A Xaar Perspective on 'The Inkjet DRUPA'

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Abstract

DRUPA 2008 appeared to herald a coming-of-age of inkjet technology for mainstream print applications. Xaar and its partners and licensees presented a number of digital presses exploiting a variety of Xaar technologies showing real printing. Those technologies combined with the OEMs' own have impacted various commercial print applications today. Three of those technologies have been key to a good fit: first, the underlying piezoelectric DOD structure that delivers high native resolution and long printhead life; second, grayscale printing and its benefits in high-quality single-pass printing; third, TF Technology™, significant in meeting commercial printers' expectations for reliability. Past the euphoria of the show, the industry realizes that users face challenges with printing on a wide variety of media, and OEMs maintain steady progress in evolving their presses.

DRUPA 2008 – a year on…

"The tumult and the shouting dies, the captains and the kings depart…" and the Düsseldorf halls are again silent. A year on, it is a good time to reflect on what was informally billed as 'the inkjet DRUPA'. Those who have visited DRUPA shows in the past know that it is vast, with 390,000 visitors and 1,968 exhibitors spread across the 43 acre site. The challenge for the inkjet aficionado was to see all the relevant products and technologies, dispersed as they were across multiple halls. Fortunately, there was plenty to see.

Since June of 2008 of course, the world economy has significantly worsened. In June 2009, the goliath of DRUPA, Heidelberg Druckmaschinen AG, reported an 18% fall in sales and a half-billion dollar swing into the red. In the US, printing industry shipments are down 9.8%, and profits down 97.2%, according to WhatTheyThink.com, Economics & Research Center.

The result of the slowdown has been that many of the innovative products showcased at DRUPA 08 have taken longer to come to market than anticipated.

What did we see?

In non-consumer printing, inkjet technology has historically been well-established in wide-format and grand-format graphics, in coding & marking applications, and in mailing/addressing. In terms of inkjet technology, thermal inkjet (TIJ) has dominated the smaller wide-format machines and is making inroads into barcoding and mailing/addressing applications; piezo inkjet (PIJ) is widely used in grand-format and barcode printing; and continuous inkjet (CIJ) dominates small-character marking and high-speed addressing application – the latter mostly based on Kodak's 'Versamark' technology.

At DRUPA, innovations were evident in all of these applications, but the most noticeable were in the advent of single-pass color web printing.

Digital presses

Until not long before this DRUPA, digital web presses have been almost exclusively based upon electrophotography, with the liquid toner-based HP Indigo series of presses having the highest profile. (There are some inkjet exceptions: the Screen Truepress Jet520, based on Epson printheads was launched a couple of years ago. Screen showed a double speed version of this press, as well as the new Truepress JetSX B2 format sheetfed press. And Océ's Jetstream family among others pre-dated DRUPA.)

The main digital presses shown at DRUPA used all available inkjet technologies:

- As noted, Screen uses Epson PIJ heads
- HP's Inkjet Web Press is based on its Scalable Printing Technology TIJ heads (with massive redundancy to ensure print quality)
- Océ's Jetstream (and the equivalent Miyakoshi MJP600) use the Kyocera PIJ heads
- FujiFim's Jetpress720 is a B2 sheetfed press using the new Dimatix 'Samba' PIJ heads, fabricated using silicon MEMS technology.
- Kodak showed a concept press using its 'Stream' CIJ technology
- Kodak also showed a Panasonic-based (PIJ) color web press, the Versamark VL2000. The same printheads are in the Impika iPrint label press.
- Agfa's well-known 'Dotrix' uses Xaar PIJ technology licensed to Toshiba-TEC
- EFI-Jetrion, Nilpeter, and Beijing Founder all showed narrow-web presses based on the Xaar 1001 printhead.

This amounted to a significant amount of digital printing innovation. Unfortunately, the 'bleeding edge' nature of much of the innovation was evident in the difficulty in getting print samples. When the presses were run, the results in many cases were not available for close inspection, much less removal for a more leisurely review. The most prominent exceptions to this rule were the Xaar-based OEMs – mainly because their products were already in the market.

Wide-format printers

The news in wide and grand-format was the widespread adoption of greyscale printheads, and a general tendency to smaller drop sizes, and higher speed operation. Among the greyscale (variable drop) printers, Xaar OEMs like Agfa, Mutoh, and Teckwin found competition mainly from Toshiba-TEC users like Mimaki, Screen, FujiFilm and Océ. Raster Printers (now EFI-Rastek) showed a small UV flatbed printer using the Dimatix M-class head with 3 drop sizes, but this machine has since migrated to Toshiba-TEC heads following the withdrawal of the M-class. The tendency towards smaller drop sizes was evident in EFI-Vutek's adoption of Xaar-licensee Seiko's heads (with 35pl drops) for its QS series of machines. The company also showed a

prototype high-speed 'DS' series flatbed with unspecified printheads but, one year on, this has yet to come to market.

Dimatix OEMs Gandi Innovations and Durst also showed new grand-format machines, both roll-to-roll and flatbed at Drupa, based on arrays of Spectra PIJ heads. 42pl drop-size Konica-Minolta heads were in evidence on the Gerber Ion printer, whose significant innovation is the use of cationic – as opposed to the normal free radical – UV-curable inks.

