

Simple Tools for Ink Jet Printing on Flexible Substrates

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Who is Dimatix?

- May 2005 Spectra, Inc. changed its name to Dimatix, Inc.
- Created two divisions
 - Spectra Printing Division (SPD) for graphic arts and ordinary printing applications
 - Materials Deposition Division (MDD) for non-traditional ink jet applications based on depositing functional fluid
 - World class silicon MEMS printhead technology and fab



Simple Tools for Ink Jet Printing on Flexible Substrates

- Rationale for ink jets as display manufacturing tools
- Status
- Display and electronics printing the new way
 - System
 - Printheads
- Future directions



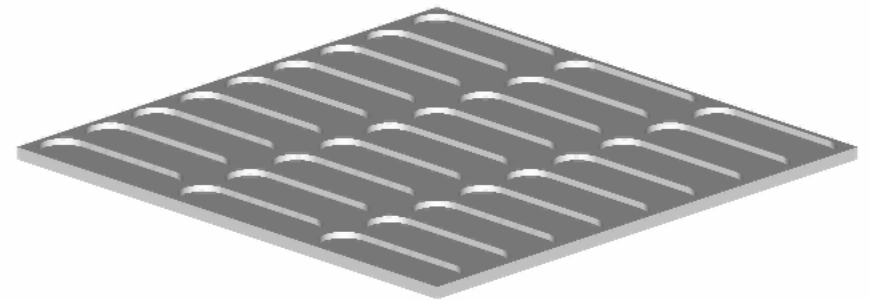
Rationale for Ink Jets as Display Manufacturing Tools

- Production of large LC and Plasma TVs is moving to very large substrates: 1870 mm x 2200 mm and larger
 - Opportunity for new methods
 - Requires high reliability, high yields
 - Requires high throughput
- Manufacturers look for cost reduction, material saving and process improvement



Advantages of Ink Jets in Precision Fabrication

- Ink jet is non-contact digital printing
 - Consistent drop volume
 - Accurate drop placement
 - Ideal for flexible substrates
- Additive = does not waste expensive materials
- Special fluids formulated for each application
- Deposition system is ink jet, fluid, printer and software



Status for Ink Jet Manufacturing of Displays and Backplanes

- Manufacturing cost reductions for LCDs
- PLED manufacturing
- Organic TFTs on Flexible Substrates
- Conductive fluidic nano materials
 - Silver
 - Copper?
 - Gold?



Reducing Manufacturing Costs for Flat Panel Displays

- PI material coating
- RGB color filter jetting
- LCD material deposition
- LCD spacer depositions
- Plasma display conductive traces at backplane



Production of LCD Color Filters

Dai Nippon Print Achieves World First 6th Generation Line Inkjet Production Method

By Aki Tsukioka, Japan Corporate News Staff Writer, Sept 12, 2005 Print

DNP "...aims to invest approximately 25 billion yen and introduce a second sixth generation LCD color filter line...to forge ahead with the expansion of more efficient production capabilities, and cost cutting solutions, while also achieving the kind of highly pure colors that were not previously available with photolithographic techniques"



PLED Displays are Manufactured with Ink Jets

- Ink jet precisely deposits Light Emitting Polymers into display pixels
- Pilot and production lines in Europe and Asia
- Most revenue in 2005 from vacuum deposited OLEDs
- OTB acquired Philips PolyLed 3Q2005
- Sumitomo acquires Dow LEP technology, May 2005
- CDT/Sumitomo joint venture for display fluids and processes May 2005



Courtesy Philips PolyLed

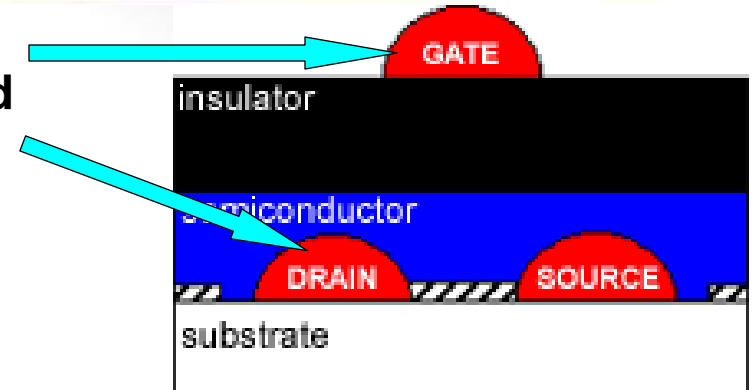


Ink Jets for Organic Electronics

- Thin Film Transistors (TFT)
- e-Paper and e-Poster
- Large area solar cells
- Dielectric polymers

