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The Digital Revolution: Integrating Inkjet Technology into the Industrial Manufacturing Process

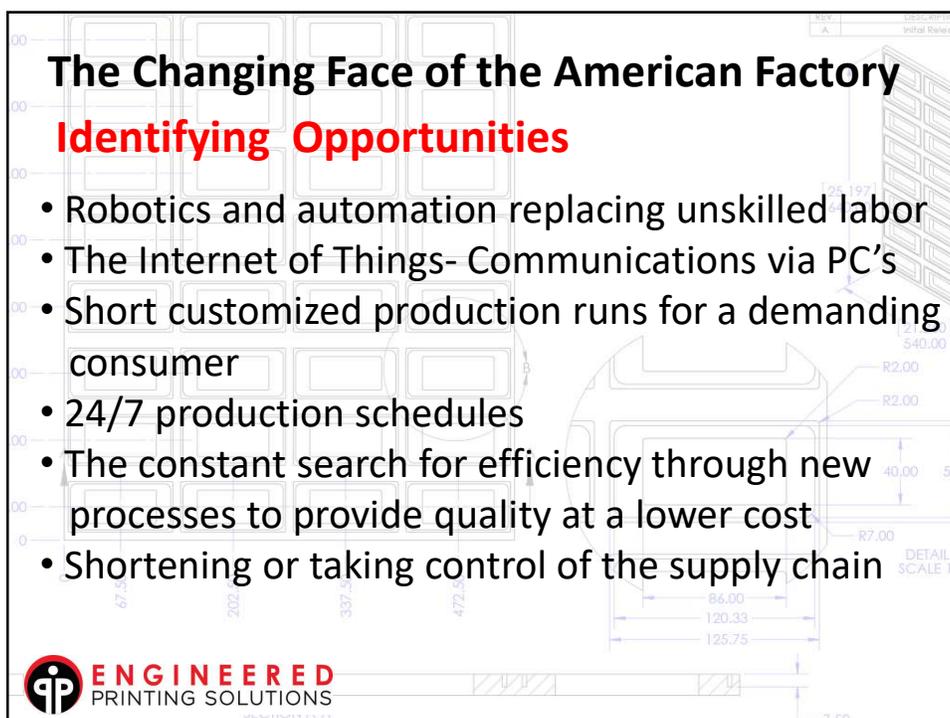
Julian Joffe | President

jjoffe@epsvt.com

SECTION A-A

DETAIL SCALE 1

Dimensions: 67.50, 202.50, 337.50, 472.50, 25.197, 640.00, 121.50, 540.00, R2.00, R2.00, 40.00, 55, R7.00, 86.00, 120.33, 125.75, 7.50



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The Changing Face of the American Factory
Identifying Opportunities

- Robotics and automation replacing unskilled labor
- The Internet of Things- Communications via PC's
- Short customized production runs for a demanding consumer
- 24/7 production schedules
- The constant search for efficiency through new processes to provide quality at a lower cost
- Shortening or taking control of the supply chain

SECTION A-A

DETAIL SCALE 1

Dimensions: 67.50, 202.50, 337.50, 472.50, 25.197, 640.00, 121.50, 540.00, R2.00, R2.00, 40.00, 55, R7.00, 86.00, 120.33, 125.75, 7.50

First Steps

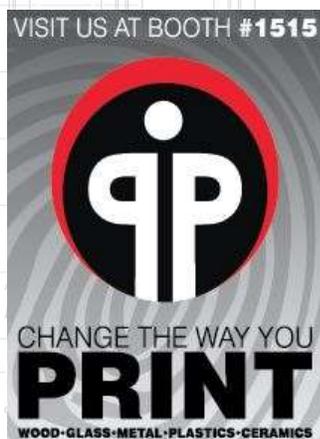
Analyze the process

- Where best to integrate the decorating process?
 - In-line or Off-line
 - Off the part press
 - At an assembly cell
 - Prior to packaging
- Factors to consider
 - Print speed relation to the manufacturing process
 - Minimizing part handling
 - Operator involvement and competence
 - Minimizing down time and identifying bottleneck potentials



