Innovative print head launches at TheIJC

By Dr John Provost 26 November 2019

TheIJC conference, organised by ESMA (European Specialist Printers Manufacturers Association) and Steve Knight from Direct Digital Technologies, was held in Dusseldorf, Germany, on 29-30 October and once again brought together the global ink jet industry. At this year’s conference there were over 500 delegates from 250 organisations and 24 countries, together with 87 companies and organisations exhibiting, at what is now the largest conference in the world devoted solely to inkjet printing technologies.

TheIJC 2019 covered the complete range of applications in all inkjet printing industries and had speakers from all sides of the industry, digital print machines integrators, print head OEMs, and chemistry providers of both inks and media surfaces. In my opinion, it is the most informative conference to keep up with developments in the inkjet industry.

This year, the number of lectures totalled 63 and was broken up into plenary sessions on both days – which was exclusively taken up by the major print head OEMs, with presentations on their print head technology and future developments. At this year’s conference, there were a number of major announcements on new print head launches, which could well have a significant impact for the digital textile industry. Following the plenary sessions on each day, there were three parallel technical sessions.
Always an excellent feature of the conference was the table-top exhibitions, which this year numbered 87 companies and research organisations and gave many opportunities for networking and follow up discussions with the presenters.

Table-top exhibitors were significant at TheIJC 2019 in Dusseldorf

This year, there were no specific presentations on digital textile printing. However, there were considerable developments in print head technology, ink manufacturing and media chemistry. These were specifically relevant to digital textiles, particularly new introductions by the print head OEMs in the plenary sessions. Many of the major OEM print head manufacturers announced significant developments for their respective print head architecture. As we will discuss later in the article, the announcements of further developments in print head nozzle re-circulation technology, more compact print heads and importantly new generations of print heads, will have an influence on future digital textile printing machine developments. Also, the developments on specific print heads and dispersing agents and additive chemistry could have an impact on the textile pigment print market penetration, which at the moment in the roll-to-roll digital textile print sector is still relatively small, with estimates still less than 5% of total digital textile production globally.

Nine of the major print head manufacturers gave detailed presentations in the plenary sessions (Memjet, Ricoh, Xaar, Seiko Instruments, Epson, Kyocera, FujiFilm Diamatix, Konica Minolta and Toshiba Tec). For the first time at TheIJC, a detailed overview by Epson of its MEMS (micro electro mechanical systems) print head ranges were given, including details of the Epson print heads, now being made available to print machine integrators. This comes after the opening of the new MEMS print head manufacturing factory in 2018 in Hirooka, Japan, a facility with a manufacturing capacity of up to two million print heads annually.
With the huge increase in production levels in the roll-to-roll digital textile printing market in the last few years, all the major print head OEMs are now placing more emphasis on digital textile applications.

The single most important driving force for the on-going market growth of digital textiles has been developments in print heads, enabling production levels, print quality and operability performance to continuously improve (1). The print heads used in the available roll-to-roll digital textile printers have been, up to this year, all been using piezo drop on demand (DOD) technology. However, at FESPA in Munich and ITMA Barcelona in June 2019, Hewlett Packard (HP), introduced its range of thermal drop on demand print head textile printers for disperse dye sublimation inks, the HP Stitch S series range of printers (2).

Thermal drop on demand print heads have been used in the past in digital textile printers, with the ColorSpan and Encad series of small production printers and the high production industrial scanning printer from Canon launched in 1996 (using its own bubble jet technology). However, all were withdrawn in favour of piezo DOD technology (3,4).

There was also a new presentation at TheIJC from Tom Roethke (VP of Engineering) of MemJet Inc, discussing the latest improvements to the company’s high-speed MEMS based thermal DOD print head technology. The latest development, the Duraflex four colour thermal print head (5,6) is capable of high-speed single pass printing with the company’s own developed aqueous encapsulated pigment inks.