**Plastic Logic named
Start-Up of the Year
at Electra 05 – the
European Electronics
Industry Awards**

Inkjet printed



Plastic Logic flexible backplane
December 2005

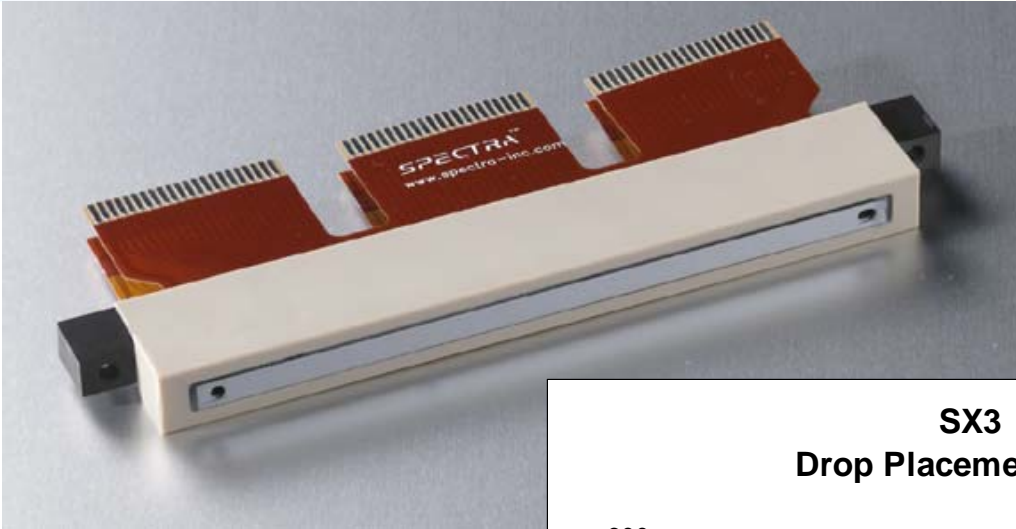


Requirements for Precision Manufacturing with Ink Jet Tools

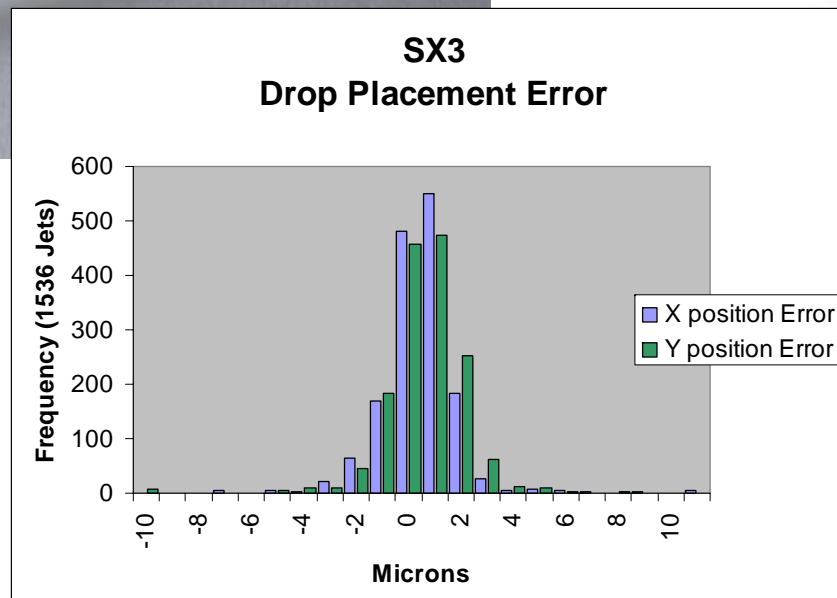
- Printing system designed for the application
 - Precision
 - Speed
 - Maintenance
 - Reliability
 - productivity
- “Inks” formulated to meet application standards
 - Jet reliably
- Ink jet print engine engineered for the application
 - Drop volume and velocity control
 - Drop placement control
 - Robust to wide variety of fluids
 - High drop deposition rate
 - Manage flexible substrates?



