In-Register In-Vacuum Pattern Printing - From Wish to Reality

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Aimcal Fall Technical Conference 2008
HISTORICAL METHODS OF ACHIEVING SELECTIVE METALLISATION IN A VACUUM METALLISER

- MECHANICAL SHIELDING – COATING APERTURE SHIELD
- MECHANICAL SHIELDING – SHADOW BAND MASKING SYSTEM
- IN-LINE OIL BOILER SYSTEM

TYPICAL APPLICATIONS
- FUNCTIONAL – CAPACITOR
- DECORATIVE – PACKAGING (SWEET WRAPPINGS)
• Contamination with aluminium
• Accuracy of shield - Size variation
  • Edge Definition
MECHANICAL MASKING SYSTEM – SHADOW BANDS

- System cost
- Edge definition.
- Set up time
Stripe Metallizing

Incoming Substrate

Oil Boiler

Chilled Process Drum

Wire Feed System

PVD Evaporator Source
LIMITATIONS OF DE-MET USING MECHANICAL SHIELDING, SHADOW BANDS AND OIL BOILER SYSTEM

- ONLY CONTINUOUS LINES CAN BE CREATED OF VARYING WIDTHS - CLEAR WINDOWS CANNOT BE ACHIEVED.

- SMALL FEATURE SIZE IMAGES CANNOT BE ACHIEVED DUE TO THE LIMITATION OF THE SLOT AND THE MINIMUM DISTANCE FROM THE OIL BOILER TO THE PASSING SUBSTRATE.
BASIC FLEXO PATTERN PRINTING SYSTEM

Pattern Print Roller/Cliché Plate
Driven Anilox Roller
Oil Evaporator
Wipe Down Roller

Process Drum
Pattern Printing

Evaporation zone: $5 \times 10^{-4}$ mbar

Winding zone

Unwind

Rewind

Anilox Roller and Oil Boiler

Cliché Plate

Process Drum
PRINT SYSTEM OVERVIEW
Pattern Printing

Cliché Plate

Cooled Process Drum

Oil Printed Clear Windows
Pattern Printing

- Oil Pre-Printed Substrate
- Process Drum
- Evaporation Source
Achieving Registration

- Sensing Head
- Print Length
- Pre Printed Substrate

Angular Correction & Ratio Correction
In Register

- Print Sleeve
- Process Drum
- Winding zone
- Evaporation zone
  $5 \times 10^{-4}$ mbar
Print System User Interface
TD Registration - Registration Mark

WEB DIRECTION

In Register
Out Of Register
PATTERN PRINTING ACCURACY

- PRINTING RESOLUTION
  - MD: 30-50 micron
  - TD: 30-50 micron

- REGISTRATION ACCURACY
  - MD: 500 micron
  - TD: 500 micron
PARAMETERS EFFECTING PRINT QUALITY

- BOILER TEMPERATURE
- CONTACT PRESSURE
- OIL METERING
- PROCESS DRUM TEMPERATURE
- OIL CHARACTERISTICS
- ANILOX CELL VOLUME
- CLICHÉ PLATE MATERIAL
- DEPOSITION RATE/ HEAT LOAD
- EVAPORATOR TEMPERATURE/ HEAT LOAD
- LINE SPEED
- SUBSTRATE SURFACE
- PLASMA PRE-TREATMENT
FUTURE DEVELOPMENTS

FILM WIDTH: 400mm  ➔  FILM WIDTH: UPTO 2450mm
PATTERN PRINTED EXAMPLES - 1
Overall Image Diameter = 6mm. Magnification x 10
PATTERN PRINTED EXAMPLES - 3

50 μm lines, gap 80 μm
Magnification x 60

50 μm lines, gap 80 μm
Magnification x 60

50 μm lines, gap 80 μm
Magnification x 200

Magnification x 10
PATTERN PRINTED EXAMPLES - 4

- 20 μm line thickness, 30 μm gap
- 20 μm line thickness, 20 μm gap
- 20 μm line thickness, 20 μm gap
- 20 μm line thickness, 20 μm gap
- 20 μm line thickness
ACKNOWLEDGEMENTS & THANKS

- PRINTPACK INC. FOR SUPPLYING TEST MATERIALS AND OFFERING TECHNICAL SUPPORT DURING THE DEVELOPMENT PHASE OF THE PRINTING/REGISTRATION WORK

THANKS FOR LISTENING