The better barrier for cosmetic packaging
Introducing EVAL Europe

Kuraray and EVAL Europe

Kuraray Co., Ltd. has long been a leader in high gas barrier technology and development. The company is the first and foremost producer of EVOH (ethylene vinyl-alcohol copolymer resins) under the name EVAL™ and the manufacturer of KURARISTER™.

The company was established in 1926 in Kurashiki, Japan for the industrial manufacture of chemical fibres. Since then, it has capitalised fully on its technological strengths in the fields of polymerisation and synthetics. Today, the Kuraray Group consists of about 70 companies, employing around 7,000 people worldwide.

Kuraray has been manufacturing and marketing ethylene vinyl-alcohol (EVOH) copolymer resins since 1972. Ever since, EVAL™ - the registered trademark for its EVOH resins - has grown into one of the company’s core businesses.

EVAL Europe nv was founded as a wholly owned subsidiary in Antwerp in 1997 to supply the European, Middle Eastern and African markets with EVAL™. EVAL Europe nv and its team of experts serves European customers from its Technical and Development Centre. The first EVOH production site in Europe doubled its production capacity in October 2004 to 24,000 tons per year.

Building on three decades of expertise in EVOH production, EVAL Europe remains the region’s leading EVOH manufacturer.

Unique technology from Kuraray

Kuraray, Co. Ltd. has developed leading high barrier technologies that are results of Kuraray’s pioneering research and development in this field.

EVAL™ resins are characterised by superior gas barrier properties and excellent coextrusion processability, while being recyclable. Technological innovation has led to an extended range of different grades of EVAL™ resins for food packaging, construction and building, automotive, industrial and cosmetics applications.

EVAL™ is the better barrier material for a variety of cosmetic packaging applications made from flexible, blow moulded, thermoformed and tube structures. It offers a superior barrier against oxygen and fragrance, and due to its chemical resistance reduces scalping and permeation of valuable ingredients. Functional as an inside layer, EVAL™ is also easy-to-print, and when used outside provides high gloss for attractive double-take cosmetic packaging.
Flexible packaging material for cosmetics must not only keep oxygen out, but must also protect the valuable contents so they retain their active cosmetic agents from the production line all the way to the end consumer.

Packaging material using EVAL™ provides this functionality, and can easily be printed with high-quality graphics to increase the visibility of the package. It can also be left transparent to draw attention to the contents.

**EVAL™ resins used in flexible applications:**

- Makes for an excellent oxygen and fragrance barrier.
- Ensures preservation of cosmetic agents and fragrances inside the package.
- Can be left transparent and can be easily printed with high-quality graphics.
- Provides reliable barrier properties during processing, filling and transport.

**Processing method**

Coextrusion cast and blown film

<table>
<thead>
<tr>
<th>Typical applications</th>
<th>Typical structure (in/out)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-barrier laminate packages</td>
<td>PE/tie/EVAL™/tie/PE</td>
</tr>
<tr>
<td>Shampoo</td>
<td>PE/PE/tie/EVAL™/tie/PE</td>
</tr>
<tr>
<td>Refreshment towels</td>
<td></td>
</tr>
<tr>
<td>Toothpaste</td>
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</table>
Cosmetic packaging has to provide product preservation without any loss of quality of the product. Moreover, the quality and attractiveness of the package itself is becoming increasingly important.

Cosmetic packaging does not only have to keep oxygen out, it also has to ensure that the active agents of the cosmetics are well preserved inside. Even when the product is in use, the package has to avoid that perfumes or other fragrances alter or lose their performance.

**EVAL™ resins used in bottle applications:**

- Provide an excellent barrier against oxygen and fragrances.
- Offer resistance to the chemical ingredients of the cosmetic products.
- Keep the fragrances and the cosmetic agents inside the package, even when the product is in use.
- Allow very low scalping or permeating of the ingredients.
- Create a glossy and easily printable surface when EVAL™ is used as an outside layer.
- Are flexible enough to be squeezed, yet strong enough to prevent the package from being damaged during handling or transport.

**Processing method**

Coextrusion blow moulding

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<table>
<thead>
<tr>
<th>Typical applications</th>
<th>Typical structure (in/out)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfume bottles</td>
<td>PP/regrind/tie/EVAL™</td>
</tr>
<tr>
<td></td>
<td>PE/regrind/tie/EVAL™</td>
</tr>
<tr>
<td>Cosmetic creams</td>
<td>PP/regrind/tie/EVAL™/tie/PP</td>
</tr>
<tr>
<td></td>
<td>PE/regrind/tie/EVAL™/tie/PP</td>
</tr>
</tbody>
</table>
Thermoformed trays used in packaging cosmetics have to protect the colour, the fragrance and the valuable active components of your product.

EVAL™ T and J types are special grades that provide a very strong and effective protection of the content, even under deep thermoforming conditions. Both EVAL™ T and J types also allow for transparency when desired for marketing the packaged product.

Even during handling and storage, EVAL™ provides reliable and resilient barrier properties.

**EVAL™ resins used in thermoformed applications:**

- Provide an outstanding barrier against oxygen and fragrance.
- Retain the contents’ colour, consistency, fragrance and cosmetic function even after long periods of storage.
- Are resistant to the chemical ingredients of cosmetic products.
- Provide excellent transparency.
- Have excellent thermoforming characteristics, often allowing for thickness reduction without compromising on performance.

