USTAG and CGATS, I am a member of IDEAlliance, NAPL, and the Academy of Screen and Digital Technology. I write articles for trade publications that get published all around the world. I support the industry through communicating new ideas, techniques, and technologies. I am free with the information I have and nothing is a big secret. I want people to learn and use the things that I know that are proven and effective. ■

*This interview was conducted by Bruce Ridge, Director of Technical Service, Nazdar Ink Technologies. Bruce has been a member of the Academy of Screen and Digital Technologies since 2004. Updated from an article originally printed in the SGIA Journal and reprinted with permission, this is the latest in a series of interviews of Academy members intended to acknowledge the work members have done to further the development of our industry.*

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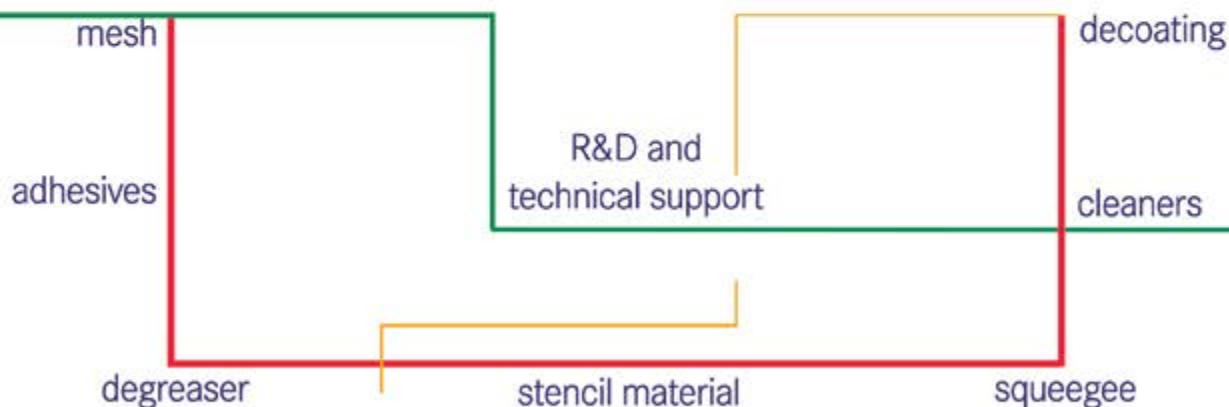
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## DO YOU HAVE NEWS TO SHARE?

CONTACT: [inbrief@specialistprinting.com](mailto:inbrief@specialistprinting.com)

### Messe Frankfurt acquires Screen Print India

To strengthen its presence in the country, Messe Frankfurt India Trade Fair, the Indian subsidiary of Messe Frankfurt Exhibition, has acquired the rights of Screen Print India.

Owned and managed by Aditya Expositions since its debut in 1994, the acquisition of the exhibition held biennially in Mumbai reinforces Messe Frankfurt's position as a formidable player in the print sector and broadens its scope in the textile technologies portfolio.

"Screen Print India accelerates our strategy to expand and enhance the offerings we provide to our customers and partners in the printing and textile sectors," stated Raj Manek, Executive Director and Board Member of Messe Frankfurt Asia Holding. "By allowing both Media Expo and Screen Print India fairs to be independent of each other, we aim to develop the exhibitions in a more targeted and well-defined manner to suit their respective visitor profiles and market demands. Going forward, we also aim to expand the exhibit segments and develop the scale of the platform to that of internationally renowned exhibitions in this space."

"Under the aegis of Messe Frankfurt India Trade Fair Pvt Ltd, Screen Print India will realise its true potential and soar to even greater heights," commented Devang Sheth, Managing Director of Aditya Exposition.

The event will be part of Messe Frankfurt's Texpertise Network and in the coming years the organiser aims to expand the exhibit segments to cover embroidery, garment and apparel printing which will supplement its textile technologies portfolio.

"Digital printing is becoming more and more relevant for our textile shows over the last years," explained Olaf Schmidt, Vice President Textiles & Textile Technologies, Messe Frankfurt Exhibition. "The potential of digital printing solutions for the textile industry is growing a lot. Under the umbrella of our worldwide Texpertise Network, Screen Print India will now make the next big step in its development."

The next Screen Print India will be held from 20–22 April 2018 at the Bombay Convention and Exhibition Centre in India. ■

### ESMA gives good game

With 146 goals scored in 30 games, the ESMA Football Tournament 2017 will go down in history as the most prolific edition of the event. The five-a-side system contributed to the high scores and allowed more member companies to be involved.

