

NEW PRINTHEADS CREATE NEW OPPORTUNITIES

Matt Barr and Graham Vleck explore how targeted printhead development such as improved nozzle technology and ink recirculation is bringing more applications into the scope of inkjet technology



Matt Barr is a Technical Specialist at Industrial Inkjet

The world of inkjet printing technology has recently been one of both rapid growth and near stagnation, depending on the market or application under consideration. The technology enablers of printheads, print electronics, inks and curing technologies are all under continual pressure to achieve capabilities that unlock new markets or opportunities. This article considers how recent printhead developments are helping to deliver this.

One defining feature of digital printing technologies is that ink drops are generated and projected onto the substrate. Drop location accuracy requires straight drop ejection and velocity control but suitably sized drops are also required to minimise flight disturbance from the air flow regime under the printhead during the printing process, especially at higher print speeds.

PRINthead POWER

Konica Minolta's independent firing KM1024i series of printheads was first introduced in 2012, with variants optimised to produce 6, 13 and 30-picolitre drop volumes. They became established for reliably jetting a wide range of fluids. Variants of these printheads are still widely used, for example in coding and marking applications that can require large throw distances to print onto concave sections such as the base of a coffee cup. For these applications, the medium/large drop volumes with larger drop mass help to achieve a long throw distance that is a requirement for this type of application. The drop mass/volume is important because a



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larger drop slows down less quickly and is less able to be disturbed in flight than a smaller one. For a given ejection velocity, a larger drop will have more energy and momentum and travel further in a straight

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line. But at the same time, larger drops also mean a reduction in the ability to print fine details.

Printhead and drive electronics manufacturers promote grey scaling technologies as a solution to the large throw distance/high print quality dichotomy. This provides both fine details from a small native drop volume, and when the image requires it, several small drops can coalesce in flight to produce a larger drop.



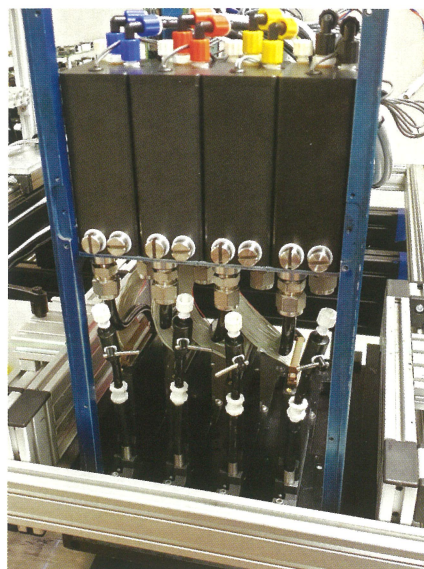
KM1280iMHH printhead

ACHIEVING LARGE THROW DISTANCES

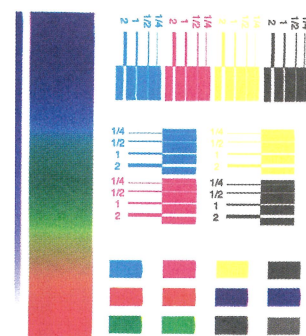
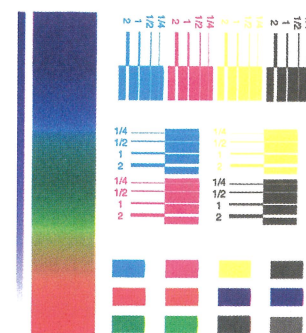
As new markets and opportunities continue to search for the perfect decoration technology, the choice has sometimes been to create a process with an older technology or try to force new technologies into something that doesn't quite work and that can restrict wider adoption. Thankfully there is a new generation of state-of-the-art printheads being released with new capabilities and formats. These are bringing applications that were not practically achievable to now be within reach of inkjet technology.

Since its purchase of Panasonic Precision, Konica Minolta has been exploring what is possible to achieve regarding large throw distances. Rifling is the idea of causing the drop to rotate around the jetting axis. Once generated in the nozzle, if the drop continues to rotate in flight this prevents the drop tumbling and helps to maintain its trajectory. Konica Minolta is developing laser ablated

stainless steel nozzle plates incorporating Panasonic's unique nozzle technology for this purpose. Combined with carefully optimised waveforms to increase jetting velocity without reducing reliability, the KM800 printhead



KM1280iMHH lab test printer



KM1280iMHH print samples



KM1280iM
900x450 1DPD
Low Sat Waveform
4mm GAP

KM1280iM
900x450 1DPD
Low Sat Waveform
5mm GAP

delivers ink throw distances up to perhaps 20mm depending on the required print quality.

KM1280iMHH PRINthead

Integrators today have an increasing number of options to choose from when selecting a printhead for their application. Printhead manufacturers are bringing printheads to the market with higher resolutions and increased drop location accuracies. One trend is towards 600 and 1200dpi resolutions and small drop volumes below 5pl with highly optimised waveforms typically targeting flexible packaging applications with a low print gap. Konica Minolta's KM1280iMHH takes a different direction. This printhead

smooth print quality whilst maintaining drop accuracy with reasonable print gaps. The specific integration of a silicon nozzle plate ensures excellent jetting straightness to maximise print quality at an intermediate to long ink throw distances, making the printhead suited for a range of applications.

APPLICATIONS

Inkjet machine builders are often quoted as saying that "we can print on anything". Such statements are then followed with clarification and qualifying statements to get from the starting point of 'technically feasible' to a much better position of 'practically achievable'.

If we look at product decoration

Another area that has been an active target has been decor and building products. For many years now inkjet has dominated in the ceramic printing industry. Some of the capabilities that enabled inkjet use in that application, in particular nozzle-level ink recirculation, are now seeing a resurgence in demand as ink chemists have started formulating décor inks using inorganic pigments with significant resistance to UV fading. This is a key requirement for outdoor building products. Konica Minolta's KM1024aLHG-RC printhead incorporates recirculation paths out from both sides of the nozzle to eliminate any dead zones in the flow.

As developments continue to occur with all of the inkjet technology stakeholders, new and exciting opportunities will enter the zone of being practically achievable, continuously expanding the reach of inkjet applications. ■

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