With the recent significant digital textile printer launches by HP, it will be interesting to watch for future developments in thermal drop on demand print head technology in digital textiles, particularly with a number of recent patent applications by HP in the digital textile area (7,8).

Figure 1 gives an update of the global print head market share in digital textile production in printed volume terms, based on the 2018 WTIN Intelligence: Digital Textiles detailed analysis of the global roll-to-roll digital textile print market.

Table 1 updates the latest position (as of November 2019) of which print heads are integrated into commercially available roll-to-roll digital textile printers.
Figure 1 – Print head market share by volume of roll-to-roll digital textile production (of 2018 production of 2.57 billion sqm). Source: WTIN Intelligence: Digital Textiles
### Table 1 – Print heads used in the major roll-to-roll digital textile printers. Source: Dr J Provost

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Some Typical Digital Textile Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPSON</strong></td>
<td>DX5, DX6, DX7 (Micro Precision Mach Technology) Precision Core Technology</td>
<td>Robustelli Mona Lisa, Mona Lisa Evo Tre, Mutoh, Epson SureColor Dye Sub SC-F Series, Sure-fire F2000, MTex various. Various DTG Printers</td>
</tr>
<tr>
<td><strong>RICOH</strong></td>
<td>Gen 4 (MH2420), Gen 4L 15pl (MH2620), Gen 5 4 Color, (MHS440)</td>
<td>Mimaki TX400, Durst Kappa 180 V2, Durst Alpha, Anajet DTG MP5 M, d.gen Telios Grande, Papyrus Mimaki TX500, Amplia Targa (Brazil), Anajet (Ricoh) DTG</td>
</tr>
<tr>
<td><strong>SII</strong></td>
<td>508GS, 1024GS 510BN, 1024BN, RC512</td>
<td>D-Gen Antrix Toshin 2020, Hollanders Colorbooster, EFI Vutek FabriVu, Zimmer Infiniti SK</td>
</tr>
<tr>
<td><strong>KONICA MINOLTA</strong></td>
<td>KM256, KM512, KM1024i, KM1024i Double Panasonic UA800</td>
<td>Nassenger V, Nassenger V11, Nassenger Pro 60, Pro 120, Pro 1000, Nassenger SP1 DIGI FD-1908, Mimaki TX300P-1800, MTex Blue</td>
</tr>
<tr>
<td><strong>KYOCERA</strong></td>
<td>KJ4B series</td>
<td>EFI Reggiani Renior, Nextone, One, Pro, Top, Flexy, Vogue, Colours MS IP Series, MS La-Ro, Mini La-Ro, LM (Mimaki) Tiger, Leopard, Atexco Vega 318, Vega 3000T, Aeon Ky Series, Arioli Arioprint 8.16, ATP Tinta, ColorJet Metro, ColorJet Fabjet, Ichinose 2050, Aleph La Forte Series, Mouvent TX Series, Miyakoshi MTP</td>
</tr>
<tr>
<td><strong>DIMATIX</strong></td>
<td>Spectra Series, Polaris Series StarFire SG1024 Samba G3L Samba GMA99</td>
<td>Agfa Aqualjet, Durst Rhotex, Kornit DTG Printers, Kornit Allogro ITH GB Series (India), Zimmer Coloris 3, Kerajet SP SPG Pike Single Pass, SPG Javelin, FloraTextra (China) EFI Reggiani BOLT, Atexco Vega One</td>
</tr>
<tr>
<td><strong>BROTHER</strong></td>
<td>Brother own head</td>
<td>DTG printers, GT 540, GT 782 DTG Series GT3 Mimaki TS55-1800</td>
</tr>
<tr>
<td><strong>XAAR</strong></td>
<td>1201 print head</td>
<td>d.Gen Papyrus 740K (Korea), Xuki X6-3000XS (Xu Cheng)</td>
</tr>
<tr>
<td><strong>HP</strong></td>
<td>HP own thermal DOD heads</td>
<td>HP Stitch S300, HP Stitch S500, HP Stitch S1000</td>
</tr>
</tbody>
</table>

