



 **EVAL** EUROPE

**EVAL**™ The better barrier for industrial applications



**kuraray**

# 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™. Its specialised team 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.

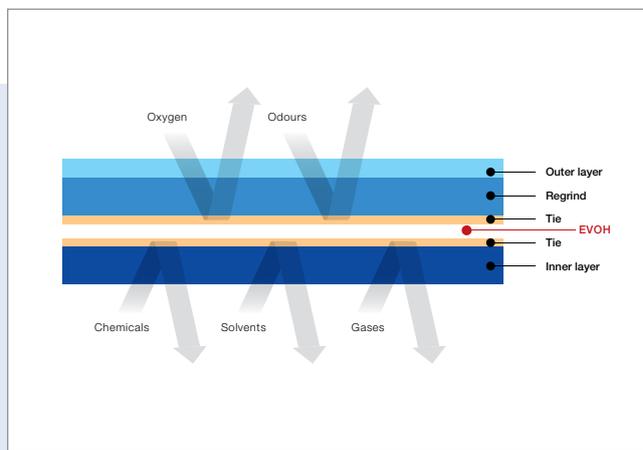
## Unique technology from Kuraray

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

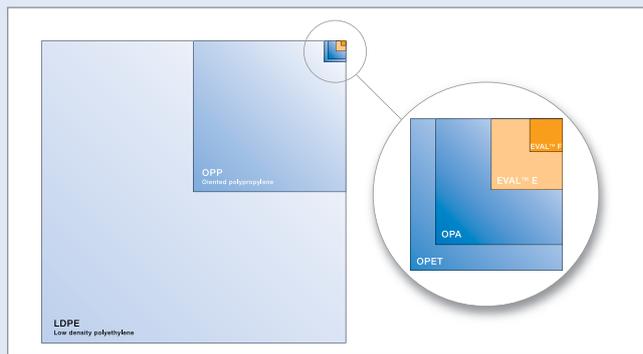
EVAL™ resins are used in industrial applications because of their excellent barrier properties for gases and solvents and their outstanding resistance to oil and chemical agents. These two properties make EVAL™ extremely suitable for different industrial applications where a high-quality barrier is essential, such as under-floor heating pipes and the packaging of chemicals. An EVAL™ layer offers the following benefits:

- Outstanding gas barrier properties.
- Excellent resistance and barrier to chemicals.
- Long-term thermal stability.
- The flexibility of plastics.

EVAL™ is the better barrier material for various industrial applications made from flexible, bottle, pipe and sheet structures.



Typical coextruded multilayer structure



Amount of oxygen permeation at equal thickness and conditions (0% RH)

# EVAL™ used in bottle applications

When exposed to solvents or other chemical substances, many plastics will swell, soften, elute or deform. Moreover, chemicals that are packaged in plastic bottles will also easily evaporate. EVAL™ resins offer very high resistance to hydrocarbons, oils and organic solvents.

Thanks to this outstanding characteristic of EVAL™ resins, plastic containers can safely hold chemical solvents, agrochemicals and pesticides for extended periods of time, without deformation.

### Benefits

- Excellent resistance to solvents, gasoline, agricultural chemicals and surfacting agents.

- Very slow permeation rate of chemicals.
- Superior gas barrier properties.
- No deformation, swelling or softening of the package.

### Processing method

Coextrusion blow moulding



Typical applications	Typical structure (in/out)
Chemical packaging bottles	EVAL™/tie/HDPE EVAL™/tie/regrind/HDPE HDPE/regrind/tie/EVAL™/tie/HDPE

# EVAL™ used in chemical protective clothing

People working with chemical substances must have 100% confidence in the protective working of their safety gloves. These gloves have to provide an excellent protection to avoid aggressive chemical substances coming in contact with the skin.

Many plastic materials deform, soften and elute when exposed to solvents or other chemical substances. EVAL™ resins offer very high resistance to hydrocarbons, oils and organic solvents, which makes them very suitable to be used for protective clothing.

### Benefits

- Excellent resistance to chemicals, chemical solvents and surfacting agents.
- Very low permeation level of chemical solvents.
- Flexibility.

### Processing method

Film coextrusion, blown and cast film



Typical applications	Typical structure (in/out)
Chemical protective clothing	PE/tie/EVAL™/tie/PE PA/EVAL™/PA/tie/PE
Safety gloves	PE/tie/EVAL™/tie/PE

# EVAL™ used in Intermediate Bulk Containers (IBC)

EVAL™ has long been used as an effective barrier layer in bottles, either to protect contents from contact with oxygen or to ensure that valuable chemical content does not evaporate or permeate into its container. Recently these benefits have been extended to bulk storage by adding a high barrier EVAL™ layer to much larger intermediate bulk containers (IBC).

