

# ASEPTIC PACKAGING

Hydrogen peroxide and peracetic acid  
for the food and beverage industry

OXTERIL<sup>®</sup>  
PERACLEAN<sup>®</sup>



## AMERICAS



## EUROPE / MEA





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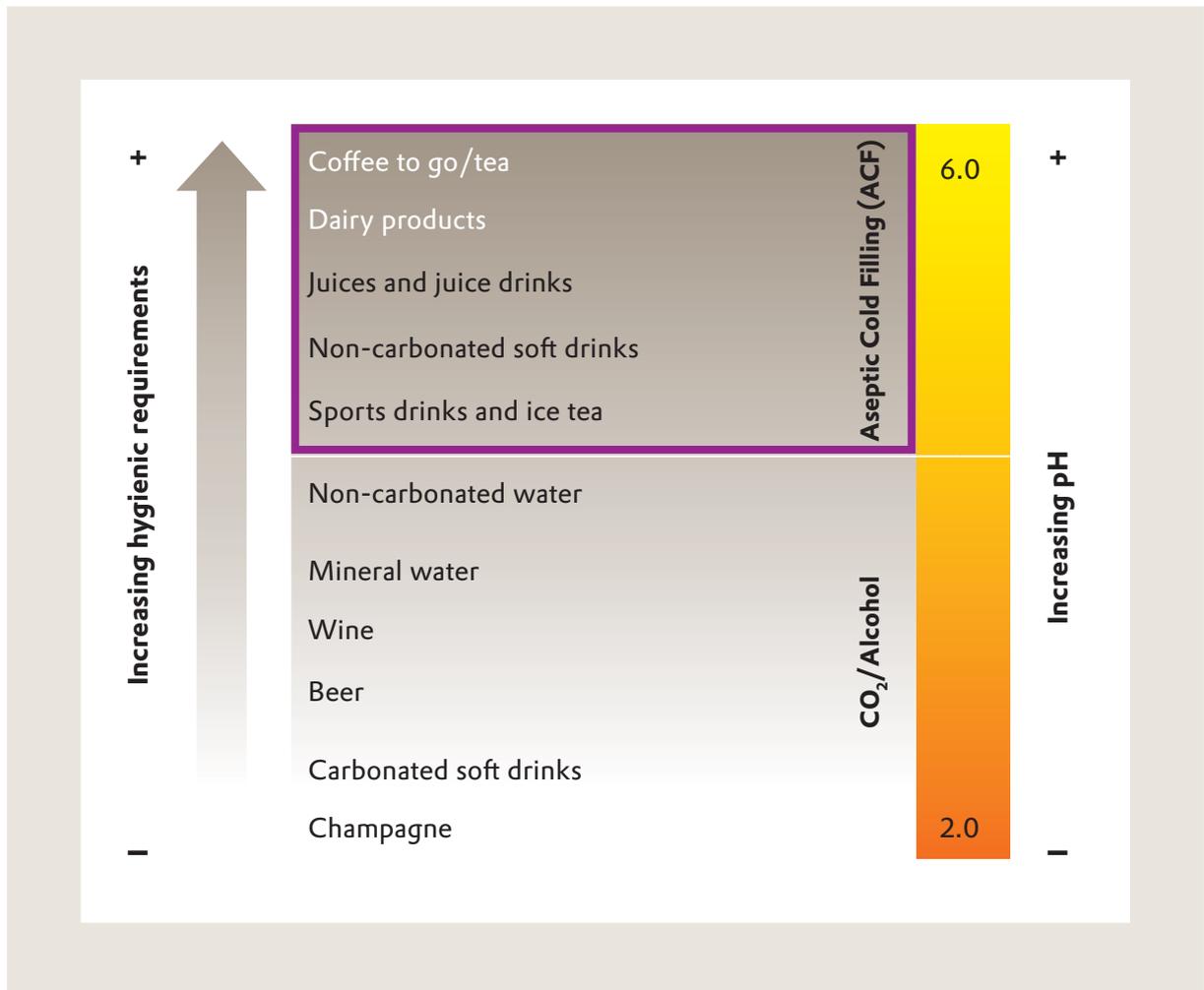
*Evonik is a leading supplier of H<sub>2</sub>O<sub>2</sub> with 18 production sites and an annual global capacity totaling more than one million metric tons. We are the innovative leader in high quality products and services, offering more than a century of worldwide experience to serve the megatrends of the modern society and to deliver an exceptional value for our customers. To ensure optimal supply of hydrogen peroxide to the world market, we operate production facilities at thirteen locations around the world.*

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# ASEPTIC PACKAGING – DEFINITELY SAFE

Aseptic packaging is used to protect food and beverages all along the supply chain. It guarantees a high quality of the packed food stuff combined with a long shelf life. As consumer demand grows for preservative-free 'natural' beverages and for products with additional benefits, nowadays a vast variety of food and beverage products are aseptically packaged in cartons, pouches, cups or bottles. Aseptic packaging utilizes hydrogen

peroxide or peracetic acid for the sterilization of the packaging material and machines and enables the introduction of gently bottled beverages without additional thermal stress or added preservatives. The focus is on slightly acidic to neutral pH food and beverage products with rising hygienic requirements, such as dairy products and juices.





