BOPP films for Sustainable Solutions

Mr. K. Manohar
Chief Technology Officer
Max Group – A Leading Indian Conglomerate

Max Group
(in the business of Life)

MAX FINANCIAL SERVICES

Max Life Insurance Business*

MAX INDIA LIMITED

Health & Allied Business

MAX VENTURES & INDUSTRIES

Manufacturing & Other Businesses

Group CSR Arm

Toppan

51%

49%
Alchemy, Gold and Plastics

Alchemists in Medieval Europe aimed to turn iron or steel into gold.

Modern plastic technologists started with propylene monomer to create polypropylene.

Plastics and Packaging - Historical milestones

- Parkesine
- Cellophane
- Scotch tape
- PVDC
- Tupperware®
- Spray bottle for perfume
- Polyethylene garbage bag
- Zipper bags
- Bubble Wrap®
- PLA packaging

- 1862
- 1900s
- 1930
- 1933
- 1946
- 1946
- 1950
- 1954
- 1960
- 1988
- 2000

- A Parkes
- Brandenberger
- Richard Drew
- Ralph Wiley
- Earl Tupper
- Montenier
- Harry Wasylyk
- Alfred Fielding

- 1862
- 1900s
- 1930
- 1933
- 1946
- 1946
- 1950
- 1954
- 1960
- 1988
- 2000
## Rigid packaging vs. flexible packaging

<table>
<thead>
<tr>
<th>Feature</th>
<th>Rigid Packaging</th>
<th>Flexible Packaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Heavy, adds weight</td>
<td>Lighter</td>
</tr>
<tr>
<td>Size</td>
<td>Larger packing's</td>
<td>Size of packing is 60%</td>
</tr>
<tr>
<td>Storage</td>
<td>More space needed</td>
<td>40% less space needed to store</td>
</tr>
<tr>
<td>Energy requirement</td>
<td>More fuel burnt for transport</td>
<td>Less fuel required for transport</td>
</tr>
<tr>
<td>Re-sealing</td>
<td>Not possible by design</td>
<td>Can be designed to re-seal</td>
</tr>
<tr>
<td>Re-used</td>
<td>Can be re-used</td>
<td>Not designed for re-use.</td>
</tr>
<tr>
<td>Disposal</td>
<td>Difficult due to size</td>
<td>Easy due to compressibility</td>
</tr>
</tbody>
</table>

### Transition from rigid to flexible packaging:

- Global market for flexible packaging to grow at CAGR of 3.8% between from $98 billion (2016) to $248 billion (2020)
- Flexible packaging encroaching market share from rigid packaging
- Key areas of growth – FMCG, pet food, motor oil, baby food
- Key advantage of flexible packaging - preserves product freshness
Flexible packaging growth drivers & geographical distribution

Growth drivers for flexible packaging vs. rigid packaging:

- Packaging weight
- Product-to-package ratio,
- Volume of landfill discards,
- Greenhouse emissions and
- Total energy consumption in manufacturing the packaging

Total Flexible Packaging market worth $219 billion (2016)

- Middle East & Africa
- Western Europe
- Eastern Europe
- North America
- South & Central America
- Asia-Pacific
Multi layer packaging – a value proposition

What and Why?

- Films containing multiple layers of extremely thin layers of films of different resins
- Used in packaging to achieve specific requirements in a cost-effective manner

Rigidity

Heat resistance

Cold resistance

Flexibility

Heat sealing

Runnability
Strategies for packaging optimisation

- Reduce food waste in total value chain
- Improve degree of filling – transport work reduced
- Increase use of recycled materials in packaging
- Reduce material density in packaging
- Select low impact materials & suppliers for packaging
## Plastics – Face the facts

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Plastics production/p.a.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>2.5 billion</td>
<td>1.5 million tons</td>
</tr>
<tr>
<td>2016</td>
<td>7.0 billion</td>
<td>320 million tons</td>
</tr>
<tr>
<td>2034</td>
<td>8.8 billion (predicted)</td>
<td>640 million tons</td>
</tr>
</tbody>
</table>

### Alarm bells:

- Everyday 8 million tonnes plastics waste enter the oceans
- 5000 items marine plastics found/mile of UK beaches
- 100% marine turtles, 59% whales, 36% seals and 40% sea birds - affected

### Plastics on our dinner table!

5.25 trillion plastics pieces floating in the oceans

2014: Plastics vs. fish in oceans: 1:5

2050: Plastics vs. fish in oceans: >1:1
What and Why?

- Sustainability is the endurance of systems and processes.
- The term can be defined as the ability to sustain itself in the prolonged future.
- Often been defined as how biological systems endure and remain diverse and productive.
- Four types of sustainability:
  - Human sustainability - The maintenance of human life.
  - Economic sustainability - having enough capital for a designated period of time. **Main objective** - to make sure that the resources are preserved for the human beings in the future.
  - Social sustainability/Society - Maintaining law and order, preservation of societal values.
  - Environmental sustainability - We depend on natural resources. Depletion of natural resources should be reversed.
The Story of The Easter Island

• One of the most remote islands in the world
• Around 2500 miles from the nearest continent- South America
• First populated by Polynesians (around 30 people)
• Civilisation reached an advanced stage-population of 7000 in year 1550
• Constructed and placed over 600 huge stone statues
• Civilisation collapsed in 400 years due to massive environmental degradation

