

New solutions from Kuraray

**Safe and
sustainable
packaging
for meat**

EVAL™

PLANTIC™

KURARAY POVAL™

EXCEVAL™

MonoSol

Sustainability: the most urgent trend in packaging

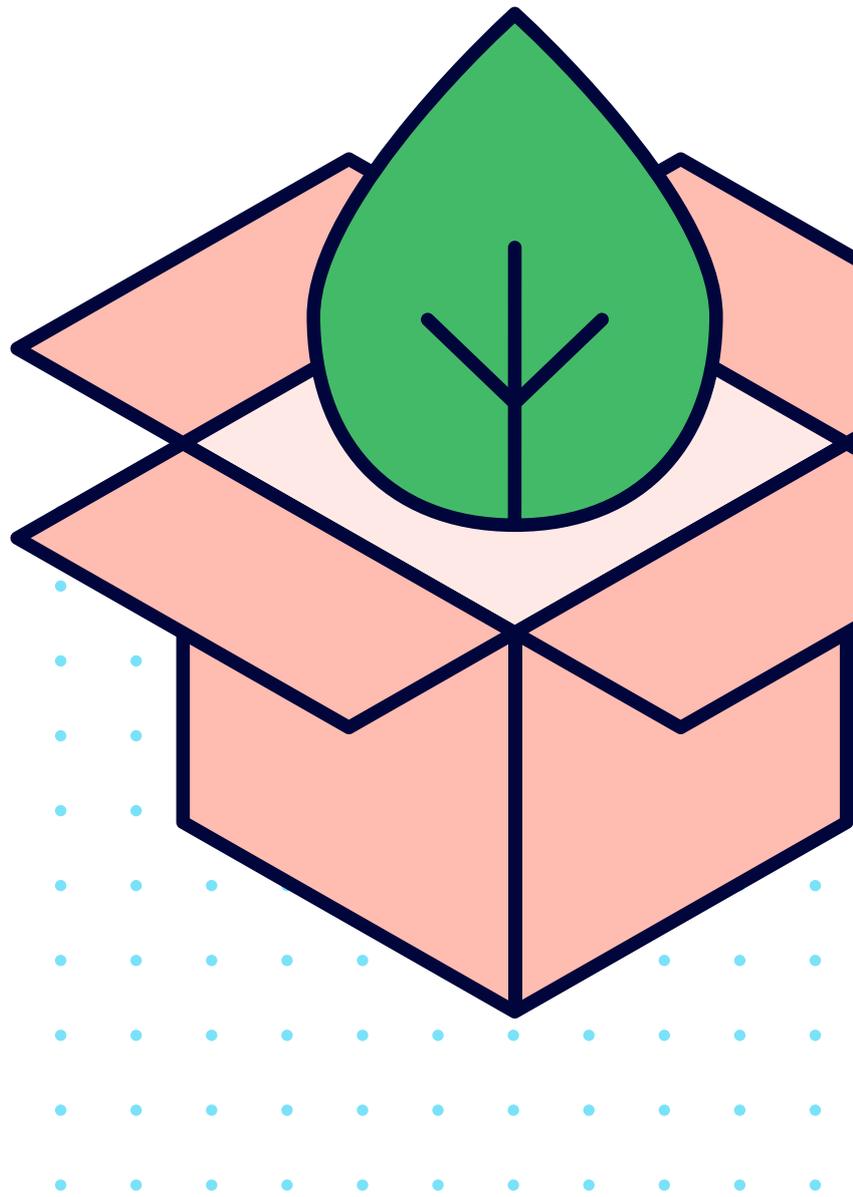
Various trends and requirements are currently transforming the packaging market: renewable raw materials, reducing the amount of packaging material, cutting CO₂ emissions, monolayer products, recyclability, repulpability or biodegradability – to name a few.

Consumers and brand owners driving the trend

Greater sustainability and circularity are an urgent issue for the whole of society and are being driven forward by legislators and consumers as well as brand owners and industry. The objective is to find circular packaging solutions. This also applies to plastics. Several major players in the food sector, from Danone and Mondelez to Nestlé and Unilever, have already published voluntary commitments or pledges.

Revision of the PPWD in the EU

The trend towards sustainability also has a political dimension. An example from the European Union: in conjunction with the “European Green Deal” to reduce CO₂, the “Packaging and Packaging Waste Directive” (PPWD) is intended to ensure a high level of environmental protection. The latest amendment to the directive contains, among other things, updated measures to promote reuse, recycling and other forms of recovery of packaging waste as an alternative to disposal. The EU Commission intends to publish a proposal on further tightening of the PPWD before the end of 2022.