Design Considerations –

Materials Handling



- Shape of Product
 - Is fixturing needed
 - Distance of head to print area
 - Cylindrical printing
- Continuous belt, shuttle system or intermittent indexing
- Rotary or Elliptical Table transport
- Roll to roll for food packaging and web fed products
- Identifying the optimal start and finish position of product



Design Considerations- Materials Handling

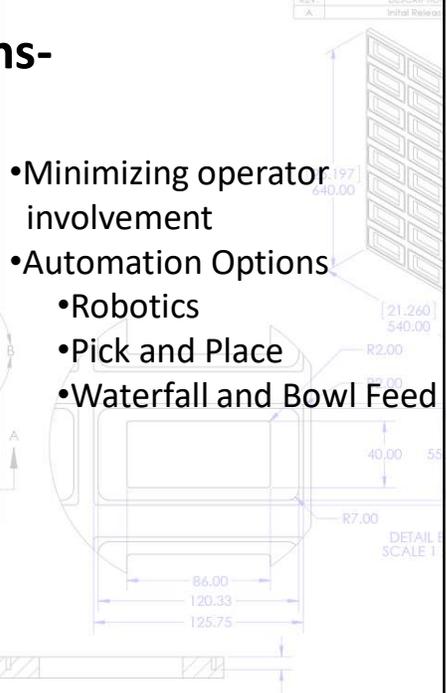
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PRINT

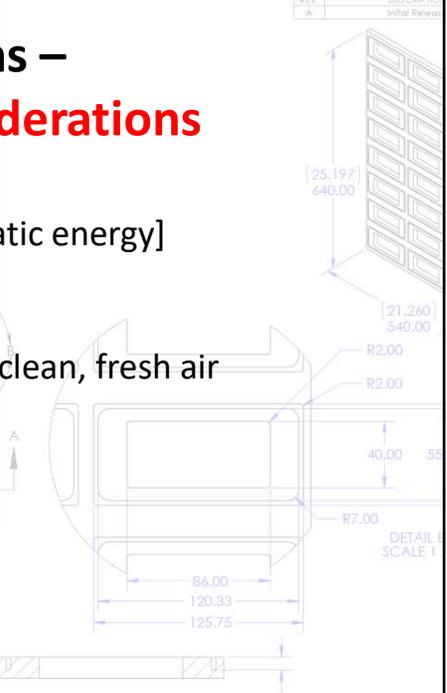
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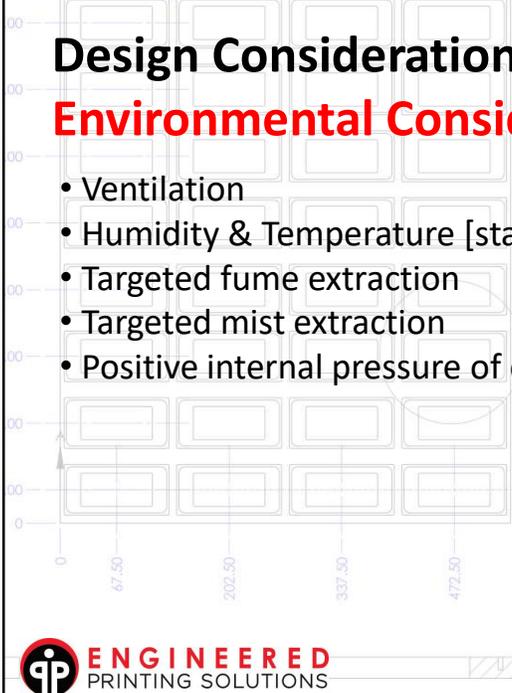
- Minimizing operator involvement
- Automation Options
 - Robotics
 - Pick and Place
 - Waterfall and Bowl Feed



Design Considerations – Environmental Considerations

- Ventilation
- Humidity & Temperature [static energy]
- Targeted fume extraction
- Targeted mist extraction
- Positive internal pressure of clean, fresh air





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Integrating new process in work flow— HMI and Communications

