



Inkjet digital printing on a grease cartridge

Swapping the press is just the start

# What do new entrants into inkjet digital decorative printing need to watch out for?

In recent years, a number of manufacturers of inkjet digital printers have launched models for the decoration of glass, metal or plastic containers. The systems differ in their complexity and, consequently, the required level of investment. In line with its declared commitment to guaranteed reliability and printer availability, Koenig & Bauer subsidiary Kammann is aiming the digital printers it introduced three years ago at the upper end of the performance and price spectrum. At this level, according to Matthias Graf, managing director of KBA-Kammann GmbH (Bad Oeynhausen), inkjet already delivers production quality on a par with screen printing and even enables the same industrial approach.



All-over printing of plastic containers with demanding geometries

The contactless nature of inkjet makes it a particularly suitable method for printing on asymmetrical objects. In order to guarantee consistent quality, however, it is necessary to keep the distance between the inkjet print head and the object being printed as constant as possible.

This is not difficult in the case of uniformly cylindrical objects such as silicone or grease cartridges, but the challenges become significantly greater with convex or concave shapes or when decorating objects which are entirely asymmetrical such as decorated beer glasses or plastic containers for the body care market.

## Kammann: Practical experience since 2013

Kammann entered the market for inkjet digital presses in 2013 and

there are now about a dozen users who have adopted the technology developed in Bad Oeynhausen – primarily in the form of hybrid printers which offer both screen and inkjet printing.

What has become clear to Kammann in the course of numerous discussions over the past few years, however, is that many users who are planning to take the plunge and move into digital printing have not thought this step through sufficiently and are thus inadequately prepared. Potentially trapped in a technology which they cannot handle, such customers can all too quickly find that their investment has become a dead end and subsequently draw completely wrong conclusions as to the market maturity of the digital printing process as such.

## Why use digital printing to decorate objects?

Digital printing technology, in combination with web shops, has given the public the opportunity to customise virtually any printable item. Having started with paper products such as photobooks, this trend has long since spread to packaging of all kinds.

The personalisation of a plastic drinking bottle with a name or even a photo triggers a steep increase in value, and consumers are prepared to pay a lot more money than they would for an "impersonal" mass-produced product. This in turn means that suppliers are able to achieve higher margins.

Inkjet digital makes it possible to decorate even single objects. Equally, a different image can be printed on each example of the same object. By eliminating screen costs, inkjet digital also offers an alternative for short print runs and applications, such as samples of new decorative designs or instances where numerous different motifs are required, but the required batch sizes are correspondingly small. If digital printing can be used to reduce minimum order quantities, then customers may be willing to accept higher unit costs.

## Special applications

Leaving aside production quantities, there are still many other rea-

sons why companies should consider inkjet for decorative printing.

*Halftone decorations:* It is common knowledge that the make-ready for many halftone decorations can occupy screen printers for half an hour or more, especially when decorating glass objects with their attendant dimensional tolerances. Digital printing is a meaningful alternative for such applications, because the inkjet heads are always perfectly aligned with each other. And since it is a contactless process, quality is not critically affected by the varying distances of the heads from the surface of the object.

*Alternative to sleeves:* Digital print can also be used as an alternative to sleeve labels where it is sometimes impossible to avoid blisters and air bubbles, which otherwise impact production quality. Inkjet heads are able to print all parts of a shaped bottle.

*Tight radii, grooved surfaces:* Oval objects with their often tight radii are ideally suited to inkjet printing, and the same is true for the decoration of objects with surfaces which have been impossible or at least problematic up until now. Grooved surfaces are one example.

The illustrations on page 43 reveal some of the characteristics of digital printing:



**Individually designed glass bottles, presented at Glasstec 2016**

1. As a contactless printing process, it is capable of printing in places which screen printing cannot reach.
2. It is possible to print with accurate register on both debossing and embossing.
3. The entire surface of an object, right down to the base, can be finished without problems.
4. Sharp reproduction of fine lines and type.
5. 360-degree sleeve printing is also possible – even with photorealistic images.