**Processing method**

Sheet coextrusion and thermoforming

<table>
<thead>
<tr>
<th>Typical applications</th>
<th>Typical structure (in/out)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoformed portion packs of shampoo, foam baths and liquid soaps</td>
<td>PET/tie/EVAL™/tie/PET</td>
</tr>
<tr>
<td></td>
<td>PS/tie/EVAL™/tie/PE</td>
</tr>
<tr>
<td></td>
<td>PP/tie/EVAL™/tie/PP</td>
</tr>
</tbody>
</table>
Cosmetic tube packaging is required to keep the oxygen out of the package and to retain the perfumes and active ingredients. A tube has to be flexible and easy to squeeze but, in the interest of aesthetics, also needs to return to its original shape after use.

**EVAL™ resins used in tube applications**
- Prevent oxygen from penetrating the package and ensures that the substances and the active agents of the cosmetics are kept inside the package.
- Make for an outstanding aroma barrier to prevent the outward diffusion of the perfumes.
- Are flexible and easy to squeeze.
- Allow very low scalping and permeation of the ingredients.
- Provide glossiness when used as an outside layer.
- Can be printed with high-quality graphics to increase the visibility and the attractiveness of the package.

### Processing method
Tube coextrusion

<table>
<thead>
<tr>
<th>Typical applications</th>
<th>Typical structure (in/out)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmetic products such as day cream, toothpaste, skin care agents, shower cream</td>
<td>PE/tie/EVAL™/tie/PE</td>
</tr>
<tr>
<td></td>
<td>PE/regrind/tie/EVAL™/tie/PE</td>
</tr>
</tbody>
</table>

**EVAL™ - The environmentally friendly barrier**

EVAL™ EVOH is an environmentally friendly plastic. It contains no chlorine, dioxin, metals or endocrine disrupters. It can be recycled, either as part of a separate coextruded regrind layer or as post-consumer regrind. And it will not disrupt polyolefin or PET recycling streams and processes.

Even fully sustainable packaging only has value if it remains functional. EVAL™ EVOH adds real functionality to packaging, and helps lower environmental impact at several stages of the packaging lifecycle. The superior gas barrier properties of EVAL™ protect barrier quality and prolong freshness and shelf life, reducing waste and unnecessary transport, and allowing significant reduction in the required thickness of packaging structures.
EVAL™ ethylene vinyl alcohol (EVOH) copolymer resins provide outstanding gas barrier properties and excellent processability. The key to this balance of characteristics is the proper copolymerisation ratio of ethylene to vinyl alcohol. Kuraray’s unique proprietary manufacturing process has produced the world’s widest available range of EVOH grades.

**EVAL™ M** type has the lowest ethylene content available, and provides the highest barrier for automotive and flexible applications.

**EVAL™ L** type has a very low ethylene content and is suitable as an ultra high-barrier grade in flexible, bottle and sheet applications.

**EVAL™ F** type offers superior barrier performance with long-term run stability, and is widely used as the standard grade for flexible, automotive, bottle and tube applications. Specific versions exist for coating and pipe applications.

**EVAL™ T** type was specially developed to obtain reliable layer distribution in thermoforming, and has become the industry standard for multilayer sheet and thermoformed flexible applications.

**EVAL™ J** type offers thermoforming results even superior to those of T, and can be used for unusually deep-draw or sensitive sheet-based applications.

**EVAL™ C** type can be used for high-speed coextrusion coating and cast flexible applications.

**EVAL™ H** type combines high barrier properties with long-term run stability and thermoformability. The higher ethylene content allows easier processing and longer running times on older coextrusion equipment, especially for blown flexible structures.

**EVAL™ E** type has a higher ethylene content that allows for greater flexibility and even easier processing.

**EVAL™ G** type has the highest ethylene content, making it the best candidate among standard EVAL™ grades for stretch and shrink film applications.

### Scale of ethylene content (mol%)

<table>
<thead>
<tr>
<th>Type</th>
<th>Ethylene Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>24 mol%</td>
</tr>
<tr>
<td>L</td>
<td>27 mol%</td>
</tr>
<tr>
<td>F</td>
<td>32 mol%</td>
</tr>
<tr>
<td>T</td>
<td>35 mol%</td>
</tr>
<tr>
<td>J</td>
<td>38 mol%</td>
</tr>
<tr>
<td>C</td>
<td>44 mol%</td>
</tr>
<tr>
<td>H</td>
<td>48 mol%</td>
</tr>
</tbody>
</table>
EVAL™ the world’s leading EVOH

Europe
EVAL Europe nv (Antwerp, Belgium)
Capacity: 24,000 tons/year
Europe’s first and largest EVOH production facility

Americas
EVAL Company of America (Pasadena, Texas, USA)
Capacity: 35,000 tons/year
The world’s largest EVOH production facility

Asia-Pacific
Kuraray Co. Ltd. (Okayama, Japan)
Capacity: 10,000 tons/year
The world’s first EVOH production facility

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EVAL™ resins are produced worldwide under unified Kuraray product and quality specifications.

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