Inkjet & Direct Container Printing – Challenges & Successes

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Global Inkjet Systems

- Electronics, firmware, drivers, RIPs, software utilities, user interfaces and components for ink delivery systems
Agenda

• Understanding shapes
• (Some of the) challenges for inkjet
• Next development - full height printing of cones
• Who’s doing what in the market – the success stories
Unfolding or “Flattening” Shapes

- Allows us to understand the complexities of printing onto that surface
  - Cylinders
    - Slice a cylinder down one side – unfolds/flattens to a simple rectangle
  - Cones
    - Cones unfold into “arced” rectangle
  - Tubs
    - Tubs are combinations of cones and cylinders with discontinuities
Some of the Challenges for Inkjet and DCP

- **Inkjet printheads**
  - Designed to print onto flat surfaces
  - Throw distance
    - Drops only jet a few millimetres and decelerate quickly
    - Larger drops jet further
    - Smaller drops improve graphical image quality
  - Distance between nozzle banks
    - Time of flight on curved surfaces
  - Jet straightness
  - Printhead dimensions
    - Reaching the nooks & crannies

- **Need to manage physical characteristics of printhead in relation to curved surface**
  - Jet straightness
  - Time of flight
  - Distance between nozzle banks
  - Image compensation – where applicable
Printhead Orientation

• **Orientation of the object under the printhead to get best possible print**

• **Three key issues**
  - Symmetry
  - Nozzle bank width
    - The narrower the better
  - Number of columns
    - Different times of flights
    - More complex

• **Printhead orientation**
  - Printing downwards
  - Printing sideways “skyscraper mode” (printhead dependent)
Full Product Height Printing

• **Cylinders/Tubes**
  • Full coverage now well established

• **Cones**
  • Most images are one head height and/or cover only a section of the cone requiring only minor distortion correction
  • Full height printing opens up new markets for full product decoration
Full Product Height Printing - Cones

Continuous shape, but more complicated than a tube

- Nozzle alignment issues (as with tubes)
- Resolution changes when printing onto curved surfaces
- Need to compensate for density increase
- Screening more complex
Full Product Height Printing - Cones

- **Challenges**
  - Mechanical alignment of heads
  - Density & screening correction
  - Jetting angle variations
  - Stitching – additional complexity
  - Software adjustment to support array of multiple printheads

- **Image printed without correction**
  - Nozzle misalignment
  - Time of flight differences
  - Increasing density
  - Screening issue - changes in dot gain

- **Increasing density**
  - High Resolution
  - Low Resolution

- **Printheads**
Full Product Height Printing - Cones

e.g. Xaar 1002 or KM1024 – 2 rows of nozzles

1 Nozzle Bank Correction

Standard nozzle bank correction – applies to any inkjet application

2 Cone to printhead geometry mapping – correcting for curvature of the cone

Opposite distortion required in the data to achieve correct end result when wrapped onto the product
Full Product Height Printing - Cones

3 Density correction and varying resolution screening

Opposite distortion required again for density correction
Screening correction to minimise dot gain issues

4 Printhead alignment and stitching

Stitching more than one head per colour increases complexity
Full Product Height Printing - Cones

- **First step - knowing how to print onto cones**
  - This reverse transform technology can be understood
  - Correct nozzle alignment
  - Density correction
  - No dot gain issues
  - No screening artefacts

- **Second step – automating the process for high speed production**
  - Link it to a RIP (variable data capable if possible)
  - Apply the correction automatically for different images in real time
  - Accelerate the processing to allow maximum variable data throughput

Technology proven - products are now in production
Dubuit 9150

- 800 pcs/hour (dimension dependent)
  - Diameter: 10 to 100mm
  - Height: 40 to 200mm
- Flat or curved surfaces
- 360dpi greyscale
- CMYK + W
- Small system footprint
- [www.dubuit.com](http://www.dubuit.com)
- Concept 972 and 9964
  - Up to 4,000 pcs/hour
  - Hybrid screen/inkjet systems
Hinterkopf D240