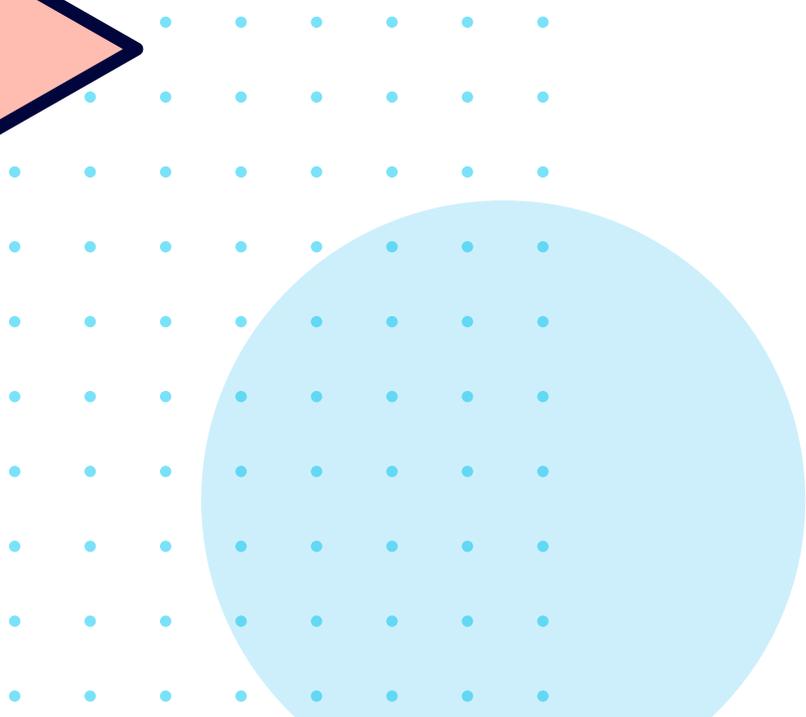
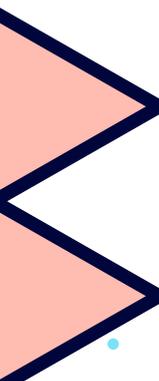
International complexity

Sustainability is a global megatrend in the packaging industry. However, there are significant differences in national and regional legislation and regulatory requirements. Internationally, in some instances, the disparity between packaging and recycling regulations is as big as the difference in the available recycling infrastructure. Nevertheless, the overriding global trend

is the same: reducing and recycling packaging are on the agenda everywhere and legislation is becoming more stringent. For brand owners and manufacturers, the extremely heterogeneous regulatory landscape is a major challenge. A conventional packaging concept that can still be used in some countries may no longer be acceptable in other states and regions. However, they all agree that the objective is to protect food and avoid waste.

Combining functionality and sustainability

It is vital to ensure that new, more sustainable packaging solutions continue to meet the full range of functional requirements for food packaging. All the Kuraray innovations outlined below combine these two objectives: as well as focusing on sustainability, they provide reliable protection for food. These packaging ideas based on Kuraray's products point the way to circular packaging. Every packaging problem is specific. Therefore, Kuraray's experts are committed to helping their customers and the entire supply chain find packaging solutions that meet their specific needs and ensure compliance with specific regulatory requirements.



Regional packaging preferences for fresh red meat



Fresh red meat is perishable. Without suitable packaging it is difficult to ensure the shelf-life consumers expect when they purchase this comparably expensive and resource-intensive food. Moreover, regional differences need to be taken into account when selecting packaging to ensure that perishable foods are delivered to consumers in perfect condition. In North America, for example, it is common to protect meat by packaging it in flexible shrink film. In Europe, vacuum skin packaging (VSP) and modified atmosphere packaging (MAP) are common. Which protective gases are used to replace ambient oxygen depends on the type of meat. In Asia, by contrast, MAP with a rigid tray tends to be preferred. Consequently, the choice of packaging needs to take account of regional conventions.

Recyclable meat packaging without PVDC



Conventional packaging for fresh red meat is often difficult to recycle. For example, shrink film is frequently made from materials such as polyvinylidene chloride (PVDC), which is problematic for two reasons. First, there is not yet an established method of recycling PVDC. Second, all chlorinated products tend to intensify the already yellowish tint of the packaging. This can greatly reduce consumers' perception of the quality of the food at the point of sale.

It is therefore equally important to prevent meat going off and to use packaging solutions that are both aesthetically appealing and easy to recycle. The six solutions presented here, all of which use polymers from Kuraray, meet these requirements and link improved sustainability with the necessary functionality. They protect this perishable food, ensure it is presented in an appealing manner and is easy to recycle.

