PackAge 2008

RECENT ADVANCES IN CONVERTING TECHNOLOGIES
Overall Market Trends

- Market Size – US$ 950mio
- Annual historic growth @ 15% per annum
- Future growth trend driven by:
  - Growth in per capita income
  - Double income families
  - Improving retailing infrastructure
  - Inward direct investment by multinational brand owners
Flexible Packaging Demand Drivers

- Food processing sector valued at Rs.35000cr & growing @ 12%pa.
- 1/3rd of this is value-added food products
- Much of this industry is small-scale due to:
  - Prohibition of direct FDI in retail
  - Prohibition in contract farming
  - Some of the highest taxes on processed foods in the world
  - India is unusual in its high usage of flexible packaging in liquid products, i.e. edible oil, milk
Food & Grocery Retailing

- India’s retail sector is the world’s 8\textsuperscript{th} largest with annual sales of around Rs.32500cr.
- Rapid growth in grocery & food retailing driven by its fast growing 350mio middle class consumers.
- Emergence of multiple retailing, although still in its infancy.
- Currently 97\% of food retail sales are via over 1.0mio family-owned stores, the highest no. of retail outlets per capita of any country in the world.
Flexible Packaging Industry – A Bird’s Eye View

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2007$million</th>
<th>Trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1040</td>
<td>Growing @ 15%pa+</td>
</tr>
<tr>
<td>Export</td>
<td>100</td>
<td>Growing strongly to neighbouring countries, Mid East, Africa, Europe &amp; N America</td>
</tr>
<tr>
<td>Domestic Sales</td>
<td>940</td>
<td></td>
</tr>
<tr>
<td>Imports</td>
<td>10</td>
<td>Minimal with little growth</td>
</tr>
<tr>
<td>Domestic Consumption</td>
<td>950</td>
<td>Growing @ 15%pa+</td>
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</tbody>
</table>
Features of Flexible Packaging Industry in India

• The US$1.1billion Indian flexible packaging industry operates at 2 levels
  – The ‘organized market’ comprising around 40 converters. Estimated sale – US$650.0mio
  – The ‘unorganized market’ comprising over 500 small converters. Estimated sale – US$440.0mio

• The market is increasingly investing in modern equipment to meet needs of a rapidly growing retail sector.
Domestic Consumption of Flexible Packaging

• Unique feature of one product, chewing tobacco, accounting for 1/3\textsuperscript{rd} of sales
  – Packaging is mainly PET-based, 2-ply or 3-ply providing good odour barrier
  – Approx. 60,000T/annum PET film consumed a/c for 50% of total consumption

• Other major consumption products – food staples, confectionery, biscuits, snacks, detergents, soap, shampoo, & other house-hold products
Future Trends in Flexible Packaging Market

• Retail will continue to drive business & growth
• Collaboration between suppliers, converters, & customers need of the hour
• Sustainability – An issue that is not going away
• Surging raw material prices & availability could result in slow-down in the immediate context
• Fragmentation of industry to continue
Future Trend in Product Movement

• Roll stock business will continue its dominance over value-added products, accounting for 61% of the industry

• Growth in value-added businesses, currently at @ 11% of industry sales
  – Pouches – lay-flat, stand-up, retort
  – Shrink sleeves
  – Wraps
  – Extrusion
  – High-barrier pharmaceutical packaging

• Movement towards PS, PET, & OPA indicating rise in high barrier packaging demand
RECENT ADVANCES IN CONVERTING TECHNOLOGIES

• INDEX
  • BARRIER
  • SHELF APPEAL
  • FUNCTIONAL
BARRIER

- **NANO-CLAY filled NYLON co-ex film**
  - Extremely Low OTR compared to conventional co-ex Nylon film
  - Comparative data - 10mic Nylon content in 70mic co-ex film

<table>
<thead>
<tr>
<th>Film currently in use</th>
<th>60cc/sqm/24 hr at 24degC &amp; 0% R/H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NANO-NYLON modified film</strong></td>
<td>10cc/sqm/24 hr at 24degC &amp; 0% R/H</td>
</tr>
</tbody>
</table>

  - Increases performance of product shelf life

- **High Barrier METBOPP**
  - Extremely low WVTR

<table>
<thead>
<tr>
<th>Regular METBOPP</th>
<th>0.60g/sqm/24 hr at 37.8degC &amp; 90% R/H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH BARRIER METBOPP</strong></td>
<td>0.30g/sqm/24 hr at 37.8degC &amp; 90% R/H</td>
</tr>
</tbody>
</table>

