TECHNICAL GUIDE

PACKAGING

EMBELLISHING & FULFILLMENT

Second Edition

FESPA
profit for purpose

Embellishing & fulfillment

Packaging printing is one of the few sectors of the wider printing industry that isn't particularly threatened by e-media or the internet of things. And with a steady stream of digital printing technologies being introduced, it's also possible to meet customer demands for ever-shorter turnarounds.

Screen printing is capable of creating a host of stunning special effects. Raised varnish, cold foiling, fluorescent and metallic finishes add interest, value, and can be a key differentiator. Special coatings added to embellish prints produced in the screen printing workflow include such things as scratch and sniff. Photochromic inks can be used so that colours change dramatically under different lighting conditions. Thermochromic inks are affected by temperature to produce different colours and phosphorescent inks glow in the dark.

In food packaging such inks and coatings should only be used if they are nonmigrating and comply with food safety regulations.

The is also true for hot foil blocking and and embossing. Both techniques add a touch of luxury to products if the run length and end product value justify the added cost.

This Sakurai Cylinder screen printing line for embellishment with max sheet B1 runs at 2,000 sheets per hour using the latest camera registration for a perfect fit. Some of Sakurai's cylinder presses run at up to 4,000 B1 sheets per hour using conventional gripper feed.

This folding box board presentation box includes a host of special effects on gold Mirriboard. There is structured UV varnish, cold foil, microlens varnish included which are all intended to add value. Image courtesy of Perfect Packaging, India.

Switching to digital printing offers opportunities for completely new services and features, but has its own challenges. For instance, it's not much use to have a very short startup time for the digital press, if the finishing part of the job is done

3

Image courtesy of Scodix

conventionally and takes days to complete. Digital foiling and digital cutting to offer new complimentary services, but will also bring new challenges and training needs. Digital production does not replace conventional methods, but rather opens up new possibilities. Those possibilities need to be proactively sold to excite customers and justify the additional production budget.

Packaging printing often includes a series of additional effects and features, otherwise known as embellishments. In a digital workflow it makes sense to add embellishments on a digital press if possible, or alternatively to have efficient near-line capacity.

Finishing, or fulfillment, is another task which should ideally be done digitally, but there are other aspects of fulfillment that have less to do with technology and more to do with general Quality Management. We'll go through these areas in this guide, giving some examples of what to consider and to put in place.

Close up of Scodix varnish and cold gold foiling where the varnish becomes an adhesive for foil transfer.

Embellishments

While packaging print production as such covers a wide range of applications, perhaps one of the most attractive, and possibly most profitable, is exclusive and custom-tailored packaging. Digital printing, of course, opens up the possibility to produce personalised products using variable data software. But today that might not be attractive enough to raise anyone's eyebrows or make them say WOW! More impressive embellishments are ever more needed, and the chase is on to offer such new unique special effects.