As can be seen from Figure 1, Kyocera still holds the highest market share (at 48%) in the roll-to-roll digital textile market by production volume of digital textiles printed in square metres. This is due to the wide application of the Kyocera KJ4B series of heads in high-speed scanning and single pass digital textile applications. The nearest rival is the Epson series of print heads, both the DX types used in many of the small to medium production scanning textile print machines and the ‘precision core print head’ used in the Robustelli Monna Lisa Evo Tre machine and the SureColor SC-F series of disperse dye sub printers. As we will discuss later, although Epson print heads have been described under DX names by many print machine integrators and Eastern third party print head suppliers, the DX nomenclature is not recognised by Epson itself and in the company’s presentation, it gave details of its own nomenclature, specifications, and importantly which of its print heads are being made available to print systems integrators in the future.

With so many presentations on print head technology, it is impossible to discuss all the future technology presented at the conference in this short article. However, I would like to give more details on two presentations in particular, one from Shin Ishikura of Kyocera’s InkJet Design Centre and secondly by Duncan Ferguson, VP of Professional Printing an Epson Europe.

**KYOCERA**
Shin Ishikura of Kyocera gave one of the most significant technology announcements of the conference; the forthcoming launch of the second generation of the Kyocera series of print heads: IJP 2.0.

Ishikura first gave an overview of the key developments and milestones of the Kyocera KJ4B print head series from its first announcement in 2005, through to the first early adopters at Drupa 2008 in single pass applications. The first adopter in the digital textile printing industry was MS Italy (now part of the Dover group), which installed the first single-pass digital textile partner in Como, Italy, in 2012. It has since gone on to be the market leader in single pass digital textiles, with a probable 30 MS LaRio textile printer machine placements globally.

Although only introducing two models of the print head in 2005, Kyocera now has a complete range covering all industrial applications. After highlighting the future requirements of print heads such as higher throughput, a wider operating window and a more robust head, particularly important in digital textile applications, Ishikura gave details of the forthcoming second generation – the IJP 2.0.

The Kyocera second generation will have a rigid box structure, monolithic piezo actuator and importantly an option for re-circulation, using a double channel to equalise the pressure between supply and return. There will be two introductions next year; the print head model which will probably be promoted for digital textiles will be the aqueous ink 600 dpi model, which is claimed will be able to lay-down 25-50% more ink. As Kyocera has now made this public announcement, I would imagine that the major Italian digital textile print machinery manufacturers have already been evaluating its performance and we will undoubtedly see new digital textile print machines with the new IJP 2.0 next year.
Figure 2 shows a schematic of the Kyocera second generation print head, IJP2.0, compared to the established KJ4B series print head, showing the robust rigid frame and the new monolithic piezo actuator and new ink flow paths.

Figure 3 gives the specification of the 600 dpi aqueous model, which is likely to be used in digital textile print machines.

Figure 2 – Kyocera print heads IJP 1.0 (KJ4B series) and Second Generation IJP2.0 print head. Diagram: Kyocera Fine Ceramics GmbH
Table 2 summarises the three SI MEMS that will probably be of interest to digital textile printer machinery OEMs, including the latest precision core type: the S3200. The two MACH Mems technology types, the F1440 and the L1440 shown in Table 2, are believed to be the unofficial names used by resellers in the East (for the DX5 and DX7 heads). We will have to watch the market to see if any major digital textile print machinery OEMs are allowed to integrate these heads into a digital textile machine, which obviously would be competition to Epson's own range digital textile machines.
Table 2 – Epson Si MEMS Print Heads now available to OEM partners