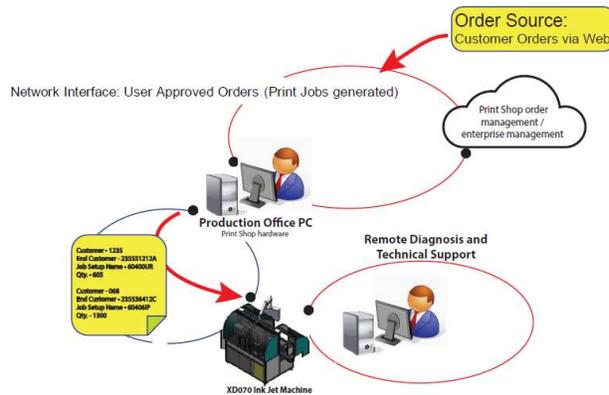
- Integrating part marking/decoration with process flow
 - Interfacing with ERP systems
 - Auto transfer to printer HMI via network
 - Barcode scanning
 - Job storage on the print controller or remotely
 - Batch tracking
 - Variable data
 - Communicating with existing analog equipment



Integrating new process in work flow— HMI and Communications

CONTROLLING EQUIPMENT OPERATION REMOTELY

Print Jobs can also be submitted to the Print Queue remotely across the network via Ethernet



Print Process Development- Choosing The Print Head

- Print head selection
- Speed to drop size consideration
- Turbulence minimization
- Maintenance of heads
- Ink Management Systems

The image shows a technical drawing of a print head assembly. On the left is a grid pattern with dimensions 67.50, 202.50, 337.50, and 472.50. On the right is a detailed view of the print head with dimensions: 25.197, 640.00, 21.260, 540.00, R2.00, R2.00, 40.00, 55, R7.00, 86.00, 120.33, 125.75, and 7.50. The drawing is labeled 'DETAIL SCALE 1:1'.

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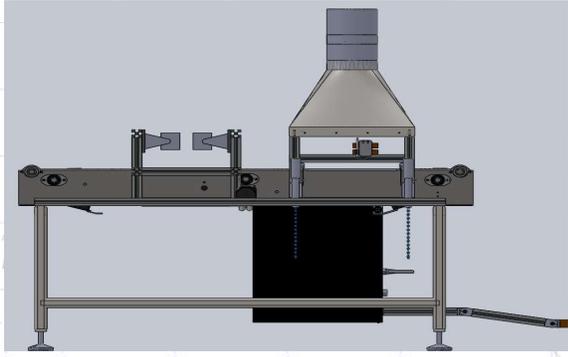
Print Process Development- Jetting Examples Good & Bad

- Waveform development
- Droplet formation and restriction
- Effect of print head to product offset

The image shows two side-by-side images of printed droplets. The left image shows good droplet formation with uniform, circular droplets. The right image shows poor droplet formation with irregular, elongated droplets. The background of the images is a grid pattern with dimensions 67.50, 202.50, 337.50, and 472.50. The drawing is labeled 'DETAIL SCALE 1:1'.

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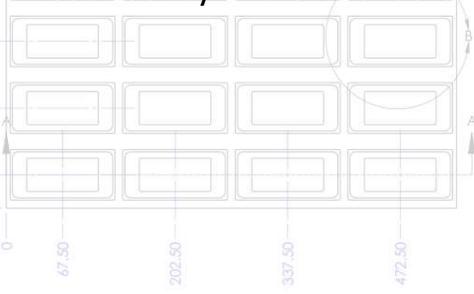
Print Process Development – Pretreatment



- Flame
- Corona
- Plasma

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Print Process Development– UV Cure intensity, Strike Time



- Correct lamp selection
- Variable intensity control via software
- Redundancy and UV sensors

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201 Tennis Way
East Dorset, VT 05253
Phone: 802.362.0844
Fax : 802.362.0858
Email: jjoffe@epsvt.com
Website: www.epsvt.com

SECTION A-A

DETAIL (SCALE)

Technical drawing showing a window frame cross-section (SECTION A-A) and a detail view. The drawing includes dimensions such as 67.50, 202.50, 337.50, 25.197, 640.00, 21.260, 540.00, R2.00, 40.00, 55, 17.00, 7.50, and 281. The detail view shows a window frame with a handle and a label 'IMPROVED POLYCARBONATE PANELS'. The drawing is labeled 'SECTION A-A' and 'DETAIL (SCALE)'.