One advantage digital has over conventional screen print is greater registration precision between the printed image and the overprinted enhancement. Only the best available screen technology can ensure that the UV varnish does not wander or drift throughout the run, due to the nature of the process which uses the sheet edge as the common point of register. Digital presses use photo-optic camera systems to ensure registration precision of +/- 250 microns, allowing even for fine text to be accurately enhanced.
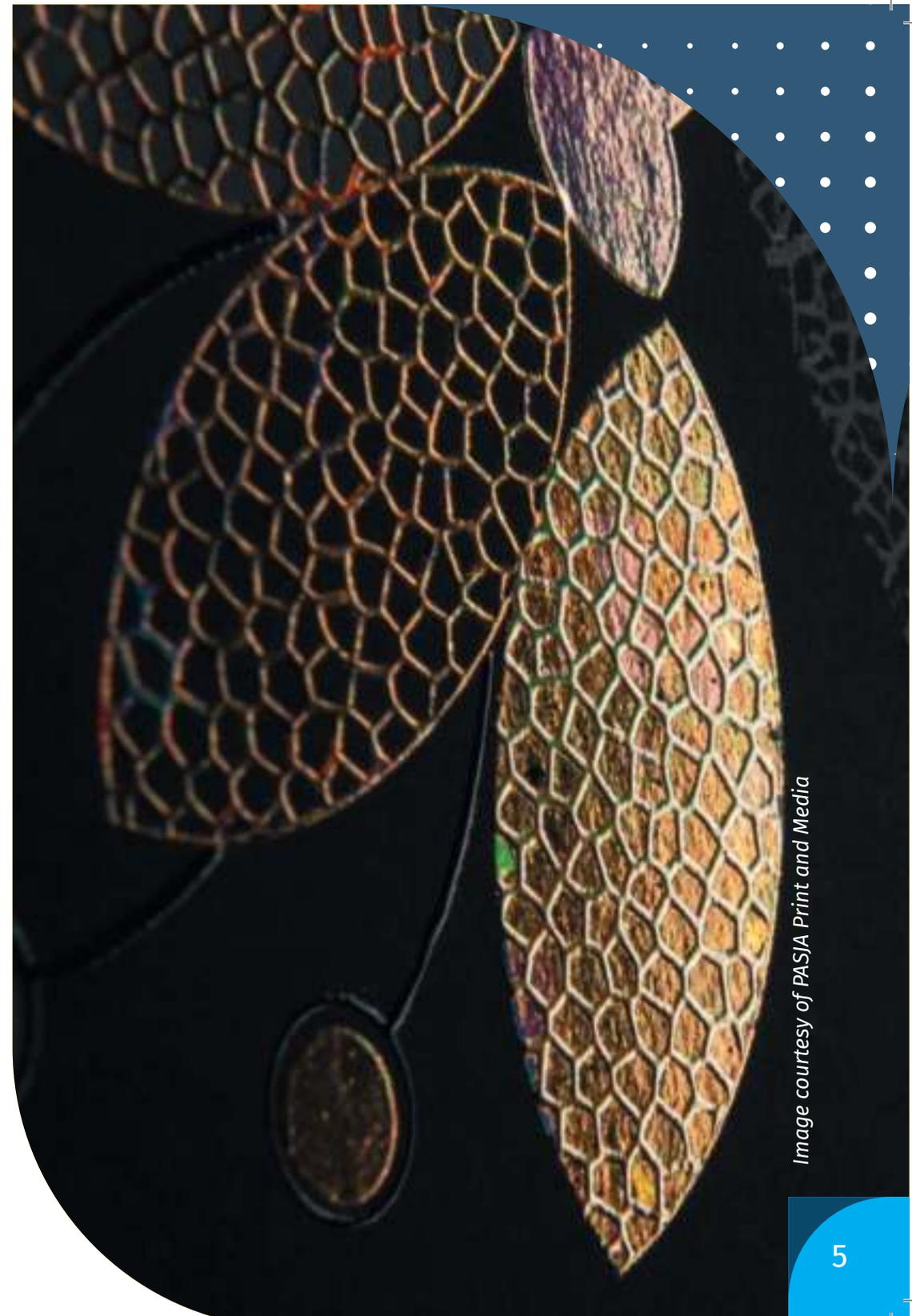
Image courtesy of PASJA Print and Media
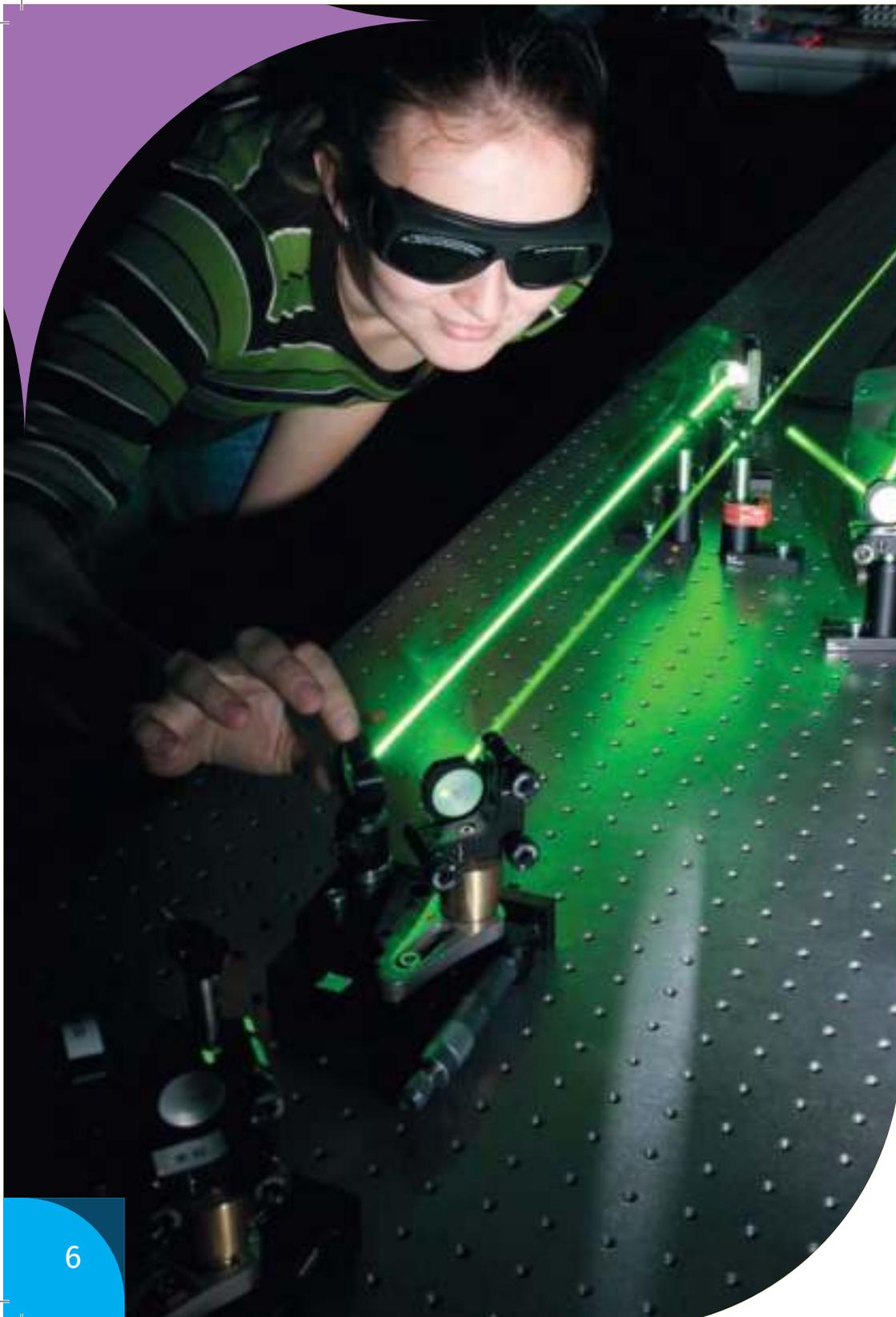
MGI JetVarnish Evo 3D inkjet varnish running at 2,300 B1 sheets per hour at maximum speed (subject to design and thickness of varnish) Add foil unit for the full range of digital effects whereby even raised foiled embossing can be mass customised.