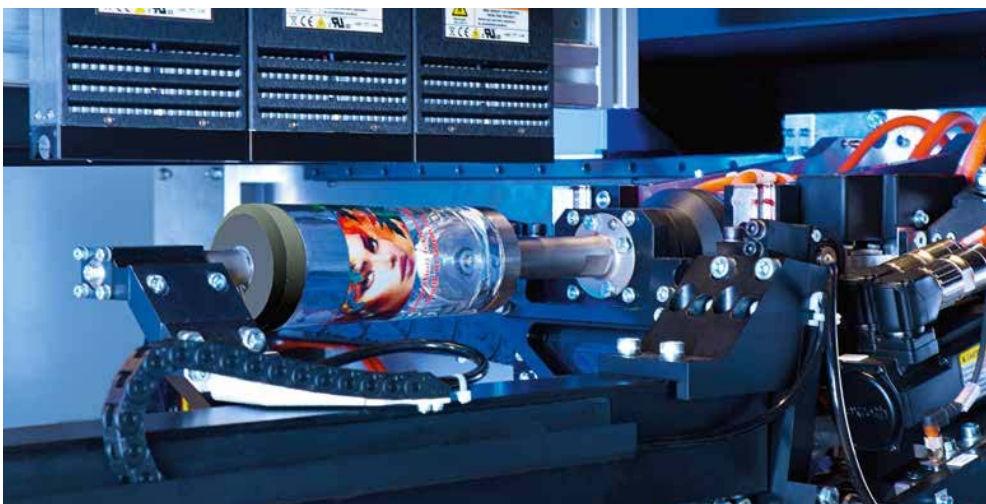
Inkjet digital is also capable, to some extent, of producing the relief structures which screen printing achieves through appropriately thick layers of ink. A double application of opaque white already creates the impression of a relief.

**LED-UV pinning station**

## What do I need to watch out for when I move into inkjet digital?

Professional-grade digital printers should not be confused with desktop office printers, even though both employ the inkjet process. The same holds true for the quality of the end product, and even more so for the prerequisites to be met by the production environment.

The so-called drop-on-demand (DOD) piezoelectric process is one in which the nozzles of a print head are opened for each individual drop of ink. This means that drops of ink are only expelled when they are actually needed. The individual ink drops fired at



the surface of the object can be as small as 2 picolitres (1 picolitre equals a trillionth of a litre,  $10^{-12}$  litre). The nozzles in an inkjet head are correspondingly tiny and can thus easily become blocked. Such blockages can already be triggered by stray light hitting the UV-cured inks which are commonly used for container decoration. Just one blocked nozzle will be apparent in the printed image, and so it is vital to prevent nozzle blockages if top quality is to be achieved.

It also does inkjet print heads no favours if they are used infrequently. In order to avoid these kinds of problems, Kammann ensures that the ink in its digital and hybrid presses is kept circulating. In addition, shields prevent stray light from reaching the individual print heads. These measures ensure exceptionally reliable print head operation, but if a nozzle should still fail, despite everything, smart software functions can compensate during the printing process by activating redundant rows of nozzles.

Such complexity means that what an inkjet press used for decorating containers really needs are operators who know what they are doing and who are prepared to take on board the importance of press

care and regular servicing. The process also calls for skilled pre-press staff who are able to optimise data supplied by the customer for print.

### Support from the press manufacturer

Digital printing can only be economically viable when, on the one hand, high-quality products are produced consistently and, on the other hand, the necessary makeready times, net machine performance and the costs of the consumables remain within the defined envelope. As with screen printing and/or hot stamping, makeready time can be minimised through the use of 3D scanners, as well as an optimum level of press automation.

Kammann's staff are fully conversant with the various hurdles confronting both newcomers and printers switching to digital. A manufacturer with expertise covering the entire production process, who can thus provide comprehensive support, is especially important for companies who have previously outsourced their decorating processes to service providers and possibly lack basic knowledge which is imperative when bringing this value creation step back in-house.

**Motorised product alignment for high-quality print results**

Before they make an investment decision, Kammann guides those interested in moving into inkjet digital print through all the steps in the process, using their own products as examples. This starts with data preparation and profile generation, and continues with advice on the optimum level of automation for the printer. This is the only way to lay the necessary foundations for investment calculations, assessments of employee training needs and effective realisation of the digital print workflow.