HP, by virtue of its integration over the past couple of years of Scitex Vision, NUR and Colorspan, had the most eclectic range of wide-format machines. These machines featured printheads using HP's own TIJ technology, the HP PIJ head known as 'X2', plus PIJ heads from Ricoh, Dimatix and Xaar. Inks ranged from HP's water-based dye inks, through solvent to UV-curable, and specially featured HP's new eco-friendly latex inks.

Industrial printers

By 'industrial printers' we mean inkjet applications other than the main ones described above. An example was the Atlantic-Zeiser booth, showing its 'Omega' series of UV printers for I.D. cards and similar applications, using Konica-Minolta PIJ heads.

Inkjet integrators Xennia and FFEI both showed complete inkjet sub-systems, including printbars using arrays of Xaar 1001 heads, ink supply systems and datapath electronics. Both companies offer such systems for integration with other OEMs' media transport systems, though Xennia showed a transport of its own, printing on ceramic tiles, and a prototype narrow-web press.

Technologies and Trade-Offs

The DOD printheads used in the application of greatest novelty, digital web presses, fell into two main categories, whether TIJ or PIJ: small-drop binary heads, and greyscale heads. The former had drop sizes in the 2-5pl range, and mainly jetted water-based inks; the latter either used 6-42pl Xaar greyscale technology and, in the case of the narrow-web label printers, jetted UV-curable inks; or smaller sub-drops and fewer grey levels, as in the case of the Kyocera and Dimatix Samba heads. These heads offer, respectively, 600 and 1200 nozzles/inch(npi), compared with the 360npi of the Xaar 1001 head, but the net 'apparent resolution' – taking into account the effect of the grey levels – is in all cases near the resolving power of the human visual system.

Maintaining drop placement accuracy (and hence print quality) with small droplets on a high-speed web is a challenge: the smaller the drop, the more likely it is to be affected by electrostatic forces and air currents. Larger, denser drops are more likely to land in the desired position.

The classic problem in single-pass printing is reliability – the loss of a single nozzle can cause an unacceptable print defect. HP's solution to this in its 'Edgeline' heads is to detect drop ejection, and substitute a 'partner nozzle' in its print position, relying on multiple head redundancy to assure continuous print quality. Xaar's approach is its 'through-flow' approach whereby ink flows continuously past each nozzle orifice, allowing nozzles to recover automatically from a meniscus failure. Dimatix claims to have 'meniscus replenishment' in the Samba head, which has not yet been publicly described in detail, but sounds similar in concept.

Recent Developments

A year on from DRUPA 2008, and one financial meltdown later, development dollars are scarcer, but the march to digital printing continues. HP estimates the digital printing market to be a $3bn opportunity for publishing, and a $13bn opportunity for direct mail and transpromo in 2010. The company is probably in the lead in terms of rolling out its DRUPA-announced digital web press, having recently added high-profile accounts like O'Neil Data Systems (publisher of Investors Business Daily) and Consolidated Graphics to its pilot program. Océ's Jetstream 2800 is in the market, and Kodak has announced 2 installations of its STREAM technology (both monochrome only). But – perhaps unsurprisingly, given the difficulty in material handling of cut sheets to inkjet tolerances – the sheetfed presses are lagging: Screen has made no post-Drupa announcements of the promised availability of the JetSX press, and FujiFilm's competing JetPress 720 is still slated for 2010 availability.

Meanwhile, Nilpeter's 'Caslon' and EFI-Jetrion's Series 4000 color label presses are well-established with customers in the US and Europe.

The recent FESPA digital show, held in Amsterdam almost exactly a year after DRUPA, was significant in showing continued momentum for inkjet both within and beyond wide/grand format printing. Scanning applications of the Xaar 1001 head were in evidence, with high-productivity printers from One Solution, M.T.L. and Neolt, but so too were single-pass industrial printers using the same printhead from Atlantic Zeiser, and German company m-print. EFI-Vutek showed a high-speed 'GS' series printer using Seiko printheads with even smaller drops: 12pl and 24pl. Durst announced 3 new high-productivity machines based on 'Quadro Arrays' of Dimatix printheads, and Swiss-based WP Digital showed the fruits of their re-engineering of the former Leggett & Platt 'Virtu' printers, based on the same heads.

Summary

The trend, evident since the advent of the Indigo printer in 1994, for the substitution of analog print processes by digital was reinforced at DRUPA 2008 and has continued since then. Inkjet has both substituted and complemented screen printing in wide format graphics, and is starting to do the same with screen and flexo printing in labels and packaging. Inkjet is making inroads into pad-printing applications, and the big prize of digital commercial printing, long under siege from electrophotography, is now on the cusp of succumbing to the superior economics of inkjet technology. But many problems remain. We have not had time here to discuss ink and substrate issues, environmental considerations (paper printed with dye-based inks is less recyclable than conventional newsprint for example), nor the effect of smaller, lighter, cheaper LED curing technology on the UV inkjet market.

Meanwhile, we remain convinced that DRUPA 2012 will see an even greater number of inkjet-based printing systems, most of which will be based on piezoelectric drop-on-demand technology.

Author Biography

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