1. Recyclable MAP tray made from EVAL™ EVOH with PP as a barrier to water

Example of a conceptual structure for such packaging:

Polypropylene / EVAL™ EVOH / polypropylene

EVAL™ is the brand name of the ethylene vinyl alcohol copolymers (EVOH) produced by Kuraray. EVAL™ EVOH films that are just one millimetre thick create a functional barrier equivalent to a ten metre thick polyethylene wall. Multilayer solutions with EVAL™ using another polymer such as polypropylene (PP) as the water barrier can be recycled without difficulty. In our example, sustainable trays for modified atmosphere packaging (MAP) are created in this way. The production process comprises cast film coextrusion at very low temperatures in combination with the water quenching or chill roll quenching method. Depending on the temperature, material qualities ranging from superclear to white can be produced. PP is a better water barrier than polyethylene (PE). Moreover, the multilayer structure with PP has better cold impact resistance than MAP trays with a conventional polyethylene terephthalate (PET) monolayer.

2. Innovative shrink bag made using supertransparent EVAL™ SC film

Example of a conceptual structure for such packaging:

Polyethylene / EVAL™ EVOH SC series / polyethylene

The EVAL™ SC series is a completely new grade of EVAL™ EVOH, the gas barrier resin from Kuraray. EVAL™ SC has far higher stretchability and shrinkability than conventional EVOH. It is therefore an ideal alternative to polyvinylidene chloride (PVDC), which has frequently been used for shrink wrap bags in the past. Polyethylene layers are applied to both sides of the EVAL™ SC film as a barrier to water. A triple-bubble blown film line is used to produce this type of packaging film. While the gas barrier properties of this completely new grade of EVAL™ EVOH developed by Kuraray are at least as good as those of conventional EVOH resins, its superior stretchability and shrinkability are outstanding benefits, giving it clear advantages over common PVDC films. Innovative shrink film based on EVAL™ SC is superclear rather than yellowish. Moreover, it is more environmentally friendly and easy to recycle.

EVAL™ EVOH: Functional barrier in a very thin layer

Kuraray's EVAL™ ethylene vinyl alcohol copolymer (EVOH) helps the food and healthcare sectors develop packaging that protects product quality for a prolonged period. Recyclable multilayer structures with EVAL™ EVOH meet the most stringent hygiene conditions and food contact standards and regulations. In packaging applications, a layer of EVAL™ EVOH just one millimetre thick creates a functional barrier equivalent to a ten metre thick wall of polyethylene.



Sustainability benefits of EVAL™

A thin EVAL™ EVOH layer allows the production of particularly lightweight, resource-saving packaging and therefore helps to reduce waste. Moreover, EVAL Europe N.V.'s EVOH production site in Belgium has ISCC PLUS certification. Certification is based on the mass-balance approach and documents the fact that the ethylene monomer in Kuraray's "biocircular EVOH" is produced from renewable resources.

3. EVAL™ AP series used in the lidding film for modified atmosphere packaging

Example of a conceptual structure for such packaging:

Polyethylene ionomer / EVAL™ EVOH AP series / polyethylene ionomer

A special EVAL™ EVOH grade plays a key role in this concept, too: the innovative EVAL™ AP series. This functional resin maximizes impermeability to gas by absorbing oxygen. Kuraray incorporates a proprietary oxygen absorption agent into this EVAL™ EVOH grade. If polyester ionomers are applied to the outer side as a water barrier, the EVAL™ AP-based film is ideal for lidding films for modified atmosphere packaging. This transparent (rather than grey) film is produced using the established triple-bubble process. This packaging concept increases the shelf-life of packed fresh meat thanks to the oxygen absorber in the EVAL™ AP. Another benefit of this packaging concept is its very good recyclability.

4. Film with EVAL™ EVOH laminated on cardboard tray for vacuum skin packaging

Example of a conceptual structure for such packaging:

Cardboard // polyethylene / EVAL™ EVOH film / polyethylene

As well as the lidding film for MAP, vacuum skin packaging naturally has a tray on which the meat is placed. In the packaging concept described here, the tray is made from sustainable cardboard, with minimal use of plastic film. EVAL™ EVOH, which acts as the gas barrier, is covered in layers of polyethylene as a barrier to water. The transparent film produced in this way is laminated onto the cardboard as a barrier layer. A laminating machine is required to produce this type of packaging. The big advantage of this innovative packaging is that the majority of the packaging is made from sustainable, readily recyclable cardboard, avoiding the use of trays made of more challenging materials such as polystyrene and polyethylene terephthalate (PET). In the recycling process, this innovative packaging features very good layer separation and simple repulpability.