### Combining the best of two worlds

The various decorating processes – screen, inkjet or hot stamping – all have their pros and cons. KBA-Kammann is the only decorating technology supplier to combine multiple processes within one printer and to offer inline hybrid solutions.

Outwardly, a linear K 20 or a K15 rotary-table printer for industrial digital printing appears identical to the same model for screen printing. Combined with a familiar operating platform, this helps to secure acceptance in any company which is already working with Kammann equipment. But even though the external dimensions of the printer may be the same, there is room inside for more print or drying stations, for example because space-saving LED-UV systems can be used.



The printing speed for decorative images whose height matches the built-in print heads is roughly the same as for screen printing, and so estimates can be based on the same output. When images of greater heights need to be printed, however, the inkjet head may have to be positioned several times. Software should shortly be available to enable "invisible" realisation of the resulting transitions. Another alternative is to print in a spiral, but this requires perfect interplay between the software, inkjet heads and transport system.

Kammann actually has a particular strength in fast and very precise product transport systems. These systems allow movement of the highly sensitive inkjet heads to be minimised and represent a decisive contribution to reliable operation of the overall printer.

### What matters at the various production steps?

Inkjet inks differ from screen printing inks in terms of covering power and this means that it is critical for the ICC profile of the printer to be matched to the object in question, its surface properties and colouring. KBA-Kammann has designed a device that makes it possible to generate optimised profiles for printing on containers.

This involves printing patches on the original object and then calibrating the individual print heads on the basis of the resulting colour and intensity measurements. Kammann offers this calibration as a service, though customers can also choose to generate the profiles themselves (in which case the additional measurement device needs to be purchased).

None of this, however, releases the user from his responsibility to acquire adequate colour management knowledge for industrial digital printing. The sheer variety of different substrates and kinds of container makes this quite a complex undertaking, but has in turn also resulted in a growing number of external consultants specialising in such industrial printing processes.

Whilst the demands on the process differ massively from screen printing, at least the tools used for pre-press are not new. In most cases, the print data is generated, checked and retouched using Adobe software such as Acrobat, Illustrator or Photoshop. The data are then ripped using Onyx or Colorgate software to obtain print-ready, rasterised data.

In contrast to screen printing, inkjet uses almost exclusively the



four process colours cyan, magenta, black and yellow, and corporate spot colours need to be composed in CMYK. Opaque white can also be printed as a base layer, of course, and the inkjet heads can be used to pre-print a primer or protective coating.

### Free choice of ink systems and print heads

At this point, it is important to make clear that the Kammann technology, unlike many competitor systems, is not tied to specific ink suppliers. This means that it is possible to use the ideal combination of primer, ink and coating for any given application. It is also possible to make case-by-case decisions regarding the colour sequence and the use of UV-LED for pinning between each ink application on the basis of the image, the object being decorated and the demands to be placed on the decoration.

Kammann also allows the use of inkjet print heads from different manufacturers. Currently, resolutions of up to 1,200 x 1,200 dpi can be achieved, though only for simple geometries and products with non-critical tolerances where a minimal distance can be guaranteed between the print head and the object being decorated. The use of different drop sizes allows the level of detail to be varied

**Digital print permits the decoration of container forms which are beyond the capabilities of other processes**

within the image as a whole, which also helps when adjusting an image to conical surfaces.

### The future of inkjet digital decorative printing

There is no doubt that digital printing can unlock new market opportunities for the decorating of containers. Its pioneers, however, are still thinly spread. Since 2010, Kammann alone has sold some 200 of its K 15 systems, but if one compares this with the number of such systems that pre-date digital, the extent of the potential becomes apparent.

The future belongs to press users who are prepared to work together with the press manufacturers and customers to develop new business models. The more “business intelligence” is fed in, the faster the digital decoration express will get under way and fuel the technological development of container decoration.

Ultimately, perhaps, we will end up with a coin-operated “box” which, rather like copiers in copy shops, can one day be left unattended to produce individually decorated souvenir mugs and glasses.

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