Step Change in Speed & Performance –
Capability & Data Rate Demands of the Latest
Industrial Inkjet Printheads

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Agenda

• Review of latest high performance industrial inkjet printheads
  – Fujifilm Dimatix
  – Kyocera
  – Konica Minolta
  – Ricoh
  – TTEC
  – Xaar

• Impact on labelling & packaging applications
  – Managing & maximising opportunities
  – Data handling & system configurations
Global Print

End-use Sectors

$ billion (constant 2010 prices and exchange rates)

Labels and packaging
Commercial/other printing
Security
Office stationery
Directories
Catalogues
Newspapers
Magazines
Books

Source: Pira International
Global Market Share 2011-2016

End-use Sectors – market share

Source: Pira International
Global Print 2011 - 2016

Print Processes – market share

Source: Pira International
Printhead “Funnel”

2011/2012: New printheads

- Fujifilm Dimatix - StarFire Series
- Konica Minolta – i Series
- Kyocera – KJ4 versions
- Ricoh – Gen 5
- TTEC – CF1L
- Xaar – 1001GS12

Key Themes
- Speed
- Resolution
- Ink recirculation
- Drop size
(Some) Things to Consider When Selecting a Printhead

- Resolution
- Drop size
- Linear speed (frequency)
- Print width
- Printhead cost
- Ink path
- Fluid compatibility
- Ink availability
- Easy to be swayed by one or two key marketing issues
- The smart money looks at all specifications objectively
Fujifilm Dimatix StarFire Series

• New family of printheads
  – Incorporate VersaDrop binary and greyscale jetting
  – RediJet – continuous ink circulation at the nozzle
    • Improves initial priming
    • Enables fast jet recovery
  – Removable/replaceable coated metal nozzle plate
  – Precise registration points enabling drop-in alignment with system-provided mounting features
    • Allows multiple printheads to be accurately arrayed into print bars
    • Reduces set-up and alignment costs during nozzle replacement or printhead exchange

• SG1024/M launched May 2012 at Drupa
  – M-C version targeted at ceramic tile market
  – Large and Small drop versions scheduled
Fujifilm Dimatix StarFire

- **SG1024/M**
  - 1024 nozzles (8 rows)
  - 64.96mm (2.55 in)
  - 400 x 400 dpi 4 grey levels
  - 40m/min @ 400 x 400dpi
  - 50m/min @ 400 x 300 dpi
  - 20-30pl fluid dependent

Images courtesy of Fujifilm Dimatix
Konica Minolta i-series

- **KM1024i/M**
  - Launched late 2011
  - 360 x 360 dpi
  - 3 x speed of standard KM1024
    - 75m/min @ 360 x 360dpi 3 levels
  - 72mm wide - slim & compact design
  - UV, solvent, oil, aqueous
  - Ink recirculation
  - Label printing, security printing
  - M (14pl) S & L drop versions scheduled

Longitudinal cross section of KM1024i
Source: IS&T NIP conference 2011
Konica Minolta i-series

- **KM1800i**
  - Thin proprietary design technology
  - 75mm wide
  - 600dpi greyscale
  - 3.5pl smallest drop
  - UV inks
  - 50m/min
  - Launched at Drupa 2012
    - KM-1 B2 cut sheet press
    - 3,300 sheets/hour
    - Co-developed with Komori
  - Commercial printing, packaging, labelling
Kyocera

- KJ4B-QA well established in single pass aqueous systems
  - 600dpi
  - 2656 nozzles
  - 108mm wide
  - Up to 4 levels
  - 75m/min
  - 30kHz

Océ JetStream
Est. 40 heads per engine

MS Italy LaRIO
>600,000 nozzles; >225 heads
Kyocera

- KJ4A-TA/AA well established in single pass UV systems
  - 600dpi
  - 2656 nozzles
  - 108mm wide
  - 20kHz
  - 50m/min 4 grey levels
  - 75m/min 3 grey levels
Kyocera

• **KJ4B-YH: 40kHz**
  – Aqueous inks
  – 2656 nozzles
  – 108mm
  – 600dpi greyscale
  – Approx. 100m/min
  – 40kHz

• **KJ4A-BH: 30kHz**
  – UV inks
  – 600dpi greyscale
  – 30kHz
  – 50% faster than 20kHz version

• **1,000 units/month production (March 2012)**
Kyocera

- **KJ4B-Z**
  - Aqueous inks
  - 1200 x 1200dpi
  - 5312 nozzles
  - 108mm
  - <2pl smallest drop
  - 80m/min

- **KJ4A/B - (2C)**
  - Aqueous and UV versions
  - 2656 nozzles
  - 112mm wide
  - 300dpi
  - Two colour (1328 nozzles each)
  - 152m/min
  - 30kHz

* Kyocera official name not yet known
Ricoh Gen 4
- 384 nozzles (2 rows)
- 32mm wide
- 300dpi
- UV, solvent, aqueous

Image courtesy of Ricoh
Ricoh Gen5

- 1280 nozzles
  - 4 rows
- 54mm wide
- 600dpi greyscale
- UV, solvent, aqueous
- Four separate independent ink manifolds
  - 1, 2 or 4 colour support
    - One colour: 600dpi
    - Two colour: 300dpi
    - Four colour: 150dpi
    - 8 greyscale levels
- 75m/min binary 30kHz
- 50m/min double & triple drop 20kHz
- Stainless steel nozzle plate
- Built in 20µ filter
- OEM engineering samples Q4 2012
- Mass production Q2 2013
TTEC- CF1L

