Latest Developments in Inkjet for IMD Applications Opportunities in Automotive

Debbie Thorp, Business Development Director

AWA - IMLCON™, IMDCON™ & IMECON™ Virtual Conference

October 2020

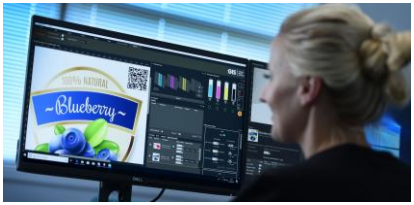
GIS – Company Overview

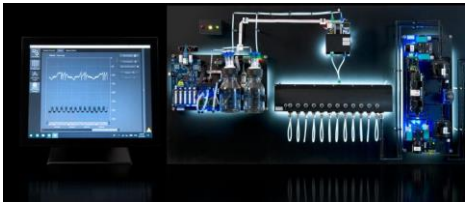
- Leading provider of technology solutions to industrial inkjet systems builders
- Founded November 2006
  - Privately owned
- Based in Cambridge, UK
  - Technical support in UK, China & Japan
- Employees ~60
- Patent protected technology
- Supplier & partner to over 130 customers worldwide
- Many applications - including labels, textile, 3D, packaging, product decoration, coatings

GIS

GLOBAL INKJET SYSTEMS

Complete image management from pixel to drop

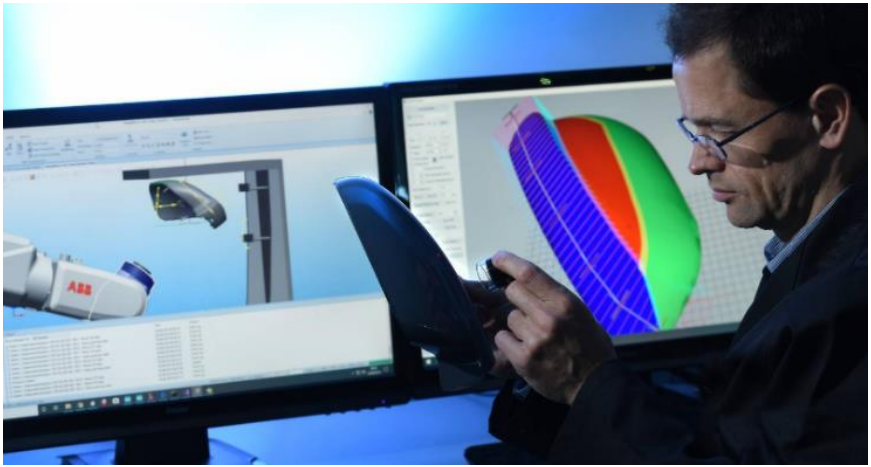




GIS customers - system builders, OEMs, integrators, large end users and fluid developers worldwide - in many different applications and markets

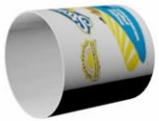
Agenda

- **Quick summary of inkjet technology in IML applications - roadmap to more complex shapes**
- **IMD applications - inkjet and robots**
- **Advantages of inkjet and developments so far**



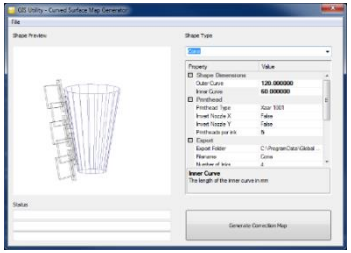
Inkjet in IML Applications

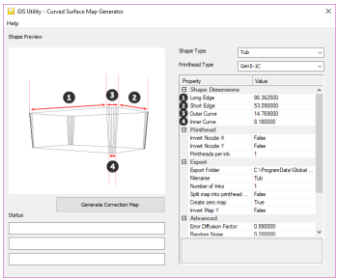
- **Inkjet printing of IML films**
  - Some usage, but not mainstream
- **Direct printing of consumer packaging products**
  - Food containers, cosmetic & personal care containers, drink containers etc
  - Life span of the product is typically measured in months, not years
  - Inkjet possibly challenging screen printing & SA labels more than IML
- **Inkjet well established for tube printing**
  - Technology well understood
  - Different printing modes available
  - Partial and full product coverage
- **Multiple systems suppliers**
  - Very small volume to full production