5. Skin packaging tray with a PLANTIC™ barrier

Example of a conceptual structure for such packaging:

Polyethylene terephthalate / PLANTIC™ / polyethylene terephthalate or polyethylene

The PET/EVOH/PE trays that are currently used are not suitable for mechanical recycling. The trend is towards PET monolayer trays. However, they are challenging for converters and tray producers in regard to gas barrier properties and the sealability of the lidding films.

The high gas barrier of the PLANTIC™ layer in PLANTIC™ film structures is inherently dispersible in water. This allows the PLANTIC™ layer to be dissolved in conventional recycling systems, followed by separation of the outer layers, so they can be recovered via traditional recycling methods. In our example, polyethylene terephthalate (PET) is used for the the main layers in the structure and polyethylene (PE) is used for the sealing layer. All existing PE-based lidding options can be used. Skin packaging produced from this type of PLANTIC™-based multilayer material keeps meat fresh for long periods and allows appealing, high-end presentation of the products. The production processes are based on dry lamination and extrusion coating.

In near-infrared (NIR), PLANTIC™ barrier films have a unique fingerprint, so the trays can be assigned to any sorting stream based on local requirements. PLANTIC™ is produced as monolayer film for lamination or extrusion coating. Once washed away in the recycling process, PLANTIC™ biodegrades in the waste water treatment plant and does not cause contamination with microplastics.

PLANTIC™:

The biopolymer that keeps oxygen out and preserves aroma

PLANTIC™ is a high-performance film manufactured by Kuraray using more than 80% renewable raw materials. It is produced from thermoplastic starch and is biodegradable and compostable (home and industrial composting). Due to its high gas barrier properties, this biopolymer from Kuraray can be used in packaging that preserves aromas and effectively keeps out oxygen. PLANTIC™ is therefore ideal for both MAP packaging for food with a short shelf life and packaging solutions for dry goods such as coffee, tea and animal feed.

6. MAP tray made of PLANTIC™ biopolymer

Example of a conceptual structure for such packaging:

Polyethylene terephthalate / PLANTIC™ / polyethylene terephthalate or polyethylene

PLANTIC™ bioplastic is also highly suitable for the production of trays for modified atmosphere packaging (MAP). As in the skin packaging described earlier, PLANTIC™ is usually covered in a layer of polyethylene terephthalate (PET) and polyethylene (PE) as a moisture barrier and heat-sealable layer. Dry lamination and extrusion coating are used to produce the tray. In near-infrared (NIR), PLANTIC™ barrier films have a unique fingerprint, so the trays can be assigned to any sorting stream based on local requirements. PLANTIC™ is produced as monolayer film for lamination or extrusion coating. Once washed away in the recycling process, PLANTIC™ biodegrades in the waste water treatment plant and does not cause contamination with microplastics.

The lidding film used with this type of tray can be made from EVOH and PP or PE. The brand name of EVOH from Kuraray is EVAL™.



Sustainability benefits of PLANTIC™

PLANTIC™ is made from plant-based starch and has a water content of around 12%. This biopolymer is dispersible in water, which makes it possible to separate multilayers and allows simple repulping of paper packaging. PLANTIC™ is certified for both industrial and home composting and can be used in the manufacture of completely compostable multilayer packaging.

Kuraray

Possible starts here

Established in 1991, Kuraray Europe GmbH is based in Hattersheim, near Frankfurt am Main, Germany. In 2021 the company generated annual sales of EUR 1.1 billion. It has more than 820 employees in Germany at its sites in Hattersheim, Frankfurt and Troisdorf. Kuraray is a global speciality chemicals company and one of the largest suppliers of polymers and synthetic microfibres for many sectors of industry. Examples are KURARAY POVAL™, MOWITAL®, TROSIFOL® and CLEARFIL™. Kuraray Europe also has around 215 employees at six other European sites. They are also working on the development and application of innovative high-performance materials for a wide range of sectors, including the automotive, paper, glass, and packaging industries, as well as for architects and dentists.

Kuraray Europe is a wholly owned subsidiary of the publicly listed Kuraray Group, which is based in Tokyo, Japan, and has more than 11,200 employees worldwide and sales of EUR 4.8 billion. Kuraray's current slogan is: "Possible starts here."

EVAL™, KURARAY POVAL™, EXCEVAL™, PLANTIC™ are trademark(s) or registered trademark(s) of Kuraray Co., Ltd. or its affiliates. Trademarks may not be applied for or registered in all countries. The information, recommendations and details given in this document have been compiled with care and to our best knowledge and belief. They do not entail an assurance of properties above and beyond the product specification. The user of our products is responsible for ensuring that the product is suitable for the intended use and conforms to all relevant regulations. Kuraray Co., Ltd. and its affiliates do not accept any guarantee or liability for any errors, inaccuracies or omissions in this document.

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.

© Kuraray Co., Ltd. 2023

www.kuraray.eu