Organised in Orsay by Paris with Machines Dubuit as the hosting party, the tournament had a strong French representation, including Encre Dubuit and Fimor. Other teams were fielded by EPTA, Kissel+Wolf, Marabu, Saati and Sefar. In total 12 teams from eight ESMA member companies started the competition in three groups. The final saw Saati defeat the 'Marabu Tigers' 5:0 and Sefar came third after defeating the EPTA team.

"It is exciting to be back with Saati at the ESMA Football Tournament and see many of the old friends still playing," said Pietro Giuliani, ex-player and currently manager of



Saati, winners of ESMA Football Tournament 2017

the Saati team. "Being one of the founders of the event which was launched in Italy more than 15 years ago, I'm amazed by the number of teams who still enjoy the tournament. It is a unique way to aggregate people from different companies which on daily basis compete in the specialist printing market."

The ESMA Football Tournament 2017 closed with a joint dinner and discussions about the next edition which most likely will take place in 2019. ■

### New Nazdar President

Michael Fox, President of Nazdar, comprised of Nazdar Ink Technologies, Nazdar SourceOne and Nazdar Consulting, will retire at the end of 2017.

Fox has been with the Thrall family organisation for over 40 years and joined Nazdar as President in 1991. He has led the company through international expansion, technological disruption, strategic acquisitions and growth in varied economies.

Richard Bowles will be promoted to President of Nazdar effective January 1, 2018. Bowles joined the company in 2002 as Vice President of Marketing and was named President of Nazdar Ink Technologies in 2013.



Mike Fox retires at the end of the year



Richard Bowles takes over as President in 2018

Jeff Thrall, CEO of Thrall Enterprises, parent company of Nazdar, stated, "I wish to thank Mike for his many contributions to Nazdar and Thrall Enterprises. In the coming months, Mike and I will be working with Richard and our leadership teams to ensure a smooth transition." ■

### Mimaki launches new printer/cutters for sign and graphics

The UCJV300-160 and UCJV150-160 roll-to-roll LED UV printing and cutting solutions from Mimaki are intended to add creativity to the production of signs and display graphics, while maintaining the company's signature affordability and ease of use.

Mimaki is also introducing a new environmentally friendly ink, LUS-170 for vibrant, eye-catching print results.

"The UCJV Series is available in two models: the four-colour UCJV150-160 and the UCJV300-160 that can accommodate up to seven ink colours in cost effective one litre bottles," said Ronald Van den Broek, General Manager Sales at Mimaki Europe. "Each can produce a wide variety of print and cut applications offered by many signage, commercial and packaging print service providers. LED UV curing technology enables PSPs to utilise an expanded range of materials



The Mimaki UCJV150-160 is an integrated LED UV printer/cutter

including uncoated print media and many thin film substrates that may be too heat sensitive for latex or solvent high heat fixation systems."

The new printing and cutting systems are expected to be available for customer shipments in the fourth quarter of 2017. ■





## Gallus Screeny

### Rotary screen printing

The Screeny A-Line products are based on proven processes and new technology and represents the characteristics of extreme spring hard, strength and high speed. The recognised high quality of Screeny screen printing plate is enhanced with new strength properties, which include extreme spring hard factors. This particular feature is created by the new base structure which combines high strength and an excellent resiliency. The extreme stability of the Screen printing plate is particularly well suited for longer and larger print jobs and for maximum reuse.

### Flat screen printing

Gallus offers an end-to-end solution for industrial glass / container screen printing – a fully integrated printing system with machine-produced screen printing plates. The new Gallus Screeny G-Line and C-Line screen printing plates set new standards in cost-efficiency and production reliability when decorating hollow glass and containers with industrial screen printing techniques.



# gallus

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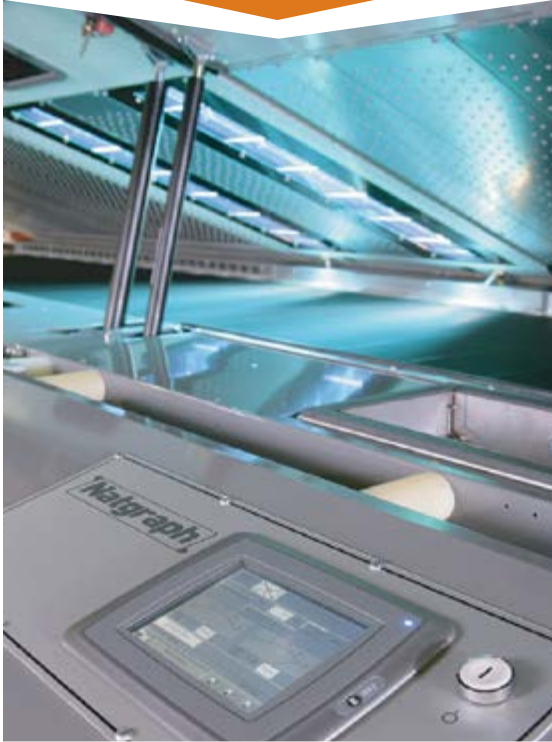