Inkjet in IML applications

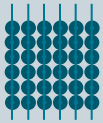
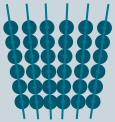
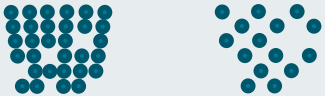
- **Direct print of conical & other container shapes**
  - Drink containers, food containers
  - Image compensation software required to avoid distortion in print
    - Resolution changes
    - Density correction
    - Screening complexity
  - Tubs more complex
    - Required corrections change during the print
    - Often from pixel to pixel
  - Partial and full product coverage
- **A stepping stone to more complex plastic components**
    - Which leads us to potential automotive applications



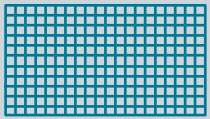
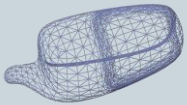
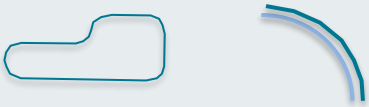


Direct Print with Inkjet – Stage 1

GIS GLOBAL INKJET SYSTEMS

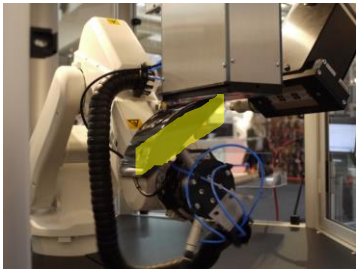
	Flat Surfaces	Curved Surfaces
Density Correction		
Throw Distance & Flight Time		
Nozzle Alignment & Interleaving		
Screening		

Direct Print with Inkjet – Stage 2

	Flat Surfaces	Curved Surfaces
Geometry	2 Dimensions 2 Degrees of Freedom	3 Dimensions 6 Degrees of Freedom
Print Path		
Shape Data		
Motion Control		

Inkjet & Robot Options

- **Printheads fixed**
  - Component fixed onto robot arm and presented to the inkjet printheads
  - Some limitations in size/weight



- **Printheads move**
  - Inkjet printheads mounted onto robot arm and move along the component
  - Enables large items to be printed

Images from IIJ, Heidelberg, Nakan & Xyrec/ SW Research Institute/ Airbus/Marabu

Inkjet in Automotive

- **Much more demanding requirements than IML**
  - Long life – years, not months
  - Specific industry requirements

- **Inkjet interest**
  - Coating primary interest
  - Decoration secondary
    - Interior trims
    - Instrument panels
    - Exterior part casings
    - Headlight covers
    - Grilles

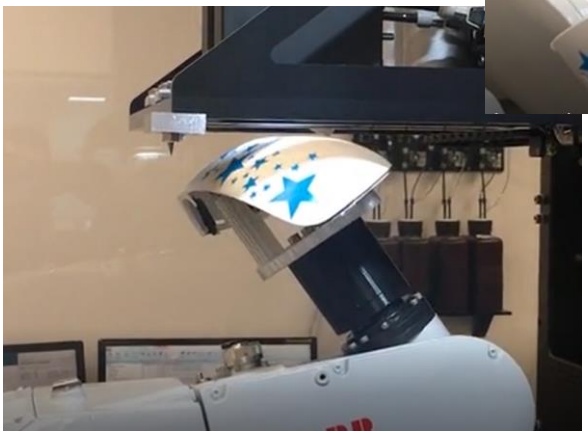
Generic Images from internet – they are not related to specific projects at GIS