Ink Jets as Tools

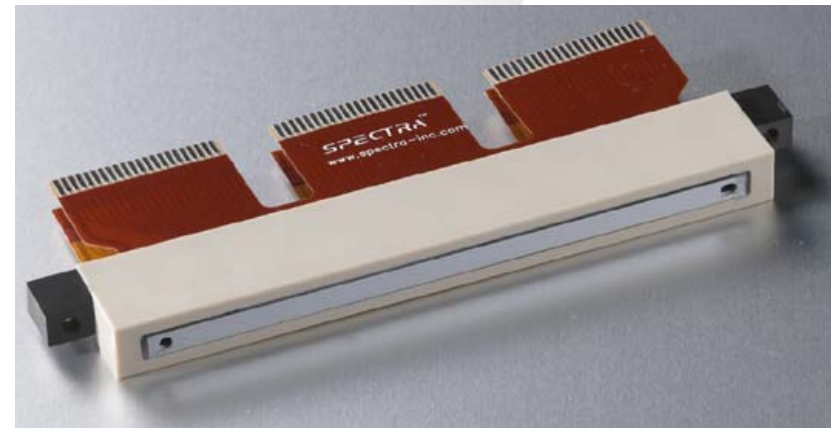


SX3 – Reliable and precise in prototyping and production



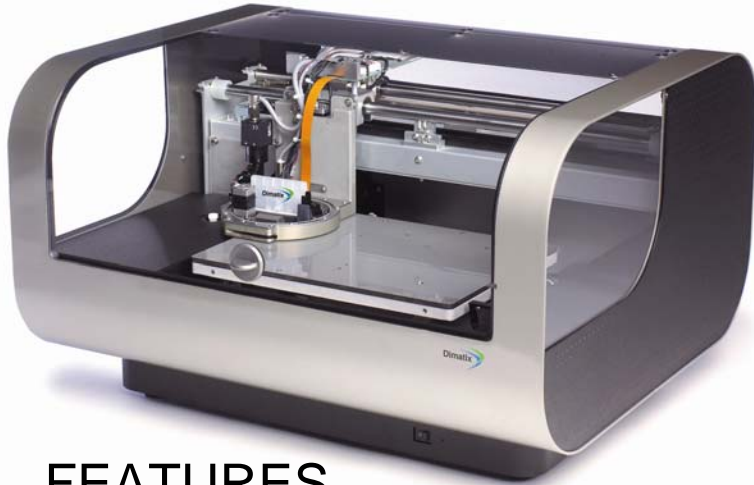
Display and Electronics Printing a New Way

- It can be costly to get started with ink jet technology
 - Commercially available systems are \$100K to more than \$500K
 - Ink jet printheads that are intended for production
 - Too expensive to use for test and R&D
 - Difficult to change fluids
- It takes time to get started
 - Time to design custom system
 - Time to receive custom system



Dimatix Materials Printer

DMP-2800 Series



Designed and built for ease-of-use and low cost

FEATURES

- XY table with an approximate 8 in x 12 in printing area
- Prints lines, dots, and mixed patterns
- Jets many fluids
- PC-user interface
- Rigid or flexible substrates

BENEFITS

- Self-contained, ready-to-go system
- User-fillable, easily changed cartridges
- 10 picoliter drops