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IN BRIEF

### Cefla Finishing to present tactile innovation at InPrint



*Cefla's J-Print single pass systems will produce tactile effects using Kuei's MyTexture technology*

Cefla Finishing is now offering relief printing or haptics effects based on Kuei's MyTexture technology applied to single pass systems – such as the J-PRINT SP1300 TD – suitable for printing on items with side dimensions up to 1560mm, with a resolution of 400Dpi at

an output rate of up to 50m/min, producing an end product with textures perfectly in tune with the visual image.

These figures and performance information suggest a highly advanced system, able to combine speed and user-friendliness, suitable for large output volumes and designed to ensure the customisation potential typical of digital printing technologies. The tactile effect created on the item at the end of the process precludes the need for additional protections and using standard coatings.

This translates into unlimited options in terms of surface characteristics – such as the extremely high strengths required in flooring. The process is suitable for integration in roller-type production lines for panels with single-pass printing machines, both for colour decoration and for tactile decoration. ■

### HEXIS Group reveals €17 million investment plan

A commitment of €17 million over three years will support HEXIS Group's five-year strategic plan up to 2020. Investments involving the acquisition of lands, a new manufacturing line, and modernisation of production tools will enable the group to own two fully autonomous production sites.

The acquisition of a plot next to the head office in Frontignan in September 2017, will make it possible to redefine flows and to strengthen the safety of assets and people. In the HEXIS subsidiaries located in Spain, West Indies and Scandinavia, new lands will allow the construction of administration, logistics and training buildings. These premises will strengthen the subsidiaries' independence, enhance responsiveness and customer service.

In the second factory based in Hagetmau, the construction and launch in 2018 of a new casting line (CAST 4) in a controlled environment will significantly increase the production capacity for special and technical product ranges. This new equipment will consequently free up production capacities in the Frontignan factory and increase the company's reactivity and flexibility.

In addition, new peripheral equipment such as cutting and packaging lines are currently being installed, to make the Hagetmau factory 100% autonomous.

Two additional VOC (Volatile Organic Compounds) processing units will be coupled with the current production equipment in Frontignan and Hagetmau. They will take care of the environmental treatment of the new production capacities and will secure production times. These new thermal oxidisers will increase the development capacity of both production sites of the group. ■

## InPrint 2017 moves industrial print to the next level

Whether focused on décor, packaging or functional printed electronics, industrial inkjet is moving onto another level. There is an acceleration in changing consumer behaviour that is placing greater emphasis on technology to enable new possibilities.

In packaging, for example, shopping behaviour has shifted dramatically. In the UK alone, 54% of all retail is now conducted online. This changing consumer landscape is placing further impetus on getting the right product into the right place and really standing out. Digital print has a huge role to play as a result as increasingly retailers want short run, customised and relevant product and need a flexible and fast production technology to help them to respond and meet these changes.

The InPrint Survey this year showed that people's growth prediction was still robust, but more moderate than 2015/16 when there was a peak in confidence in growth for industrial inkjet. This suggests that the supply chain, including most importantly the end customer, have a clearer understanding of the time and difficulty of introducing inkjet into production. It still is not quite as simple as 'plug in and play', and the market has understood this and the fruits of longer developmental work are starting to show.

Regardless of this, many believe that technical problems can be solved given the right collaboration, patience, and determination.

However, the biggest obstacle for industrial inkjet growth is the conservative culture of many manufacturing sectors that are heavily invested in analogue production and see digital as a threat and are fearful of failure.

To overcome these cultural barriers, the key to change is effective communication from the entire group of people involved in developing and manufacturing. The reality is that digital printing is not a threat to analogue production. If you have a new technology that can help you meet a new demand, whilst not disrupting your core operation, surely this is a good thing! It is a misnomer to think that digital inkjet will replace screen, flexo or gravure. It will provide new value that enables new possibilities that perfectly fit the shifting consumer behaviours we see in the world of retail. Inevitably if the end consumer is changing the rules, manufacturing will have to adapt to meet this new demand, and with effective dialogue, collaboration and effective communication success will be realised.

