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...

*WVTR (g/m² d)*

- **BOPP**
- **HPDE**
- **CPP**
- **BOPET**
- **LDPE**

*Refers to 25 µm*
Barrier properties

...but the OTR is relatively poor.

* Refers to 25 µm
Barrier properties

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.
Potentials to Reduce Environmental Impact

- Energy saving
- CO₂ 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>(O_2)TR (cm(^3)/m(^2) 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>(\leq 15)</td>
<td>MST = 105°C</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>(\leq 3)</td>
<td>Al replacement</td>
</tr>
<tr>
<td>metallised</td>
<td>20/30</td>
<td>(\leq 15)</td>
<td>WVTR = 0.30</td>
</tr>
<tr>
<td>metallised</td>
<td>30</td>
<td>(\leq 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>(\leq 15)</td>
<td>MST = 105°C</td>
</tr>
<tr>
<td>white voided metallised</td>
<td>35</td>
<td>(\leq 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>(\leq 25)</td>
<td>MST = 85°C</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>(\leq 10)</td>
<td>Enhance seal, PE</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>(\leq 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>(\leq 10)</td>
<td>Heat sealable, PE</td>
</tr>
<tr>
<td>transparent</td>
<td>30</td>
<td>(\leq 10)</td>
<td>Heat sealable, PP</td>
</tr>
</tbody>
</table>
Key applications

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

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

- Outstanding flavour barrier

Graph showing the comparison of different coatings for their performance in odor retention.

- 4-hydroxy-3-methoxybenzaldehyde (vanilla)
  - EXTENDO XTMH 20 µm: 50 µg
  - BOPP 20 µm: 50 µg
  - Acr/PVdC coated BOPP 21 µm: 50 µg
  - Acr/Acr coated BOPP 30 µm: 50 µg

- Dipropil disulfide (garlic)
  - EXTENDO XTMH 20 µm: 10 µg
  - BOPP 20 µm: 55 µg
  - Acr/PVdC coated BOPP 21 µm: 452.5 µg
  - Acr/Acr coated BOPP 30 µm: 670 µg

- 2-acetylpyridine (bread)
  - EXTENDO XTMH 20 µm: 10 µg
  - BOPP 20 µm: 55 µg
  - Acr/PVdC coated BOPP 21 µm: 260 µg
  - Acr/Acr coated BOPP 30 µm: 720 µg

- Limonene (lemon)
  - EXTENDO XTMH 20 µm: 10 µg
  - BOPP 20 µm: 55 µg
  - Acr/PVdC coated BOPP 21 µm: 200 µg
  - Acr/Acr coated BOPP 30 µm: 740 µg

TR (mg/m² d)
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><strong>EXTENDO XTMH 30 μm</strong></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 STRENGTH
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

Traditional structure

- PA 15 µm
- PP Cast 75 µm

New structure

- EXTENDO XTMH 20 µm
- PP Cast 70 µm

SUSTAINABLE
Case study: walnuts

Traditional structure

- BOPP 30 µm
- PE//EVOH 60 µm

New structure

- EXTENDO XTMH 20 µm
- PP Cast 60 µm

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: cm$^3$/m$^2$ d
  - Test Conditions: 23°C – 0% RH
  - Method: ASTM D 3985

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