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1722</td>
<td>2000-3000</td>
</tr>
<tr>
<td>1877</td>
<td>111</td>
</tr>
<tr>
<td>2017</td>
<td>7780</td>
</tr>
</tbody>
</table>

If the World lived like? | No of earths needed
UAE | 5.4X
USA | 4.1x
CHINA | 1.1x

Are we heading in the same way? Is our world not enough?
Strategies for managing plastics and plastics waste

1. REDUCE
2. REUSE
3. RECYCLE
4. RECOVERY
5. LANDFILL

https://www.geosynthetica.net/india-vertical-expansion-landfill-strata/
Dealing with plastics waste-examples

- Boat of plastic bottles - Cameroon
- Log cabin-recycled plastics - Scotland
- Bed of plastic bottles

- Recycled plastic to print 3D glasses - Belgium
- Recycled building blocks - Columbia
- Greenhouse made of waste plastic bottles
Circular Economy and Plastics

- As per circular economy Plastics material flow expected to be inside cycle
- However, waste plastics pilfered at each stage of its life
- Heterogeneity of plastics, specially multilayer films hinders direct recirculation
- Similar or homogenous materials the solution
Challenges & solutions to circular economy in packaging

Issues to circular economy in plastics:

- Varied no of heterogeneous materials- aluminium foils, different types of plastics etc.
- Difficulty in separation of multilayer packaging containing different plastics
- Lack of consumer awareness- prone to littering
- Inadequate collection & segregation mechanism of waste from municipal and solid waste
- Cost-effective recycling solutions to obtain virgin quality plastics from waste

Solutions towards achieving circular economy:

- Adoption of homogenous structures in multilayer packaging
- Replacement of aluminium foil with metallised plastic films
- Popularising buyback of plastic packaging
- Encourage single use plastic packaging for food etc.
- Loop mechanism for plastics waste- e.g. for plastic pallets
BOPP plastics flow - change format

- Circular economy approach at BOPP, Converter and post-consumer stage.
- More successful at pre-consumer stage now
- Waste plastics flow to landfill to be avoided
- Better management of post-consumer waste required
Circular Economy in Plastics – The future

Circular economy for BOPP/Flexible packaging

Strategies to achieve circular economy:

- Reduce → Plastics use
- Reuse → Plastics article
- Recycle → Plastics waste
- Loop → Use on demand
- Redesign → New materials
- Back to oil → Pyrolysis

Traditional vs New-Age
<table>
<thead>
<tr>
<th>Plastics Type</th>
<th>Petrochem/ Plant</th>
<th>Performance</th>
<th>Biodegradable</th>
<th>Recyclable</th>
<th>Circular economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional plastics</td>
<td>![Image]</td>
<td>★ ★ ★</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bio-degradable</td>
<td>![Image]</td>
<td>★</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bio-plastics</td>
<td>![Image]</td>
<td>★ ★ ★</td>
<td>Depends</td>
<td>No if degradable</td>
<td>Depends</td>
</tr>
</tbody>
</table>
BOPP Solutions- A Game Changer

BOPP benefits:
1. Recyclable
2. Preferred substrate for EPR
3. Consumer convenience…easy tear
4. Package weight reduction, yield, ply reduction
5. High productivity
6. Shelf life enhancement

PET film replacement
PE replacement
Met-PET/Al foil replacement
MAX Recyclability Differentiators - UNILAM series

- PET Replacement
- HIGH BARRIER
- Al foil replacement
- Sealing reliability
MAX UNILAM Solutions - A Game Changer

Existing Laminate

- PET + Al Foil + PE
- PET + Met-PET + PE
- PET + Met-PET + PE
- PET + Met CPP

Laminate-Max Solutions

- HROB + SL6 + PE/CPP
- OPP + Met-BOPP + PE
- OPP + Met HB OPP + PE
- OPP + High seal BOPP (MHS-C)

Recyclability

- ✓
- ✓
- ✓
- ✓
Barrier Properties- Max BOPP

OXYGEN AND WATER VAPOUR BARRIER PROPERTIES OF DIFFERENT FILMS

OTR (cc/m²/2/day)

WVTR (g/m²/day)
Max Thrust- Line 5 & Recyclability

Thicknes Capability

- High Barrier
- Control on impurities
- High Surface Energy
- Max thickness- 80 microns
- Inter-layer cohesive strength

Online-Inspection

Recyclability

- Higher Thickness films
- Novel coatings
- Biodegradable BOPP
- BOPE/MHS-C

In-Line coater

Die-Design
BOPE – Max innovations

“Max Speciality Films successfully makes its first Biaxially Oriented Polyethylene Film

BOPE- Features and advantages

- Sealability
- Recyclability
- Savings in laminate thickness up to 50%
- Higher impact resistance
- Higher puncture resistance
- Better runnability
- Made into 100% recyclable laminate
- Conducive for reverse printing
- Good thickness control
Key Contributors to Circular Economy:

- Manufacturer
- Distributor
- Retail user
- Recycling system
As responsible citizens- do not litter

Do Not Litter.
Keep Your Environment Clean.

- Segregate and Throw Waste Only in Waste Bins.
- Use Two Bins – One for Wet Waste, One for Dry Waste.

Capacity: 75,000 TPA    Employee strength: 400+

4 METALLIZERS   4 BOPP LINES   3 EXTRUSION LINES   2 COATING LINES   INNOVATION CENTRE
Circular Economy is an Attitude!

Thank you

Expect best-in-class service with the word “go”