Since its launch, InPrint has enabled this effective communication from brands who travel all over the world to meet InPrint exhibitors who have the technology and expertise to help manufacturers unlock new possibilities in industrial print production whether this is digital or screen printing. The show provides a communication solution to all who attend and its continued success will undoubtedly provide the impetus for more change, and adoption of new technologies that enable new production possibilities in line with even faster-changing consumer landscape. InPrint 2017 takes place in Munich on 14–16 November 2017. ■



InPrint 2017 takes place in Munich on 14–16 November 2017.

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## Barbieri electronic launches new measuring device

A new spectrophotometer from Barbieri electronic combines the latest colour measuring technologies with innovative methods of illumination. The Spectro LFP qb comprises three components: The Spectro LFP platform, the measuring stage with an enhanced clamping system and integrated M1 backlighting (for transmitted light measurement). The spectral unit (measuring head), which incorporates the latest qb technology and comprises the high-precision spectral core, three light sources for uniform illumination of the media surface from three different angles, and seven LEDs to guarantee real M1 daylight illumination pursuant to the standard. (The head is removable for fast and reliable spot measurement). The third component, the sensing unit, has an integrated camera which helps the measuring device to automatically recognise the target, perform a precision measurement and communicate the position and the photo to the RIP software for further processing.

The Spectro LFP qb offers a new

measurement mode M1 Part 1/Method A for reflection and transmission (pursuant to ISO 13655-2017); switchable apertures (2, 6, 8mm) for measuring different materials, surfaces, inks and resolutions; and measurement of fluorescent inks

“Our Spectro LFP qb incorporates the know-how we have built up through 15 years

of collaboration with leading international bodies, regular customer feedback and experience on the market,” said Markus Barbieri, Director of R&D. “Now we are satisfied: we can offer our customers not only solutions for existing problems but for the first time also a platform that opens up a world of new possibilities and applications.” ■



*The Spectro LFP qb ushers in a new age of colour management*

## RUCO guarantees maximum security with innovative inks

German ink specialist RUCO will be presenting its product range at InPrint 2017. The focus this year will be on two universally curing screen printing ink series that are suitable for use both with LED technology and on machines with mercury- or iron-charged standard UV lamps.

The demand for LED-curing printing inks has been increasing continually for some time and RUCO's 937LED and 955LED-LM inks allow users to enjoy all the advantages of this process.

Whether cured under standard UV lamps or LED lamps, the two-component inks of series 937LED for the decoration of glass, ceramics and metal feature excellent adhesion and very good resistance to chemicals, water and abrasion. Outstanding results are also achieved in terms of dishwasher and frost resistance. Due to their high level of reactivity they allow for high production speeds.

The new inks are also convincing from a visual point of view. In addition to 11 basic colour shades that feature high opacity and colour brilliance, RUCO offers transparent white, high-opacity white and black formulations, and a wide range of special-effect inks for metallic, glitter, matt and frost appearances. This opens up a broad spectrum of impressive design opportunities.

Ink series 955LED-LM, designed for printing on plastic containers, in particular tubes made of polyethylene, combines three crucially important forward-looking properties: in addition to offering low-migration characteristics, the inks

are free from silicone and represent a pure LED curing system. With this unprecedented combination, the product sets new standards in the field of screen printing inks.

Thanks to its low-migration formulation, 955LED-LM meets the stringent requirements of the Swiss Ordinance SR 817.023.21, EuPIA Suitability List of Photoinitiators and the Nestlé Guidance Note on Packaging Inks. Thus, the series is especially suitable for printing onto the outer surface of plastic packaging for the food and cosmetics industries. The second benefit is that the inks are completely free from silicone, which makes them ideal for combining with one another as well as with other ink systems and varnishes, while also allowing for embossing. During printing, the inks' optimum flow properties become prevalent and the print results feature exceptionally high gloss. Due to being highly reactive, the inks allow for high printing speeds of 100pcs/min and exhibit excellent adhesion and elasticity.

In addition to LED screen printing inks, RUCO will also be showcasing a wide range of pad printing inks at InPrint 2017 that meet extremely rigorous demands in terms of environmental compatibility and user friendliness, and offer excellent mechanical and chemical resistance. Ink series T35, T120 and T200 are all free from cyclohexanone and aromatic solvents.

