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PRESS RELEASE

Ink Jet as a Manufacturing Process
Good Progress, but Still a Long Way to Go

At the IMI symposium, The Commercialisation of Ink Jet as a Manufacturing Process, which took place in Geneva in April, key innovators gathered together to discuss progress. Co-chaired by printhead manufacturers Xaar and Spectra, the event included speakers from Philips, Seiko Epson, Circatex and the Universities of Manchester, Liverpool and Munich.

Printed Electronics

"Lots of progress, but still a long way to go" seemed to be the post-conference consensus, but underlying the frustration of companies wishing to utilise ink jet technology in their manufacturing processes remains a passionate desire for the technology to succeed. Demand is clearly high - much is promised, but potential implementers have to distinguish between future promises and what is available today. In short, there is a reality gap, which is not untypical in an embryonic market.

In a suitably challenging presentation, Steve Jones President of Circatex subtitled his talk on PCBs with "Why am I Waiting? A Users View." Jones described the PCB manufacturing process as "too long and too complicated," adding that he believed that ink jet technology offers the potential to reduce the number of steps in the existing process and that "our future is only limited by our imagination and ambition."

There are some significant successes happening today. Discussing the manufacturing process for full colour PLED displays at Philips PolyLED, Paul van Roosmalen, Manager Inkjet Technology, gave a detailed synopsis of the challenges of using ink jet, including dealing with accurate drop placement, crooked nozzles, missing nozzles, weak nozzles, drop to drop volume variation, fluid formulation, nozzle plate wetting and printhead failure. "Every droplet counts" said van Rossmalen, adding that "approximately 60 million droplets are required for one 14" substrate with full colour devices. One crooked jet results in 100% rejects."

In spite of these challenges, Philips has developed the world's first full colour PLED mass production line using ink jet technology. The line was installed in mid 2003 and has been fully operational since the beginning of 2004.

Van Roosmalen admitted that, when considering mass production, "the challenges and chances ahead are tremendous." But the steps that Philips has already achieved demonstrate what is possible if a development team has the tenacity to work through problems and ultimately achieve a commercial product. In terms of products and plans for mass production Philips is expected to target small size full colour passive displays and then small/medium size full colour active displays.

Seiko Epson is at the forefront of using ink jet technology in manufacturing processes. Paul Patterson, General Manager, IJIA Business Development covered the company's latest achievements, including the 20-layer circuit board sample first produced last November. The board uses an ink jet system to alternately "draw" patterns and form layers on the board using two types of ink: a conductive ink containing a dispersion of silver micro-particles measuring from several nanometres to several tens of nanometres in diameter, and a newly developed insulator ink.

An example of true commercialisation from Seiko Epson is their 15mm (0.6") XGA module for data projectors, which includes the use of ink jet in the alignment layer. The alignment layer is a layer formed on the surface of two sheets of glass or other substrates, between which liquid crystal is sandwiched. The function of the alignment layer is to align the liquid crystal molecules in a given direction. The use of ink jet technology dispenses with the need for flexo plates, reducing time and cost; and the non-contact method of applying the alignment layer produces a smoother surface and uniform display quality.

Although successes are being achieved, both the speakers from Philips and Seiko Epson agreed that there is a gap between what is available today and what is needed for greater commercialisation of ink jet as a manufacturing process. See Figs 1 & 2. The challenges are great, but so is the market demand and desire for ink jet technology to succeed.

Overview	
Ink Portfolio	Organics, Metals, Polymers
Head Technology	Piezo or Thermal
Ink Jet Machine	Accuracy, Size, # of Stages, Data
Substrate	Surface Chemistry, Glass, Polymer, etc
Process	Handling, Baking, Annealing, etc
Final Product	Specifications (Performance & Cost)
Capital Investment	(Mass Production vs. Prototype)
Supply Chain	Value Management
IP Portfolio	Process, Application, Material, etc
Collaborations	Material, Process, IP, Market, etc
Business Model	Switchboard, Cycle, Value Position, etc
Bottom Line	A Company to Manage the Above

Fig. 1 – Commercialisation Requirements Source: Seiko Epson

Know Your Core Competence Collaborate Everything Else	
Ink Portfolio	Still in Development (Limited Wins)
Head Technology	Accuracy/Drop Size/Frequency
Ink Jet Machine	One Size Does *Not* Fit All
Substrate	In Development with Inks (Limited Wins)
Process	Post Print, Temperature, Time
Final Product	Approaching Specification Goals
Capital Investment	$$$$$
Supply Chain	Blocking Strategies From Incumbents
IP Portfolio	Everyone Owns the IP for IJ of "X"
Collaborations	Stake Holders, High Maintenance
Business Model	Can Prohibit Adoption
Bottom Line	Industry & Technology is Still Fragmented

Fig. 2 – Commercialisation Reality Source: Seiko Epson

Bio & Medical

The symposium also covered bio and medical applications. Co-chair Rob Harvey, Business Development Manager of Xaar provided a comprehensive introduction to the latest developments in high-speed combinatorial testing, tissue building and novel pharmaceutical applications. Examples of recent projects included the Aj100 series of non-contact microarray spotters from ArrayJet; tissue building applications from Celltran - skin for burns and chronic ulcers; TEOX - bone and cartilage; and artificial organs for pharmaceutical research at Manchester University.

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About IMI

The Information Management Institute runs the largest and most comprehensive conference and seminar programme in the digital printing industry. Each year over 2,000 industry technical and management personnel from over 600 companies attend around 20 events covering all forms of digital printing.

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