Digital enhancement systems however have limitations of their own. For instance, when offering raised or high build varnish, uncoated or very porous materials may need to be laminated to ensure a satisfactory result. Screen printing techniques generally cope with uncoated stocks for varnish and cold foil finishes. For all processes it is important to understand them to be able to offer a wide range of options to clients and, crucially to deliver the best possible end result.

Efficient hybrid systems combine digital printing with for example flexo and screen printing to create cost-effective solutions.

The Scodix E106 inkjet embellishment press prints up to 4,000 B1 sheets per hour. It offers the scope to run straight UV varnish to compete with screen printing, for foil, matt, crystal and glitter effects for carton board printers.

Scodix digital UV structured varnish can be used to enhance colours and add cold foiling inline for even more engaging packaging.

Image courtesy of PASJA Print and Media.

Finishing

The line between embellishment and finishing is sometimes a bit blurred, but features like creasing, slitting and die-cutting are normally regarded as operations belonging to the finishing stage. It makes sense to find a digital solution for this, since cut- and crease forms are both expensive to produce and may add days or even weeks to the production cycle. With digital production, errors can be fixed immediately, and small corrections made instantly. While make ready for a new job on an analogue cutting and creasing machine typically is one to one and a half hours, in worse cases even up to four hours, cutting and creasing times can be down to about 20 minutes with a digital system.

