The Journey to Digital Flexible Packaging

Outline

- Introduction to HP Indigo
- Flexible packaging and the demand for digital printing
- Flexible packaging challenges
- HP Indigo LEP technology
- Lamination with LEP with HP
- HP Indigo 20000 Digital Press

Digital is targeting high value pages

Digital accounts for ~41% of $52.5B graphics hardware and ink value

| 2013 Graphics Industry value by application ($ billions) |
|---|---|---|---|---|---|
| Analog Pages | Digital Pages |
| 100% | 0% |
| $2.3 | $1.1 |
| $6.4 | $1.4 |
| $4.0 | $1.4 |
| $4.0 | $1.4 |
| $7.4 | $1.4 |
| $15.6 | $1.4 |
| $4.4 | $1.4 |
| $15.6 | $1.4 |

Flexible Packaging: 0.7% Digital

The Sheep and Flexible Packaging

Source: PPS MAP 2013 Q4 application market sizing for GSB

1. Value = 2013 Hardware and ink revenues (analog and digital)
Drives for digital transformation in Flexible Packaging

- SKU proliferation
- Micro-segmentation
- Faster time to market
- Supply chain efficiencies

Flexible Packaging

Technical demands
- Mid-web and wide web formats
- Regulatory
- Ability to print on challenging plastic materials
- Complex post printing processes as lamination

Flexible Packaging post print processes

Traditionally, construction components defined by the final product

Understand the final products
- Content
- Post treatment
- Storage conditions
- Shelf life

Define media & construction
- Oxygen barrier
- Light barrier
- Look & Feel

Define Adhesives
- Solvent-Based
- Solvent Less
- Water based
- ...

Define Inkset
- Based on the adhesives and substrates used

LEP Technology

Liquid Electro Photography (LEP)
Electro photography — “a process in which light is used to discharge electrically charged areas and to create a latent image that can be developed by Electro Ink”.
Electro Ink

Unlike analogue inks, which can be replaced easily, HP Indigo ElectroInk is a core component which is challenging to re-design based on the media / adhesive selection.

Electro-Ink - Schematic

Common lamination structure

1. **Primer** is a must to adhere ink to the relevant substrates.
2. **Adhesive** has to fit HP Indigo electro ink and has to be selected carefully for laminated applications.

Adhesives matrix

- **Technology**
  - Solvent Based
  - Solvent Less
  - Water Based

- **Variety of manufacturers**
  - Asian based
  - American based
  - Europeans

- **Performance**
  - General
  - Medium
  - High (Retort)

Validation flow

- **Lamination**
  - Lamination bond strength and failure mode analysis

- **Folding**
  - Folding stress test

- **Sealing**
  - Sealing stress test
  - Flat jaws + Teflon
  - Grooved jaws
  - Sealing bond strength

Major improvements using Corona treatment

**Corona Treatment – Increasing adhesion**

- Removes contamination
- Modify the polarity of surface
- Enhance chemical functionality
- Improves wetting
Mechanical Properties Evaluation

As lower the elastic modulus the better lamination performance it has with electro-ink.

Elastic modulus (3%) (MPa)

- High elastic modulus adhesive
- Mid elastic modulus adhesive
- Low elastic modulus adhesive
- Very low elastic modulus adhesive

Good and increasing performance

Mechanism

Stress distribution

- Large stress on primer-ink interface, leading to primer-ink failure
- Equal stress distribution - Soft Adhesive absorbed most of stress, the rest falls on ink, leading to good lamination bond strength

Mechanism

- Large stress on primer-ink interface, leading to primer-ink failure
- Medium stress falls on primer-ink interface, may cause failure
- Rigid Adhesive
- Flexible Adhesive
- Soft Adhesive

Achievements

- Mid-web format
- Ability to print on challenging plastic materials
- Complex post printing processes as lamination
- Regulatory

Printing HP Indigo Electro Ink on thin plastic materials is possible when using a primer which enable good adhesion of the ink to the substrate.
Thank you

What is digital printing?

Advantage

Digital printing eliminates many analog steps associated with conventional printing

• Reducing total environmental impact
• Increases throughput speed

What’s Next?

Flexible packaging segment

Build facts of advantage that clearly distinguish competition

• Field proven mature product (Happy customers)
• Brand preferred product (Happy Brands)
• No limit of Application (ink is no longer weakness)
• Real disruptive E2E that opens new opportunity (beyond printing)

Order From 50 bags
Order From 100 bags
Order From 500 bags

Digital printing time to market (TTM) Advantage

Conventional analog vs. digital

HP Indigo

-40% set-up time

Digital Printing created a breakthrough in flexible packaging printing

Lamination performance tree and Indigo 20000 application fit

Target up to medium level lamination performance applications.

Indigo 20000 Current application fit

Solvent Based

Solvent Free

Water Based

High

Medium

General

• Retort
• Microwavable
• Aqueous foods

• Meat & Cheese
• Coffee
• Snack & Confection

• Dry Foods
• Wrap around Labels

Digital

Create new incremental business

Business solutions