The Stolle Digital Decorator

Printing on Demand
Capabilities

- Can diameter range from 2.0 inch to 4.0 inch
- Can length up to 11.0 inch
- Print resolution 360 axial x 360 radial dpi to 720 axial x 1000 radial dpi
- Speeds ≈ 50 cpm depending on can size, resolution and printer configuration
  - Typical 12oz beverage can at 720x720 dpi will be approx. 40 cpm
- Fully cured can at discharge of machine – based on concurrent development of new coatings
**Machine Features**

- 16 mandrel turret wheel
- Up to 8 print stations - typical use of CYMK and white inks with three remaining stations allowing for adding possible C+, M+, specialty or proprietary colors
- LED UV pinning lamps at each print station with full cure LED UV lamp at the final station
- Applicator-type Basecoat/Primer unit with LED UV cure lamp
- Applicator-type Over Varnish unit with LED UV cure lamp
- Size as shown approx. 9ft x 8ft x 7.5ft high
Machine Configuration

- Print station
- UV cure lamp for Basecoat/Primer
- Applicator roll Basecoater/Primer unit
- Infeed
Machine Configuration

- Discharge
- Final cure lamp for varnish cure
- Applicator roll over varnish unit
**Description of Operation – Print Process Order**

1. Cans loaded through infeed
2. No can / can fully loaded check
3. Basecoat / Primer application
4. UV cure lamp for full cure of basecoat
5. First print station
6-12. Remaining print stations – Final station will have UV cure lamp for full cure of ink
13. Over varnish application
14. UV Cure lamp for full cure of varnish (if applicable)
15. Discharge
16. Can discharge check
**Description of Operation – Print and Mandrel Spin**

- Turret index motor will index to each station
- At each index position, mandrel spin motor will spin mandrels up to correct RPM for printing
  - Mandrel spin consists of a servo motor and gearhead driving the lower of a pair of main gears mounted back to back on a hub – the upper gear will then drive all mandrels at the same speed at the same time allowing timing to be maintained
- Linear actuator will move print head into position for start of print
- Encoder signals will trigger the print head to begin printing when mandrel spin position and linear actuator position are both correct
- After completion of print, turret will index to the next station
Main Assemblies – Print Station

- INX Digital JetINX PM3 Ink Recirculation System
- Xaar 1002 print head with control board
- Linear servo motor-driven actuator
- Phoseon pinning lamps (2W/cm²) for intermediate colors and full cure lamp (16W/cm²) at final color
- Ink tank (2.5L capacity shown)
INX Digital JetINX PM3 Ink Recirculation System

- Recirculation unit includes both a supply pump to bring ink from the bulk tank to an internal header tank, and a recirculation pump to recirculate from this tank to the print head and back.
- The ink will pass through a 5 micron filter from the bulk tank and a 10 micron filter before the print head.
- A heater is incorporated controlling the ink temperature going to the head – typical temperature is around 140°F (60°C).
Main Assemblies – Print Station

INX Xaar 1002 print head with control board

• 1000 active nozzles divided into 2 rows
• Rows are interlaced to develop 360 dpi native resolution
• Print swath of 2.776” (70.5mm)
• 8 grey levels with drop volumes from 6-42 pL
Main Assemblies – Print Station

Linear servo motor-driven linear actuator

- Linear motor drive with mounting platform
- Runs on precision linear guide rails
- Allows for 3 different print modes:
  - Fixed print
  - Index print
  - Helical print
Main Assemblies – Turret Assembly

- Turret
- Mandrel assembly
- Upper and lower mandrel drive gears
- Turret index direct drive servo motor
  index turret in .25 sec
- Machine base
- Mandrel spin servo drive – drives lower main gear
Main Assemblies – Turret Assembly

- Mandrel assembly
- Mandrel shaft magnetic encoder rings
- Light shield assembly to protect print head from pin/cure lamps below turret
Main Assemblies – Turret Assembly

- Gear set consists of AGMA Class 13 spiral bevel gears that provide .0005” or less variation tooth-to-tooth.
- This variation can still result in print registration errors requiring individual high resolution encoders (238,000 counts/rev.) mounted on each mandrel shaft.
- The encoder feedback allows the print head to track any speed or positional variation that arises from the gear tooth variation, maintaining accurate color registration from station to station.
Main Assemblies – Basecoat/Primer and OV Units

Applicator roll

Laser engraved Anilox/Gravure roll

Guards off

Guards on

Basecoat/Primer Units

Over Varnish Unit

Applicator roll

Chambered doctor blade fountain

Anilox/Gravure roll

LED UV cure lamp – 16 W/cm² with water cooling

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Main Assemblies – Basecoat/Primer and OV Units

- Applicator-applied over varnish allows the use of industry/customer standard coatings
- Keeps film thickness down to levels that allow for existing forming tooling to be used downstream
- UV cure lamp positioned after the over varnish to allow for curing UV varnish
  - Current UV over varnish requires an additional thermal process for full cure
Platform Benefit

• Very flexible and modular configuration
  – Number of print stations, varnish, basecoat, discharge

• Linear actuator driven print head allows for printing in different modes
  – Fixed width and position
  – Multiple print positions at each station
  – Index print
  – INX Digital helical print process

• Linear actuator has the capacity to adapt to future print heads or print head configurations, including multiple head array
Planned Markets

- **Craft/Micro Breweries**
  - Lower volume with more complex graphics

- **Specialty and promotional cans**
  - Labels changed in process
  - Different labels can be queued to print in sequence

- **Aerosol products**
  - Lower volume with higher resolution graphics

- **Food cans**
  - Lower volume with high changeover
And Now... *From Concept to Reality*
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The First Stolle Digital Decorator
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Print assembly

Pin LED UV lamp assembly
The First Stolle Digital Decorator

Over varnish unit

Mandrel and light shield assemblies
Thank You!

Mark Santos
Stolle Centennial

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