There is a range of digital solutions for this, from manufacturers such as Glowforge with small format lasers through to Trotec Laser, Highcon, SEI as examples of industrial machines.

Laser cutting enables far more complex designs than conventional die-cutting ever could and is tool-free.
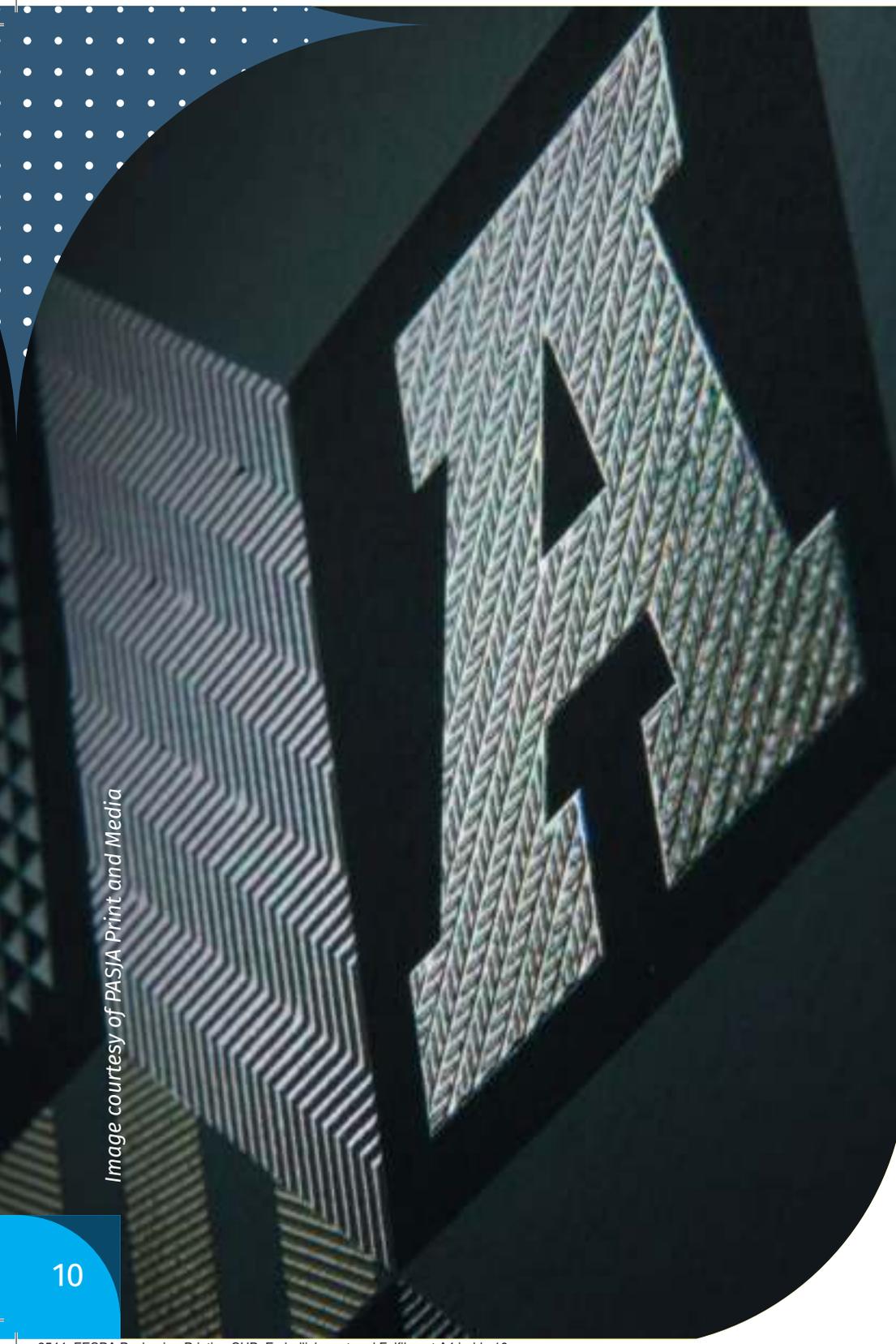
Glowforge A3 small format laser cutter, for prototyping, laser engraving and personalisation applications across multiple materials.
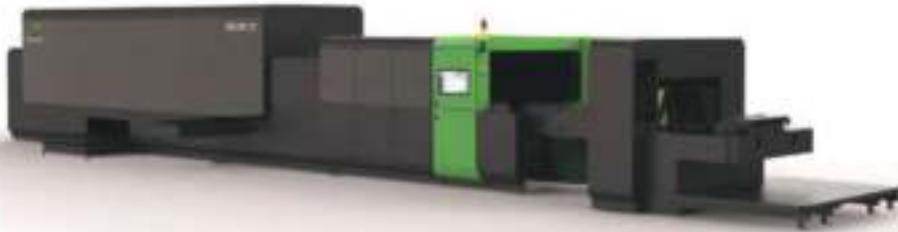
Highcon Beam 2C B1 production laser cutting and creasing plant