Pad printing inks of series T35 were developed especially for the highly sensitive field of toy decoration and are suitable for use on ABS, SAN, acrylic glass and polystyrene.

These one-component inks meet all the demands specified in relevant industrial standards, as well as in the EuPIA Exclusion Policy, REACH regulation (SVHC), the Swiss Ordinance (SR 817.023.21), Canadian Hazardous Products Act (R.S., c.H-3, s.1.) and the current European safety standard EN 71-3. T35 inks are free from phthalates and chlorine compounds and can also be used for printing onto the outer surface of food packaging, correct handling ensured.

Fast-curing pad printing inks of series T120 are ideally suited for rotary pad printing, one of their main areas of application being the high-speed printing of bottle caps made of pre-treated PE and PP. However, T120 inks are also an excellent choice when it comes to conventional pad printing applications, such as the decoration of advertising materials, electrical devices and home appliances.

One- and two-component inks of series T200 are true 'all-rounders' for universal use on a wide range of plastic materials used in the packaging, advertising and home appliance industries. These inks are free from phthalates and aromatic hydrocarbons and, like T35, can be used for printing onto the outer surface of food packaging.

RUCO's exhibition portfolio will be rounded off by proven series T25 inks for pad printing on PE and PP which are used in a wide range of industrial applications, and the universal T28 ink series, designed for the decoration and coating of glass, ceramics and metal. ■



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## Hönle has drying and finishing covered

Drying specialist Hönle will show its lamp units and the latest developments in UV/UV-LED and IR technology at InPrint 2017. In addition to the successful IR and UV versions of its jetCURE curing and

drying units for inkjet printing processes, Hönle will show the further development of the jetCURE LED. This solely air-cooled UV-LED high-performance curing unit with integrated electronics offers intensities up to 16W/cm<sup>2</sup> which lead to an efficient cure even at high web speeds. The jetCURE LED is available in the wavelengths 365, 385, 395 and 405nm. Radiation width and wavelength can be tailored to each application individually and the LED-UV unit can be retro-fitted on existing machines.

Another development is the compact, lightweight LED Powerline AC/IC, an air-cooled UV-LED high-performance unit

with intensities up to 8W/cm<sup>2</sup>. Its newly developed intelligent controller is integrated in the LED device. Hönle offers the LED Powerline AC/IC in two versions which differ in intensity output and size of the radiation aperture (78mm x 10mm/82mm x 20mm). For larger radiation widths several LED heads can be connected without gaps.

If a plug in & play solution is preferred, the LED Powerline AC/IC can be combined with the new LED powerdrive IC. This recently developed control unit has a large display screen to assist when setting operating parameters and for monitoring.

All versions of the LED Powerline AC/IC are available in the wavelengths 365/385/395/405nm for a perfect adjustment to the printing ink or coating. ■



Hönle's jetCURE LED curing unit offers intensities up to 16W/cm<sup>2</sup>

## Lotus Holland grants screen printers' dreams

Screen printers with a Computer-To-Screen (CTS) wishing for an inline exposure and development system now have an answer: Lotus Holland's Lumenator II (patent pending).

The Lumenator II is a UV-LED exposure and development system for the (textile) screen printing prepress process. It is designed to quickly expose and develop screen printing frames on which a digital image has been created with a CTS-system, such as an Exile Spyder or M&R i-Image S.

"For those who purchase a CTS-system, it makes no sense to expose and develop the screens manually," explained Frens Peters, CEO of Lotus Holland. "For that purpose, the investment of a CTS is too high. A constant and high quality of exposure and development is the result of the Lumenator II. Just by

standardising and automating, you save time."

The Lumenator's LED light ensures a homogeneous and even distribution of the light and exposure time can be entered and stored via a touchscreen display. The UV LEDs and the water supply are automatically switched off after completion of the exposure and development to reduce costs.

The entire process – from the infeed of the screen, the exposure until the developing – involves no operator. Depending on the type of mesh and the emulsion used, exposure time is only 11–14 seconds, and the development time is no more than 1.5 minutes; up to 250–300 screens per eight hours can be automatically produced.

"The quality is overwhelming," stated Peters. "We have performed tests with screens with a resolution of 1200x2400 and an LPI of 65, while majority of textile printers work with a much lower resolution.



The Lumenator II is an inline exposure and development system for screen printers with a CTS system

The Lumenator II is suitable for screens with a maximum size of 109 x 81cm (43" x 32"). As a specialist in custom-made screen cleaning equipment, Lotus Holland can also produce an inline exposure and development system for larger format screens on request." ■

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