Multi-layer high barrier packaging reduces environmental impact
The function of packaging

- Protection
- Containing
- Preserving
- Transporting
- Informing
- Selling
Barrier properties

BOPP has exceptional moisture barrier compared to other polymer packaging films...

* Refers to 25 µm
Barrier properties

...but the OTR is relatively poor.

* Refers to 25 µm
OTR can be improved by metallisation but sometimes a transparent or ultra high barrier film is needed.
Sustainability

Packaging design:
• Type of materials
• Process
• Weight and volume reduction
• Environmental impact

Prevention includes all measures aimed at reducing environmental impact.
Main criteria of prevention

- Energy saving
- CO\textsubscript{2} reduction
- Saving of raw materials
- Reusable packaging
- Use of recycled materials
- Optimisation of logistics
- Facilitation of recycling
- Simplification of the packaging structures
# Product Range

<table>
<thead>
<tr>
<th>Aesthetical Aspect</th>
<th>Thickness (µm)</th>
<th>O₂TR (cm³/m² d)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MULTILAYER FILMS Single Web Structure and/or Lamination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transparent</td>
<td>20/30</td>
<td>≤ 15</td>
<td>MST = 105°C</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>≤ 3</td>
<td>Al replacement</td>
</tr>
<tr>
<td>metallised</td>
<td>20/30</td>
<td>≤ 15</td>
<td>WVTR = 0.30</td>
</tr>
<tr>
<td>metallised</td>
<td>30</td>
<td>≤ 3</td>
<td>WVTR = 0.30</td>
</tr>
<tr>
<td><strong>MULTILAYER FILMS Single Web Structure and/or Lamination, White Voided</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>white voided</td>
<td>35</td>
<td>≤ 15</td>
<td>MST = 105°C</td>
</tr>
<tr>
<td>white voided metallised</td>
<td>35</td>
<td>≤ 15</td>
<td>WVTR = 0.40</td>
</tr>
<tr>
<td><strong>MULTILAYER FILMS Flow Wrapper Film – Horizontal, Vertical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transparent</td>
<td>35</td>
<td>≤ 25</td>
<td>MST = 85°C</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>≤ 10</td>
<td>Enhance seal, PE</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>≤ 10</td>
<td>Enhance seal, PP</td>
</tr>
<tr>
<td><strong>MULTILAYER FILMS Tray Lidding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>≤ 10</td>
<td>Heat sealable, PE</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>≤ 10</td>
<td>Heat sealable, PP</td>
</tr>
</tbody>
</table>
Key applications

- Easy Printing and Lamination
- Flow Wrap Films
- Lidding Films
- High Barrier Triplex Replacement
Technology

- OTR: 3 – 15 cm³/m² d
- chlorine free
- easy lamination and printing like standard BOPP
Properties

- **4-hydroxy-3-methoxybenzaldehyde (vanilla)**
- **dipropil disulfide (garlic)**
- **2-acetylpyridine (bread)**
- **limonene (lemon)**

![Graph showing TR values for various compounds across different materials](chart.png)

**Outstanding flavour barrier**
Properties

Oxygen transmission rates at 23°C, 50 % RH
Fraunhofer IVV Freising, September 2011

OTR (cm³/m² d)

Before pasteurization
OTR = 2,5 cm³/m² d

4 hours after pasteurization
OTR = 5 cm³/m² d

OTR after pasteurization of a single, non-laminated film EXTENDO XTMU 30 for 60 minutes at 80 °C in an autoclave
In contrast with coated BOPP films, the OTR is not influenced by scratches, wrinkles or abrasion.
Properties

In comparison with other high gas barrier films, the unit weight of the packaging can be decreased.
In contrast with other high gas barrier films, the thickness of the film does not have influence on the gas barrier properties.
Properties

- Cardboard packaging is usually made of recycled paper (mostly newspaper) that contains mineral oil residues from printing inks.
- Mineral oil residues can migrate from cardboard into food.
- Most of the plastic linings (PP or PE) in the bag-in-box systems in use today do not provide sufficient protection.
- PET and PLA have "natural barrier"
- EVOH has an excellent barrier against mineral oils

<table>
<thead>
<tr>
<th>Film type</th>
<th>Breakthrough period on 23°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDPE 100 μm</td>
<td>&lt; 10 hours</td>
</tr>
<tr>
<td>BOPP 30 μm</td>
<td>&lt; 2.1 days</td>
</tr>
<tr>
<td>EXTENDO XTMH 30 μm</td>
<td>&gt; 2.5 years</td>
</tr>
<tr>
<td>PET</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Al foil</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>BOPLA 20 μm</td>
<td>&gt; 3 years</td>
</tr>
</tbody>
</table>

Source: BASF measurements and results from Grob,K et al, Kantonales Labor Zürich, April 2011
Properties – horizontal flow wrapping

HOT - TACK

SEAL STRENGHT
Properties – tray lidding

- Film for thermoforming, PE/APET: 270 µm
- Film for lid, PVdC coated PET/PE: 70 µm

PROTECTION + = SUSTAINABLE
### Case study: fresh pasta packaging – VFFS

<table>
<thead>
<tr>
<th>Traditional structure</th>
<th>New structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA 15 µm</td>
<td>EXTENDO XTMH 20 µm</td>
</tr>
<tr>
<td>PP Cast 75 µm</td>
<td>PP Cast 70 µm</td>
</tr>
</tbody>
</table>

= SUSTAINABLE
Case study: walnuts

Traditional structure

New structure

PROTECTION +

= SUSTAINABLE
Case studies: biscuits

- BOPP matt 20 µm
- EXTENDO XTMH 20 µm
- PP Cast peelable

PROTECTION +  = SUSTAINABLE
General information

The $O_2$TR and WVTR measurements shown in this presentation are all carried out under the below conditions:

- **$O_2$TR**
  - Unit: $\text{cm}^3/\text{m}^2 \text{ d}$
  - Test Conditions: 23°C – 0% RH
  - Method: ASTM D 3985

- **WVTR**
  - Unit: $\text{g/m}^2 \text{ d}$
  - Test Condition: 38°C – 90% RH
  - Method: ASTM F 1249