Highcon uses the term Direct-to-Pack to describe their technology since they believe this technology will have as big an impact on post-press production as Computer-to-Plate (CtP) had on printing. The positive effects are the same with both: savings in both time and materials, and a more environmentally friendly production process. The Highcon Beam can process a maximum 5,000 B1 sheets per hour.

SEI PaperOne 5000 Laser B2 cutter for substrates up to 600 microns thick. It also features a digital creasing matrix option using male female plate. It has a production speed of 2,500 sheets per hour.

While lasers have been used in industrial production and also in print production, for a long time, what's unique with the new technologies is the creation of the creasing forme using digital tools. For example, an acrylic polymer can be applied to the forme inside a curing machine, where it is cured in single pass using UV light.
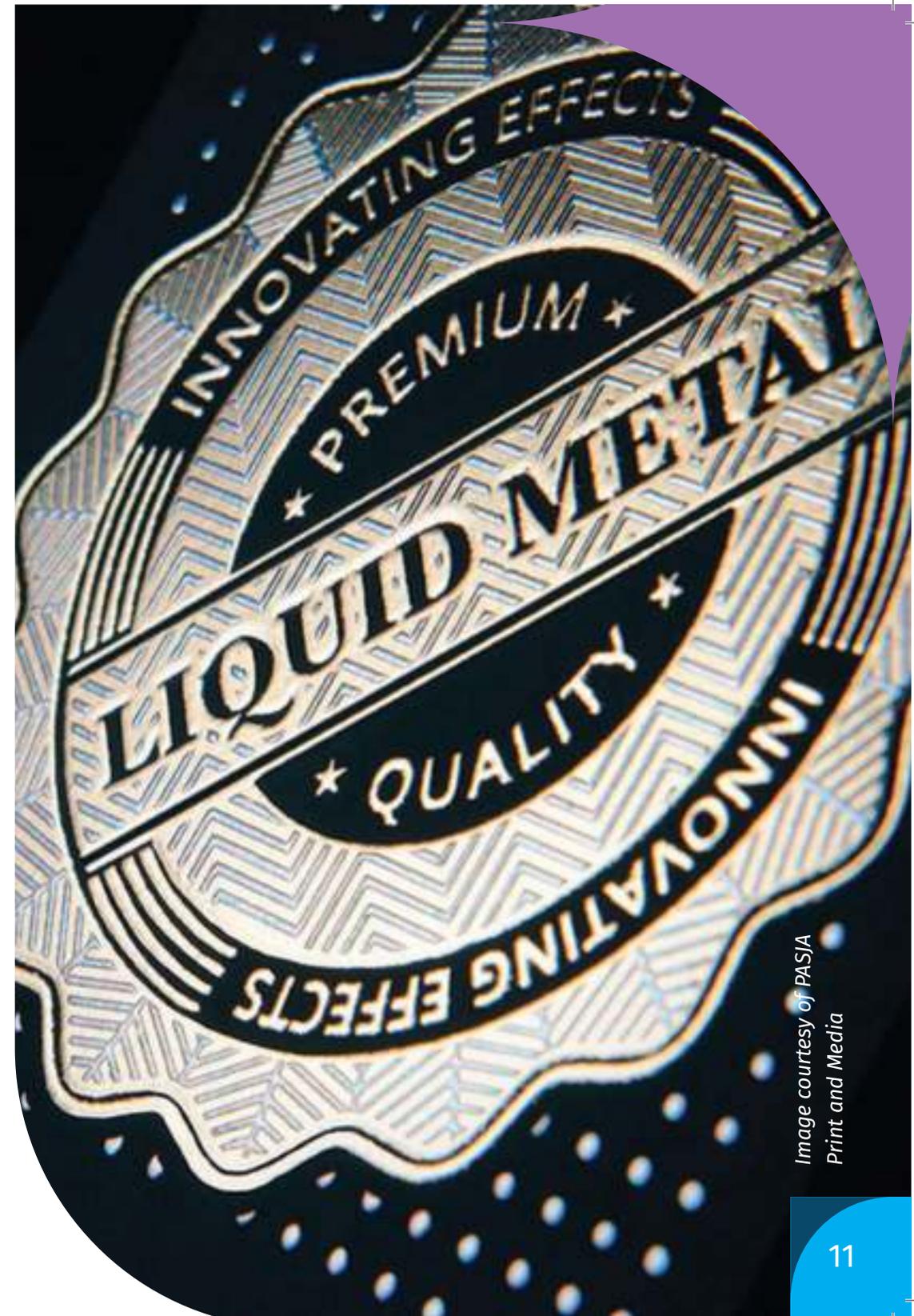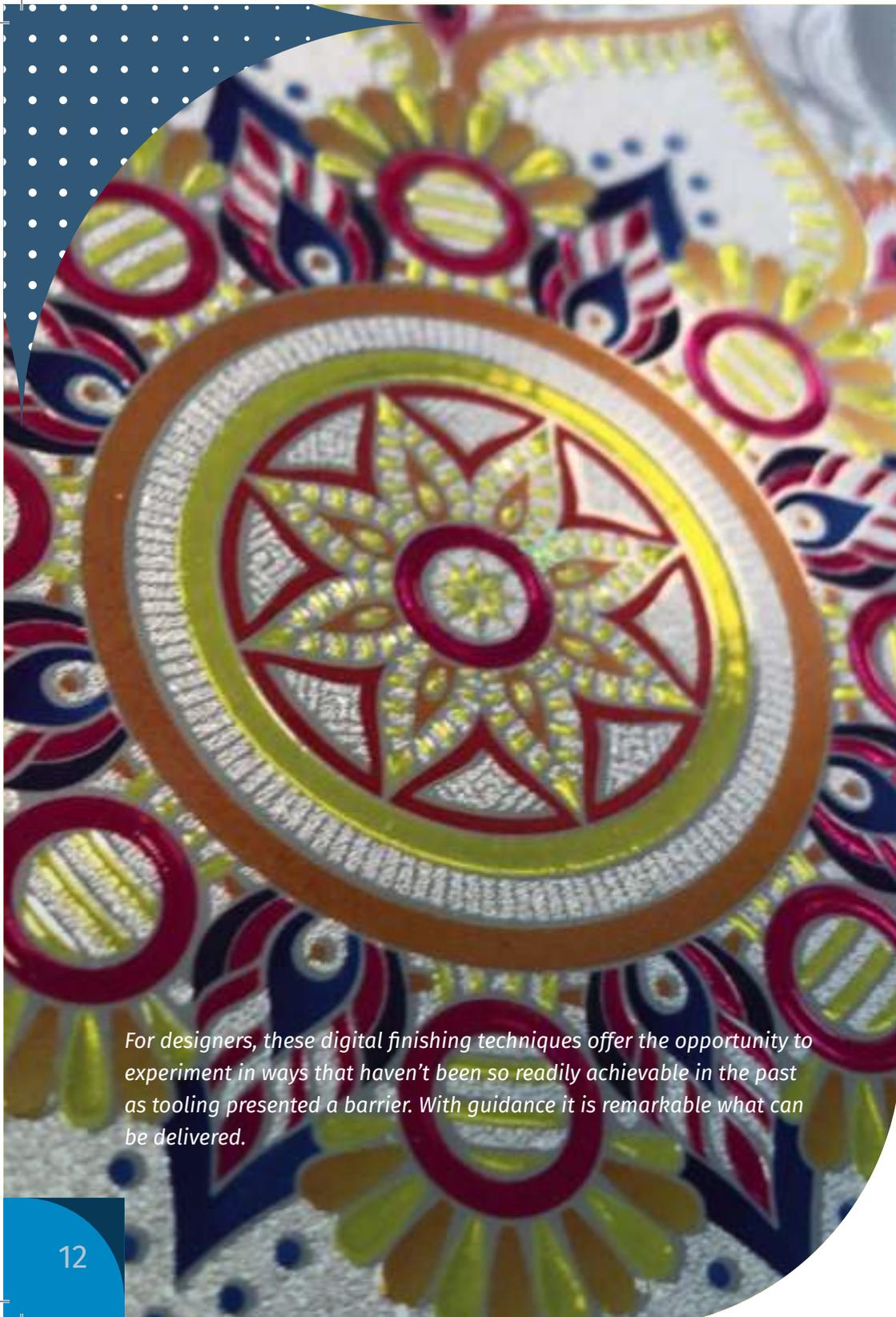
Once creased the substrate can be cut either completely or with only a partial cut, a kiss cut. Digital finishing technologies create new opportunities for printing companies interested to get into the packaging market by offering finishing and embellishment services such as these.