Key Drivers for Inkjet – Hard Coats

- **Key drivers from GIS experience in automotive hard coat applications**
- Reduction of waste
  - No overspray
  - Precise positioning
- Efficiency in manufacture
  - Reduction in manual processes
    - No masking
- Accuracy of coating
  - Ability to selectively coat complex components
- **Ability to create textures**
  - Selective coating
- **Capability for large 3D parts**

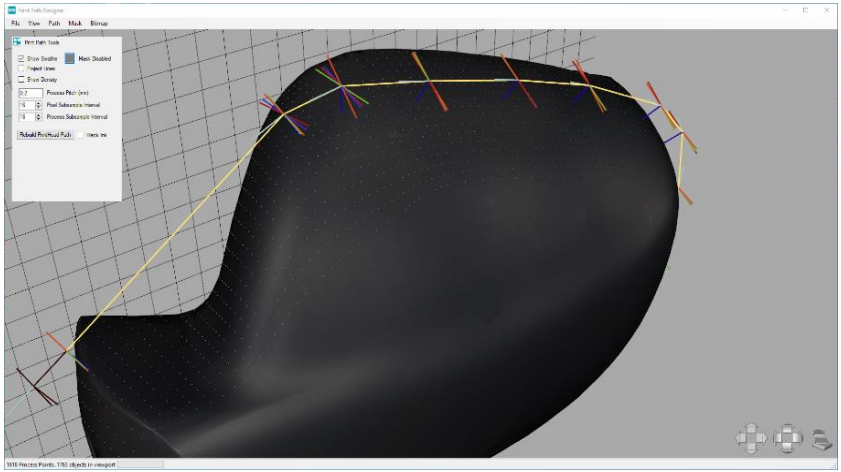
Key Drivers for Inkjet

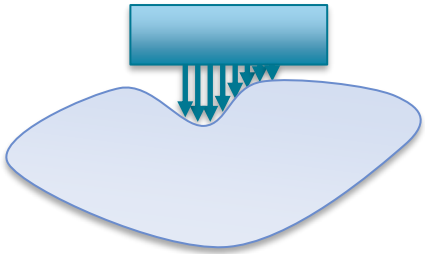
- **Decoration**
  - Product differentiation
  - Customisation



GIS Direct to Shape Studio

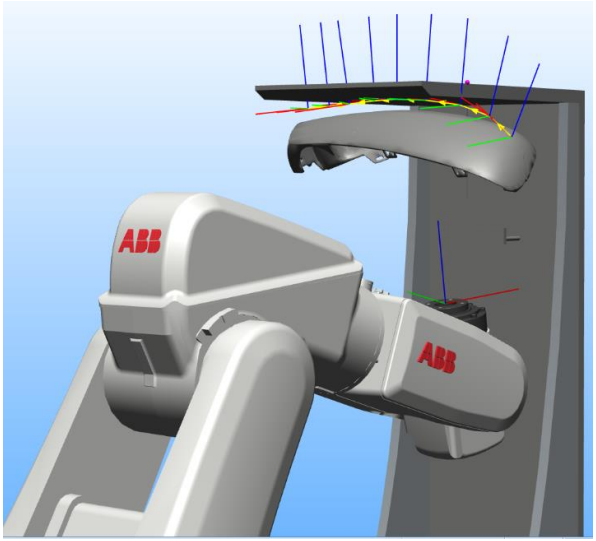
- **Many software stages required, but some of the key steps include:-**
  - Creating the print path
    - Operator specifies series of points across the surface
    - Printhead path is constructed as a series of linked segments (shown in yellow on the image below)