<table>
<thead>
<tr>
<th>Epson Print Head</th>
<th>F1440</th>
<th>L1440</th>
<th>S3200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Type</td>
<td>Micro Peizo (MACH MEMS Technology)</td>
<td>Micro Peizo (MACH MEMS Technology)</td>
<td>Precision Core (Micro TFP Chip – MEMS Technology)</td>
</tr>
<tr>
<td>Nozzle Pitch(npi)</td>
<td>180</td>
<td>180</td>
<td>300</td>
</tr>
<tr>
<td>Band Width (inch)</td>
<td>1.0</td>
<td>1.0</td>
<td>4.73</td>
</tr>
<tr>
<td>Nozzle Rows</td>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>No of nozzles</td>
<td>1440</td>
<td>1440</td>
<td>3200</td>
</tr>
<tr>
<td>Colours</td>
<td>1/2/4/8</td>
<td>1/2/4/8</td>
<td>1/2</td>
</tr>
<tr>
<td>Output Resolution</td>
<td>360 (1 Row)</td>
<td>360 (1 Row)</td>
<td>600 (1 Row)</td>
</tr>
<tr>
<td>dpi</td>
<td>180 (2 rows)</td>
<td>180 (2 rows)</td>
<td>300 (2 Rows)</td>
</tr>
<tr>
<td>Ink Type</td>
<td>Aqueous, Solvent</td>
<td>Aqueous, Solvent</td>
<td>Aqueous, Solvent, UV</td>
</tr>
</tbody>
</table>

OTHER DEVELOPMENTS

Although we have described the latest developments from Kyocera and Epson in some detail, there were also presentations from Fuji Dimatix outlining its Samba heads: the G3L and GMA series (9). They are used in high production digital textile scanning machines such as the Mouvent TX802 digital textile printers and in single pass machines, for example, the SPGPrints PIKE, Atexco Vega One and the EFI Reggiani Bolt machine, launched at ITMA Barcelona in June 2019.

Japanese OEM Konica Minolta also presented an addition to its print head range with the announcement of the KM1280iMHH-S – a 450 dpi, medium drop size head with 1280 nozzles. It has the same footprint as the well-established KM1024i head which, when available next year, will be easy to integrate into existing platforms.

There were no specific digital textile printing presentations, but two presentations did stand out as extremely relevant to the production of a stable aqueous pigment mill-based dispersions for subsequent ink formulation manufacture. Dr Peter Bene of BASF SE outlined the
development of high molecular weight polymer dispersing agents. For example, Dispex Ultra PX4290 and its complex mechanism in producing high strength and stable aqueous pigment mill-base for pigment ink jet inks.

The second interesting presentation was by Xabier Zadua of Netzchen on dispersing technology for ink jet manufacturing (10) with a very detailed explanation and examples of the multiple stages in the efficient milling of disperse dye sub and textile pigment base mill-base, for subsequent ink jet ink production. These two presentations clearly showed that to produce stable and nano particle size distribution dispersions, for ink jet inks, it needs cooperation and developments, both in the chemistry of the dispersing agents and additives and the mechanical dispersion processing stages.

Finally, digital textile pigment printing still only has a small market share (<5%) of the roll to roll digital textile market (11). The development of new print heads with improved and more efficient re-circulation technology from the major print head OEMs and with known research efforts now focused on both textile pigment dispersing additives and new milling technology, we will undoubtedly see more high production digital textile pigment printing systems at the forthcoming FESPA in Madrid in March 2020 and the four-yearly Drupa exhibition to be held in Dusseldorf in June 2020.

The IJC will return once again to the Crown Plaza Hotel, Neuss, Düsseldorf, on 27-28 October 2020 and a call for papers and table-top booking is now open.

For more details, please contact info@theijc.com and contact ESMA for PDF copies of the conference presentations (https://esma.com/shop).

REFERENCES


https://www.memjet.com/duraflex/
https://www.annessacleary.co.uk/memjet-announces-duraflex-printhead/

https://www.netzsch-grinding.com/en/chemical-industry/printing-inks/inkjet/


Have your say. Tweet and follow us @WTINcomment