  - Increases performance of product Shelf Life
  - Shelf Life: 2yrs
**BARRIER**

- **EXTRUDABLE PVDC**
  - Extremely Low OTR compared to conventional film
  - Extremely Low WVTR compared to conventional film

| Film currently in use | OTR : 120cc/sqm/24 hr at 24degC & 0% R/H  
<table>
<thead>
<tr>
<th></th>
<th>WVTR : 40g/sqm/24 hr at 37.8degC &amp; 90% R/H</th>
</tr>
</thead>
</table>
| **EXTRUDABLE PVDC**   | OTR : 7cc/sqm/24 hr at 24degC & 0% R/H   
|                       | WVTR: 7g/sqm/24 hr at 37.8degC & 90% R/H |

- Increases performance of product shelf life

* 9-LAYER FILM WITH NYLON AND EVOH

- Extremely low WVTR/OTR

| - Regular METBOPP | WVTR: 0.60g/sqm/24 hr at 37.8degC 90% R/H  
|                   | OTR : 40cc/sqm/24 hr at 24degC & 0% R/H |
| 9-LAYER FILM      | WVTR: 0.5g/sqm/24 hr at 37.8degC & 90% R/H  
|                   | OTR : 2.5cc/sqm/24 hr at 24degC & 0% R/H |

- Typical structure: LLD/Tie/Nylon/Nylon/EVOH/Nylon/Nylon/Tie/LLD
- Increases performance of product Shelf Life
- Shelf Life: 2yrs
**BARRIER**

- **SiOX COATED FILM**
  - Extremely Low OTR/MVTR compared to conventional METALISED film

| Metallised Film currently in use | OTR: 40 cc/sqm/24 hr at 24degC & 0% R/H  
WVTR: 0.6 g/sqm/24 hr at 37.8degC & 90% R/H |
|----------------------------------|---------------------------------------------|
| • SiOX COATED FILM              | OTR: 0.25 cc/sqm/24 hr at 24degC & 0% R/H  
WVTR: 0.25 g/sqm/24 hr at 37.8degC & 90% R/H |

- Increases performance of product shelf life

- **AIOX COATED FILM**
  - Extremely Low OTR/MVTR compared to conventional METALISED film

| Metallised Film currently in use | OTR: 40 cc/sqm/24 hr at 24degC & 0% R/H  
WVTR: 0.6 g/sqm/24 hr at 37.8degC & 90% R/H |
|----------------------------------|---------------------------------------------|
| • AIOX COATED FILM              | OTR: 0.25 cc/sqm/24 hr at 24degC & 0% R/H  
WVTR: 0.25 g/sqm/24 hr at 37.8degC & 90% R/H |

- Increases performance of product shelf life
SLIDER BAGS

SHELF APPEAL

3-D BAGS

WEATHER RESISTANT BAGS

WOVEN LAMINATED BAGS
SHELF APPEAL

Sleeve In Pouch:

Maintains a rigid shape in flexible packaging
FUNCTIONAL

Mono Dose Packs

Typical Structure

- 19 mic PET/50 mic PE (Medium Barrier)
- 12 mic PET/12 mic METPET/50 mic PE (High Barrier)
- 12 mic PET/7 mic FOIL/50 mic PE (Ultra High Barrier)
- Achieved packed geometry with profile die cut on FFS M/c
FUNCTIONAL

Diaphragm Bags

Typical structure for Diaphragm

- 25 mic PE/12 mic PET/25 mic PE (Medium Barrier)
- 25 mic PE/12 mic METPET/25 mic PE (High Barrier)
- Laser scored on the diaphragm for easy tear facility
FUNCTIONAL

Convenience – Easy to Peel

• **EASY PEEL LAMINATE**
  - Soup
  - Ketchup
  - Coffee
  - Wet Wipes

• *Application* – PE to PE sealing for Lo

• *Seal Strength* – 0.3kg/15mm to 1.0kg/15mm without failure of seal integrity in vacuum leak test

• *Sealant layer Thickness* – 40mic min.
FUNCTIONAL

Vacuum Packaging of Basmati Rice

• Multi-layer Structure PE/TIE/NYLON/TIE/PE
• Increased Shelf Life
• Aroma Retention
• Retail Packaging & for Export Market
FUNCTIONAL

AL FOIL Downgauging

• Use 6.35 mic Alu Foil instead of 9 mic

• Perforation count

<table>
<thead>
<tr>
<th>Foil Type</th>
<th>Perforations/sqm</th>
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<tbody>
<tr>
<td>9mic Alu Foil</td>
<td>200</td>
</tr>
<tr>
<td>6.35 mic Alu Foil</td>
<td>50</td>
</tr>
</tbody>
</table>
FUNCTIONAL

OPALTONE PRINTING

- 7-Colour separation covering all colour gamut – flexography printing technology