## Benefits

- Easy and safe transport and storage of bulk chemicals and ingredients.
- Excellent resistance to chemicals, chemical solvents and surfacting agents.

- Very low permeation level of chemical solvents.
- Protection of bulk contents against oxidation, discolouration, tainting, and evaporation.

## Processing method

Coextrusion blow moulding



Typical applications	Typical structure (in/out)
IBC	HDPE/tie/EVAL™/tie/HDPE

# EVAL™ used in stratospheric teledirigibles

EVAL™ resins are used on stratospheric dirigible exteriors to prevent the escape of helium gas. The Japanese Ministry of Education, Culture, Sports, Science and Technology and the Japanese Ministry of Public Management, Home Affairs, Posts and Telecommunications selected EVAL™ resins for its unmatched gas barrier properties and because they meet the challenge of standing up to the stratosphere, where atmospheric density is one-fifteenth to one-twentieth of what it is at sea level.

## Benefits

- Excellent gas-barrier properties against helium and hydrogen.
- Well suited for extremely frigid atmosphere conditions.
- Great flexibility.

## Processing method

Film coextrusion



Courtesy of JAXA

Typical applications	Typical structure (in/out)
Airships Stratospheric teledirigibles	TPU/EVAL™/TPU

# EVAL™ used in vacuum insulation panels

EVAL™ VM-XL film, an aluminium metallised bioriented EVAL™ film, is used in barrier laminates for vacuum insulation panels. EVAL™ VM-XL film combines excellent barrier properties with minimal thermal bridging and a very good resistance to manipulation, which prevents damage of the barrier during processing, transport and handling.

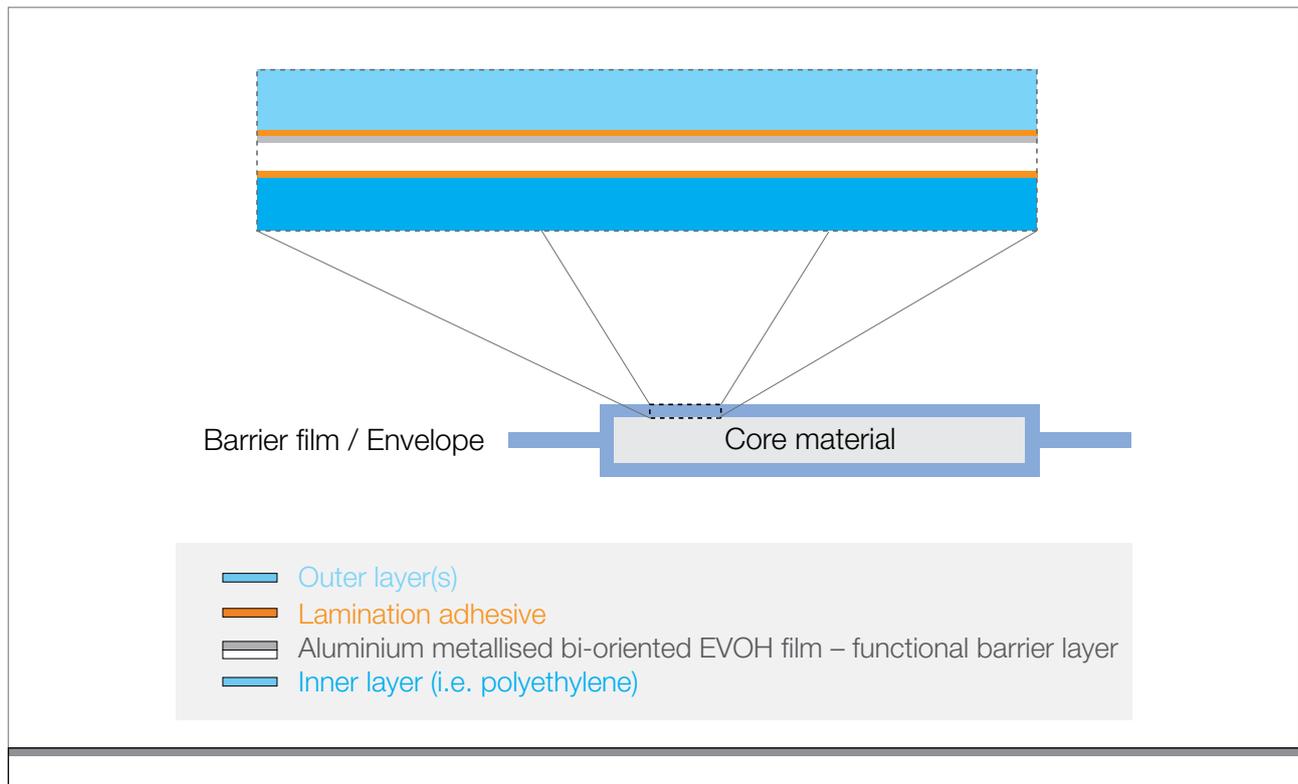
The aluminium metallised layer provides an excellent water vapour resistance. Any reduction in gas barrier property of the metallised layer due to manipulation is counterbalanced by the superior barrier properties and excellent flex crack & pinhole resistance of the EVAL™ film.