- Up to 8 inks
  - CMYK+W plus 2 special inks + lacquer
- Low migration UV inks for plastics
- Up to 1200 dpi
  - 2pt font (positive) or 3pt (negative)
- Up to 240 pieces/min
- Precision rotary indexing machine with 16 stations & 32 spindles/holders
- www.hinterkopf.de
- 1st installation – Ritter GmbH (2nd to be installed)
  - Cartridges
  - Replacing screen & thermo-transfer printing
  - Photorealistic images and variable data
Kammann K15 CNC

- **Inkjet only – W+CMYK**
- **Hybrid - screen and inkjet**
  - 2 x screen stations
  - Pre-coat white with screen
  - Spot colours with screen
- **Printing height up to 200mm**
- **Diameter 120mm, length 350mm**
- **Xaar 1002 printheads**
- [www.kammann.de](http://www.kammann.de)
KHS Innoprint

• CMYK+W - low migration/food grade UV inks
• PET bottle types ranging in size from 0.33 to 1.5 litres
• Container diameters can vary between 40 and 120 mm
• Each colour carousel has 12 printing units
• Modular configuration

• www.khs.com

• 1st installation – Martens Brouwerij
  • PET beer bottles
  • 12,000 bottles/hour
  • Dagschotel brand - in association with Belgian sitcom F.C. De Kampioenen
    • Different actors on each bottle
    • Special smartphone app (www.kampioenenbier.be)
Krones Decotype

- Modular design
- PET, PP - glass in future
- Cylindrical and odd-shaped bottles
- UV ink – up to 6 colours
- www.krones.com
- Oscar dell’Imballagio 2015*

<table>
<thead>
<tr>
<th>Performance Data</th>
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<tbody>
<tr>
<td><strong>Output (cph)</strong></td>
</tr>
<tr>
<td><strong>Specially shaped containers</strong></td>
</tr>
<tr>
<td>up to 12,000</td>
</tr>
<tr>
<td>up to 24,000</td>
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<tr>
<td><strong>Cylindrical containers</strong></td>
</tr>
<tr>
<td>up to 7,800</td>
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<tr>
<td>up to 15,600</td>
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 *) all around print, diameter = 60 mm

Higher system performance will be ensured in future by the development of additional design sizes.

*Italian Packaging Institute
Martinenghi – Michelangelo KX48P

- UV curable inks – up to 7
- Diameter range 13.5-66mm
- Length range 50-280mm
- www.martinenghi.com
- 1st installation – ALM, Spain
Polytype RDA 24-165 Hybrid & Digicup

- **Ink jet only and hybrid with dry-offset**
  - Hybrid - 2014 Tube of the Year*
  - All text & Pantone logo colours – dry offset
    - Up to 8 colours
  - Photorealistic image – inkjet
    - Up to 6 colours
- **UV low migration inkjet inks**
- **Tubes/cones/tubs**
- [www.wifag-polytype.com](http://www.wifag-polytype.com)

*North American Tube Council – Best innovative component or process*
Till SmartPrint

- Modular SmartPrint range of machines
  - Sampling system – up to 200 units/hour
  - Batch system – 500-4,800 units/hour
- CMYK UV inks and Xaar 1002 printheads
- Glass, PET and metal
- Test systems installed at Coca Cola, Anheuser Busch and Heineken
- Web2Print online shop option
- www.till-tech.com
Summary – Technology Enablers

- **Inks/printheads**
  - Drop size/ resolution/ print quality
  - Low migration/low odour
  - Adhesion
  - Recyclability
  - Reliability

- **Supporting technologies**
  - Pre-treatment/ curing/ post-treatment

- **New processes – new market opportunities**
  - Software tools – more shapes

- **Synergy of inkjet with analogue print – hybrid devices**

- **Production systems**
  - Meeting industry demands
  - Creating new market opportunities
Thank you – Any Questions?

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