- 30% reduction in ink consumption

- 50% reduction of spot colour wash-ups

- Enhanced graphic reproduction
FUNCTIONAL

Convenience – Easy to Tear

LASER SCORING

• Features - Can be registered to print design
• Negligible impact on barrier properties

BLOWN FILM RECIPE

• Feature - Easy Tear in any direction
• Application - Can be used as a sealant layer in any specification up to 100g.
• Requires a v-notch to initiate tear.
• Seal strength - 12mic PET/ 25mic PE - 1.5kg/15mm
FUNCTIONAL

ECO-PACK

- 100 % Recycleable Laminate
- Soft Touch
- No-crinkling sound of Plastics
- Protects the environment
- Ease of Tear
- Better value
FUNCTIONAL

BREATHTABLE

• Soft touch
• Cloth like feel
• Ultra thin in gauge
• No crinkling sound of conventional plastic
• Application – Baby Diapers back sheet
FUNCTIONAL

Electron Beam Curing

• High gloss i.e. replacement of film by a thin coating layer
• No environmental impact due to solvent emission compared to conventional coating
• Higher yield of packaging materials
• Instant curing at high production speed
• High chemical resistance
• High abrasion resistance
• No softening after curing
• Low odour & off taste
• Coating complies with FDA direct food contact
FUNCTIONAL
Medical Packaging

I. Cold Form Blister
• Typical structure: 25mic BON (For Support)/45mic AL FOIL (For Barrier)/60mic PVC (For sealing to lidding foil)
• Complete protection of moisture, oxygen, light & aroma
• Energy savings in blister formation compared to conventional PVC/PVDC blister material.
• Improved brand identity due to excellent reverse print graphics.
FUNCTIONAL
Medical Packaging

II. Thermoformed Blister

- Typical structure: 200mic APET (For Formation)/50mic PE (For Sealing) for non aqueous liquid pharmaceutical products.
- Typical structure: 20mic BOPP (For Support)/280mic CPP (For Formation & Sealing) for aqueous liquid pharmaceutical products.
FUNCTIONAL

Medical Packaging

III. Blister Pack Lidding Foil

• Typical latest structure: 20mic AL Foil (Hard Temper – For Push through tear)/10mic Extruded Sealant PE (For Sealing)
• No environmental impact due to VOC emission for conventional heat seal lacquer
IV. Health Care Product Sachet

- (A) Typical structure for ORS: 12micPET/12mic EXTPE/6.35 mic AL FOIL/37micPE
  - Ultra high barrier for extrusion lamination based structure
  - Easy tear
  - Excellent print graphics due to reverse print
IV. Health Care Product Sachet

- (B) Typical structure for Cough Drops for Medium Barrier: 20micBOPP/25micPE
- Typical structure for Cough Drops for High Barrier: 20micBOPP/20micMETBOPP/Registered Cold Seal
  - Moisture barrier
  - Easy tear
  - Excellent print graphics due to reverse print
FUNCTIONAL
Medical Packaging

IV. Health Care Product Sachet
• (C) Typical structure for Cough Syrup: 12micPET/50mic PE (For shorter shelf life)

• (D) Typical structure for Cough Syrup: 12micPET/9 AL Foil/50mic PE (For longer shelf life)
FUNCTIONAL

Medical Packaging

V. Contraceptive Wrap
- Typical structure: 20mic BOPP/25mic EXT PE/9mic AL Foil/30mic SPL PE
- Silicone oil lubricant resistant sealant layer
- Easy tear
- Excellent print graphics due to reverse print
FUNCTIONAL

Medical Packaging

VI . (A) Medium Barrier Films for Infusion Applications
- Polypropylene, Nylon and Polyester based films for thermoforming and flow-wrap machines

(B) Dialysis Applications
- Gas barrier EVOH films

(C) Ultra High Barrier Films for Blood Bag Applications
- Aluminum foil laminates
- AlOx clear laminates
FUNCTIONAL

ECO FRIENDLY PACKAGING

- Corn starch & polylactic acid (PLA) based polymeric materials.
- Biodegradable & commercially compostable to CO₂, water & biomass.
- 300% stronger (high tensile strength & modules of elasticity) than conventional LDPE film.
- Heat & moisture stable compared to conventional LDPE film.
- Compiles FDA for direct food contact application.
- Biodegradability with ‘Degrable Compostable Plastic” (DCP) additive to conventional PE from 6 wks to 6yrs.

Photo and thermal degradation of polyethylene carry bags made from standard polyethylene (bottom) and biodegradable polyethylene (top). Pictures show (left to right) at 0, 30 and 55 days exposure.