- Large drop version of the CF1ou
  - CF1ou 6pl to 42pl
- 636 nozzles
- 53.7mm wide
- 300dpi - 8 levels greyscale
- UV, oil
- Approx. 90pl
- Ink recirculation
- CF1L targeted at ceramic tile market

Ink circulation image courtesy of TTEC
Xaar 1001 GS12

- Large drop version of 1001 GS6 (6pl)
  - 1001 nozzles
  - 70.5mm wide
  - 360 x 360 dpi 8 levels
- GS12 = 12pl drop greyscale
- Targeted at ceramic tile market
- TF Technology (ink recirculation)
- Two operating modes
  - Large drop capable 12pl to 84pl
  OR
  - 2 x speed of GS6

Images courtesy of Xaar
Native DPI

- Xaar 1001: 360
- TTEC CF1: 300
- Ricoh Gen 5: 600
- Ricoh Gen 4: 300
- KJ4-Z: 1200
- KJ4: 600
- KM 1800i: 600
- KM 1024i: 360
- Fuji Polaris 512: 200
- Fuji SG1024: 400
Primary Drop Volume (pl)

- Xaar 1001GS12: 12 pl
- Xaar 1001GS6: 6 pl
- TTEC CF1L: 12 pl
- TTEC CF1ou: 6 pl
- Ricoh Gen 5: 7 pl
- Ricoh Gen 4: 7 pl
- KJ4/B-1200: 2 pl
- KJ4/A-600: 6 pl
- KJ4/B-600: 5 pl
- KM 1800i: 3.5 pl
- KM 1024i/M: 14 pl
- Fuji SG1024/M: 20-30 pl
Acceptance of Inkjet for Single Pass Applications

- Industry acceptance of inkjet in single pass systems
- Large arrays of inkjet becoming more common
  - Web presses
  - Sheet presses

System Group Creadigit: Fujifilm SG1024; 6 colours; 710mm print width

KBA RotaJet 76: 112 x KJ4/B printheads
Thoughts on Opportunities

• Labels
  – “Standalone” becomes more fully featured
  – In-line with existing handling/flexo systems growth
Thoughts on Opportunities

• **Corrugated packaging**
  – Large flatbed systems
    • Merging of POS displays & packaging
      – HP Scitex FB7600; 312 HP X2 piezo heads; UV inks
      – EFI HS100Pro, Inca Digital Onset, Durst, Agfa etc
  – Single pass pioneers
    • Inca/Sun Chemical FastJet (2004/2008)
    • Calypso Systems (2008)
      – KJ4/B; up to 1m/sec 600dpi; aqueous inks; 22-66cm; CMYK
    • Sun Automation CorrStream (2011)
      – Kodak CIJ; 500fpm; aqueous inks; sheets
  – A market ready for expansion?
Thoughts on Opportunities

• **Folding cartons**
  – Established mono coding
    • In-line & off-line w/stackers
  – Drupa 2012 – sheet presses
    • Potential for folding carton
    • 300gsm capability
    • Konica Minolta KM-1
      – B2; KM 1800i heads; 3,300 sheets/hour; UV inks; 1200dpi
    • Fujifilm Jetpress 720
      – B2; Samba heads; 2,700 sheets/hr; aqueous inks; 1200dpi
  – A market ready for expansion?
Thoughts on Opportunities

- **Mixed printhead resolutions**
  - Single printhead technology – running bars or colours/fluids of printheads at different resolutions
  - e.g. CMY at 360dpi and K at 720dpi
Thoughts on Opportunities

- Families of printheads – different drop sizes
- Mixing different printhead technologies
  - Decoration & pre/coating/varnishing in one pass
    - Small & large drops heads
  - e.g. EFI Cretaprint C3 ceramic tile printer
    - Modular, configurable design
    - Offering mixed head type systems
      - (Head type A) decoration + (head type B) special effects (large drop)
  - New potential opportunities in labelling & packaging
    - Product differentiation/decoration/special effects
Increasing Demands on Print Data

- **Number of printheads**
  - Higher resolution
  - Greyscale
    - Increasing resolution and moving to greyscale all require more data per square mm

- **N colours**
  - Increase in colours
    - Process colour requires at least 4 x the amount of data of monochrome

- **Pre-coat & varnish**

- **Print speed**
  - 50m/min and higher

- **Variable data usage**
  - Partially variable
  - Fully variable

- **Wide widths**
  - >1m becoming well established

- **Increasing demands on datapath**
Challenges for System Builders

Getting data to the printhead
Speed isn’t everything.....reliability & cost are also key factors

A: Speed and reliability of network, latency
B: Speed and reliability of hardware; maximum cable lengths; cost; connectors
C: Speed, reliability, waveform generation and quality, error correction etc

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Print Bar Architecture Example
Print Lane Architecture Example
Summary

• The printhead funnel will continue
  – Speed/resolution/drop size – depending on target markets

• Maximising capabilities of these printheads
  – Innovative implementation of printheads
  – System architecture & datapath handling
Thank you – Any Questions?

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