Dimatix Materials Cartridge

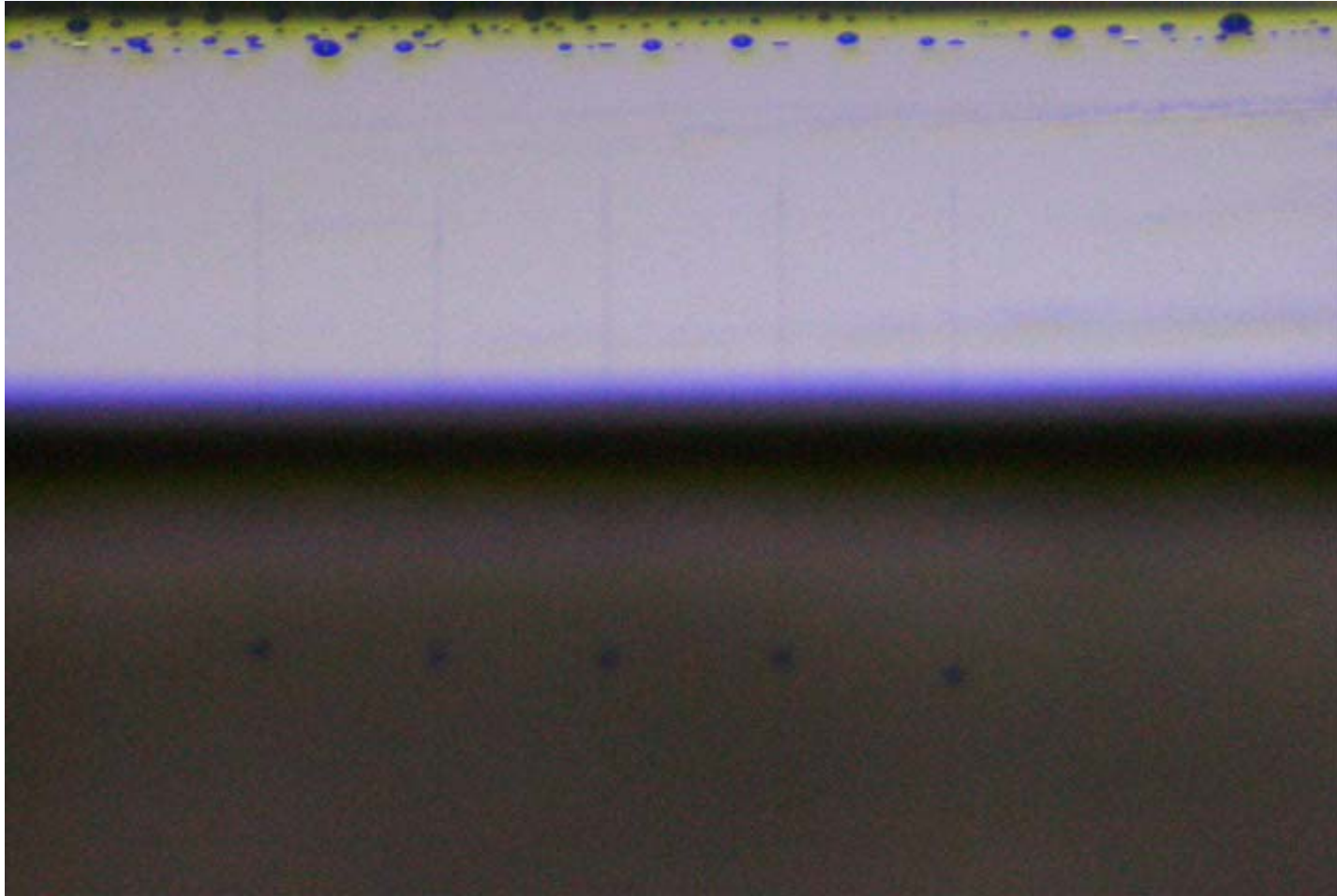
DMC-10000 Series



- Piezo drop-on-demand
- Easily interchangeable cartridge
- Economical use of expensive fluids
- Rotating carriage for variable print spacing
- Tunable jetting electronics for many solvents, aqueous solutions, UV curing, conductive inks



Jetting Cabot's Nanoparticle Silver



Simple Ink Jet Tools for Precision Fabrication

- Accelerate market development with desktop R&D printer
- Introduce disposable cartridges
 - Easy to learn about ink jetting
 - Avoid time and effort to change fluids in production printheads
 - No cross-contamination from fluids
 - Reduces cost
- Simplifies fluid formulation
 - Time to test jetting
 - Time to prepare samples for evaluation
 - Common platform with end user
- Integrated system
 - Ink jet, printing platform, software
 - Maintenance station
 - Drop visualization



Dimatix Materials Printer



Path from R&D to Mass Production

Throughput



Ultimate flexibility

Mass customization solutions

- Multiple cartridges
- Robotic handling
- Controlled atmosphere
- Multiple process steps
- Large substrate

Cost of Ownership



Modular Deposition System



Questions?