## Benefits

- Superior gas barrier properties.
- Superior water vapour barrier properties.
- High pinhole resistance (flex crack resistance).

## Processing method

Film lamination



Typical applications	Typical structure (in/out)
Laminate for refrigerators	PE/tie/VM-XL/tie/VM-PET/tie/oPA
Electric kettle	PE/tie/Al/tie/ <b>EVAL™</b> /tie/oPA
Vending machine	
Cooling box	

# EVAL™ used in bag-on-valve systems for aerosol containers

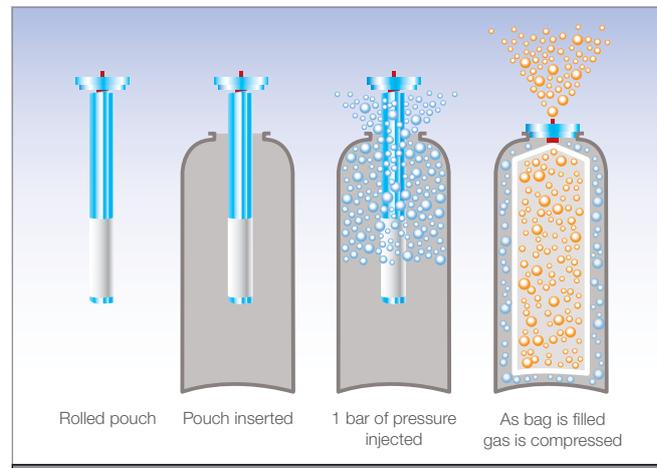
Some chemical agents are so aggressive that they can quickly attack and corrode the interior of metal aerosol cans. By adding an EVAL™ layer to a bag-on-valve system within the can, these chemicals are effectively contained.

## Benefits

- Chemical resistance against “aggressive” products like blackener and hair colourants.
- Corrosion resistance.

## Processing method

Coextrusion



Typical applications	Typical structure (in/out)
Aerosol spray cans	EVAL™ coextruded film/aluminium/PET

# EVAL™ - The environmentally friendly barrier

EVAL™ EVOH is an environmentally friendly plastic. It contains no chlorine, dioxin, metals or endocrine disruptors. 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 product quality and prolong freshness and shelf life, reducing waste and unnecessary transport, and allowing significant reduction in the required thickness of packaging structures. Even when compared to other coextruded barrier plastics like PA6, structures containing highly functional EVAL™ can usually lower total material cost even while reducing the thickness and weight of packaging.

# EVAL™ - The better barrier for industrial applications

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%)

M	2 4	<b>24 mol%</b>
	2 5	
	2 6	
L	2 7	<b>27 mol%</b>
	2 8	
	2 9	
F T J	3 0	
	3 1	
	3 2	<b>32 mol%</b>
C	3 3	
	3 4	
	3 5	<b>35 mol%</b>
H	3 6	
	3 7	
	3 8	<b>38 mol%</b>
E	3 9	
	4 0	
	4 1	
G	4 2	
	4 3	
	4 4	<b>44 mol%</b>
	4 5	
	4 6	
	4 7	
	4 8	<b>48 mol%</b>
	4 9	
	5 0	



**EVAL EUROPE**

## 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

**KURARAY CO., LTD.**

**KURARAY CO., LTD. (Shanghai)**

**EVAL AMERICAS**

### 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

**EVAL EUROPE**

## Building better barriers

### NOTICE

The information, specifications, procedures, methods and recommendations herein are presented in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. No representation, guarantee or warranty is made as to the completeness of said information, specifications, procedures, methods and recommendations or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe patents of others or give desired results. Readers are cautioned to satisfy themselves as to the suitability of said information, specifications, procedures, methods and recommendations for the purpose intended prior to use.

### Contact

EVAL Europe nv

Haven 1053

Nieuwe Weg 1 - Bus 10

B-2070 Zwijndrecht (Antwerp)

Belgium

Telephone +32 3 250 97 33

Fax +32 3 250 97 45

[www.eval.eu](http://www.eval.eu)

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