Technology for digital embellishment and finishing is developing rapidly as the use of digital printing increases, often putting up a good fight against many conventional finishing methods. Technology advances coupled with zero or minimal tooling, creates opportunities to mass-customise at near mass-production costs. Many laser engraving and cutting machines, such as those from Trotec Laser and Zünd are available for short run production, and they are capable of superb results. As the technology has matured, lasers have improved so that the aestheticly undesirable occurence of scorching is getting more rare.

Fulfilment

While finishing is included in the scope of overall fulfillment, quality control for the whole production process is integral to packaging finishing. This means that fulfillment includes many aspects of quality management, and in packaging, it is the producer that is responsible overall for quality. This can even include aspects of health and safety and it's common for packaging to meet regulatory requirements in this area. If you print packaging for food and drinks you probably should read up on what the Global Food Safety Initiative (GFSI) has to say on this or investigate the benefits to certification. GFSI is a private organization, established and managed by the Consumer Goods Forum, an international trade association. The GFSI maintains a scheme to benchmark food safety standards for manufacturers, as well as farm assurance standards.

To ensure quality on the printing side of the equation, there are internationally well known and respected certifications, among them certifications done by GMI (Graphic Measures International) monitoring both company process and print quality, certifies and measures the performance of packaging suppliers. They help brand

Packaging standards for food whether flexible films, cartons, or plastic enclosures face stringent control to ensure public health.

owners control the variables through print facility certification and scientific, repeatable measurement of global packaging. The audit includes all processes and not only the final print. But whether you go for third-party certification, or just apply your own quality management system, you need to make sure you have established Standard Operating Procedures (SOPs) for all of the crucial production steps. Those include things like colour accuracy and colour fastness, lightfastness, rub resistance, and so on.

The beauty of digital packaging print production is that the proofs (comps, mock-ups, etc) can be done in the actual production printer. But even so, the colour accuracy should be measured against a given standard, either setup internally, or using and international standard like ISO 12647-2 (litho offset), or possibly ISO 12647-6 (flexo). There is no international standard for digital printing, but the standards for conventional analogue printing can be applied here just as well.

Make sure you have nailed down the requirements from your customer down to every detail, and then build your checklist to be able to validate that you meet those requirements at every step of the way. Within ISO, there are various packaging standards relating to mechanical testing for such things as child-proof containers and transport packaging for dangerous goods.

Establish what the tolerances should be for the different measurements and that you use the relevant test methods. Also make sure that your client understands what those tolerances mean and that they acknowledge them as relevant for their print project. When it comes to colour quality, there are well established aim values for CMYK jobs, as well as acknowledged tolerances for colour deviation express as Delta E (ΔE) values. Unfortunately there is not broad agreement on what colour deviation is acceptable for spot colours, but as

a rule of thumb, you might expect about half the colour deviation when printing a single spot colours, as when printing the CMYK process colours. So if you have a tolerance of ΔE 5 for process colours, you might aim at a tolerance of ΔE 2.5 for single spot colours. The specification of spot colours is increasingly done using the Colour Exchange Format (CxF), an internationally accepted colour data format, now used in many colour management software tools. Ask the customer how they specify their brand colours, and then calculate how closely you can match this in your digital packaging printing system (or hybrid system).