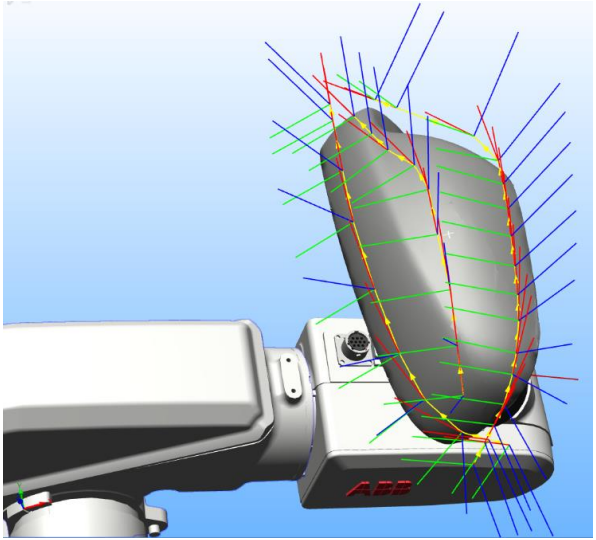




Coating coverage can be achieved even in concavities up to ~25mm depth

Virtual Printing – Defining the Print Path

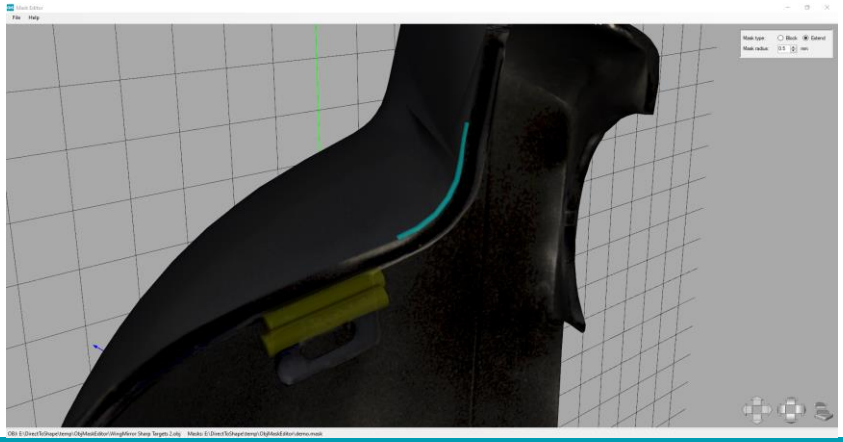




Modelling in ABB RobotStudio

GIS Direct to Shape Studio

- **Digital Masking**
  - Selective coverage
    - Protecting areas that must not be printed
      - Blocking mask (shown in yellow below)
    - Controlled overspray at the edges of a shape
      - Extending mask (shown in blue below)



Coating

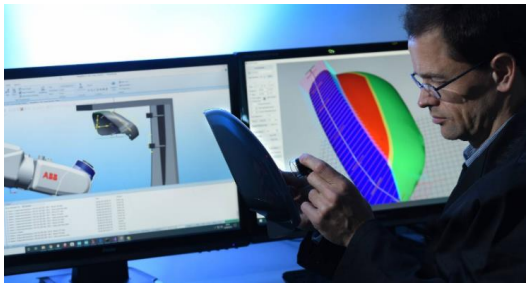
- **Applying an automotive approved hard coat**
  - Momentive SilFORT UVHC5000 or UVHC3000

Decoration

- **Printing a Marabu graphic UV curable inkjet ink**
  - Additional coating may be required for durability

Summary

- **Inkjet is a technology that has brought benefits to many industrial applications**
  - Productivity, robustness in manufacturing environments is proven
- **Significant development work is underway in automotive and consumer durable applications**
  - Software
  - Processes
- **As with other industrial markets where inkjet has made inroads**
  - Often complementary to existing technologies, rather than replacement
  - Needs specific drivers / justification to be in place for successful adoption
  - Ultimately, it finds its place / where it fits



THE QUEEN'S AWARDS FOR ENTERPRISE

Contacts

Nick Geddes, CEO
nick.geddes@globalinkjetsystems.com

Debbie Thorp, Business Development Director
debbie.thorp@globalinkjetsystems.com

Global Inkjet Systems Limited

Edinburgh House
St Johns Innovation Park
Cowley Road
Cambridge CB4 0DS

Tel: +44 (0)1223 733 733
Web: www.globalinkjetsystems.com

Technical support offices in UK, Japan and China