Print quality very much depends on the quality of the incoming files, the artwork. If customers don' supply native artwork files (often Adobe Illustrator, InDesign, or Photoshop), you may find it useful to ask for PDF/X-files, which are typically pre-flighted and checked technically before being sent to you. But even so, you should always preflight incoming files before sending them on to the press and your preflight checks should take into account embellishments where relevant.

There are acknowledged test methods for many of the finishing processes, and for the final print. For rub resistance you can use the Sutherland rub test (ASTM D5264); for lightfastness use ISO 12040, bar codes can be validated using ISO
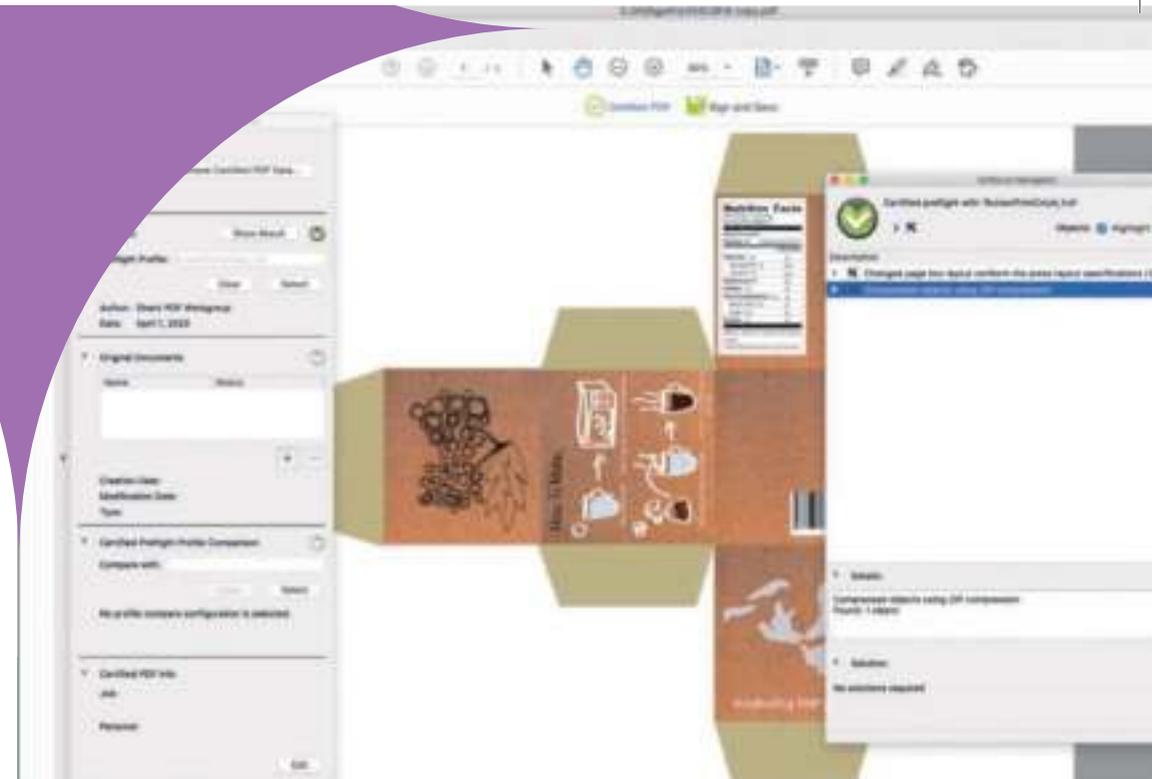
Pre-flight checks on files can be made using Enfocus Pitstop which includes the Ghent Work Group (GWG) pre-flight profiles amongst many other workflow tests and editing tools to eliminate processing problems before sending to production. Pre-flighting software can also be configured to test a whole range of custom conditions where the printed material doesn't fit established standards.

15426-1 and so on. If there is an internationally accepted or recognised test method, you should, of course, use that.

Fulfillment is about meeting customer's expectations, and if you have provided some unique features to the print, including physical embellishments, you might even exceed the customer's expectation. Using digital technologies you are in a good position to be able to do just that.

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