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*Evonik is a trusted and long-standing partner to the aseptic packaging industry, supplying OXTERIL® and PERACLEAN® products with superior quality and outstanding technical service. Our continuous product innovation in close cooperation with our customers and leading aseptic machine manufacturers allows us to provide technology tailored cutting-edge products. Our products are approved and recommended by the major packaging machine manufacturers, such as Elopak, GEA, KHS, Kronos, SIG, Syntegon, TetraPak and many more.*

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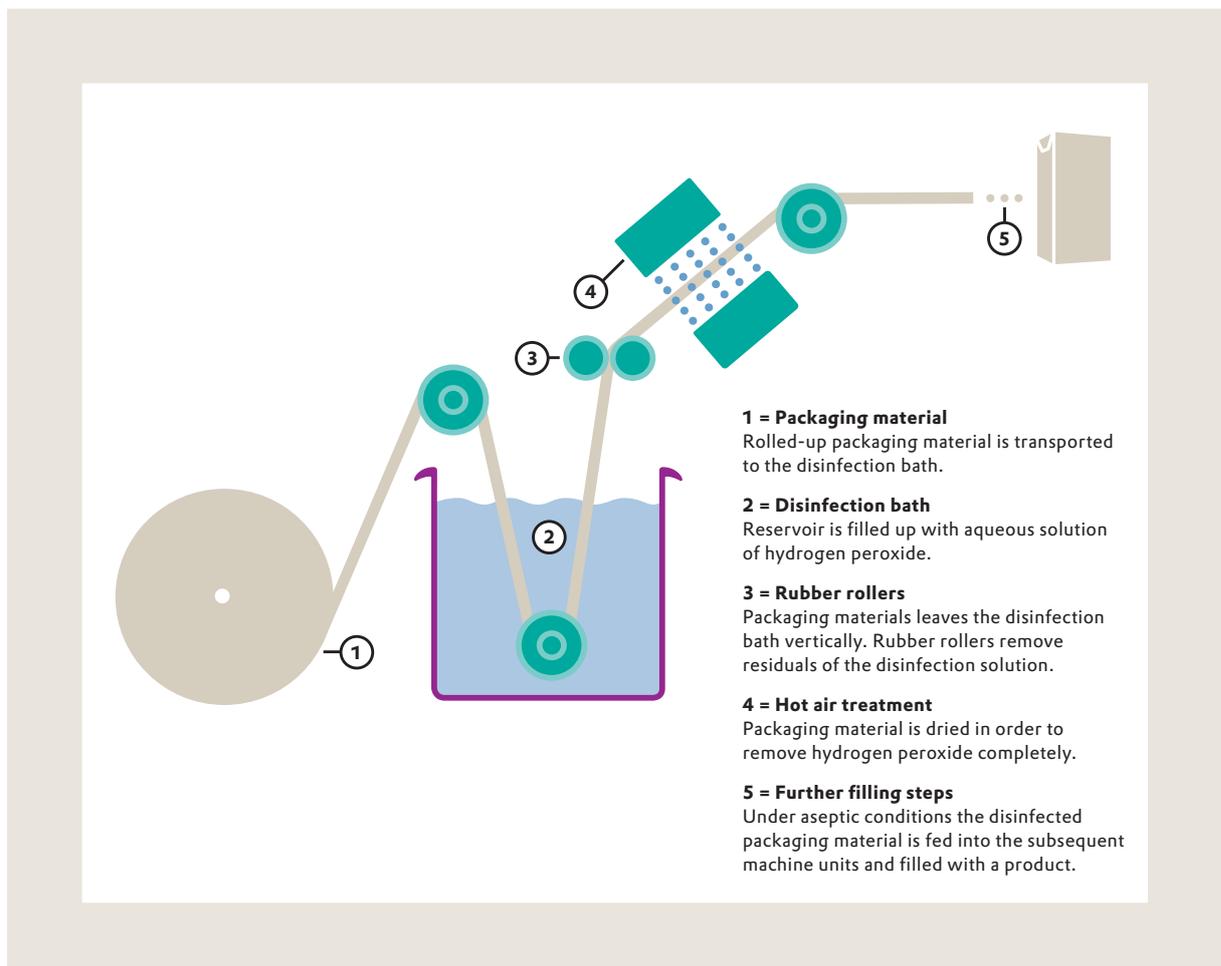
# TAKING A CLOSER LOOK – ASEPTIC PACKAGING TECHNOLOGIES

The core step in aseptic packaging is to disinfect the packaging material in order to prevent any biological contamination of the foodstuff during the packaging process. Currently, the standard aseptic process is able

to reduce the germ count by log5 and there are even attempts to reach log6 in the future. Looking more into the details of this technology, there are mainly four different approaches.

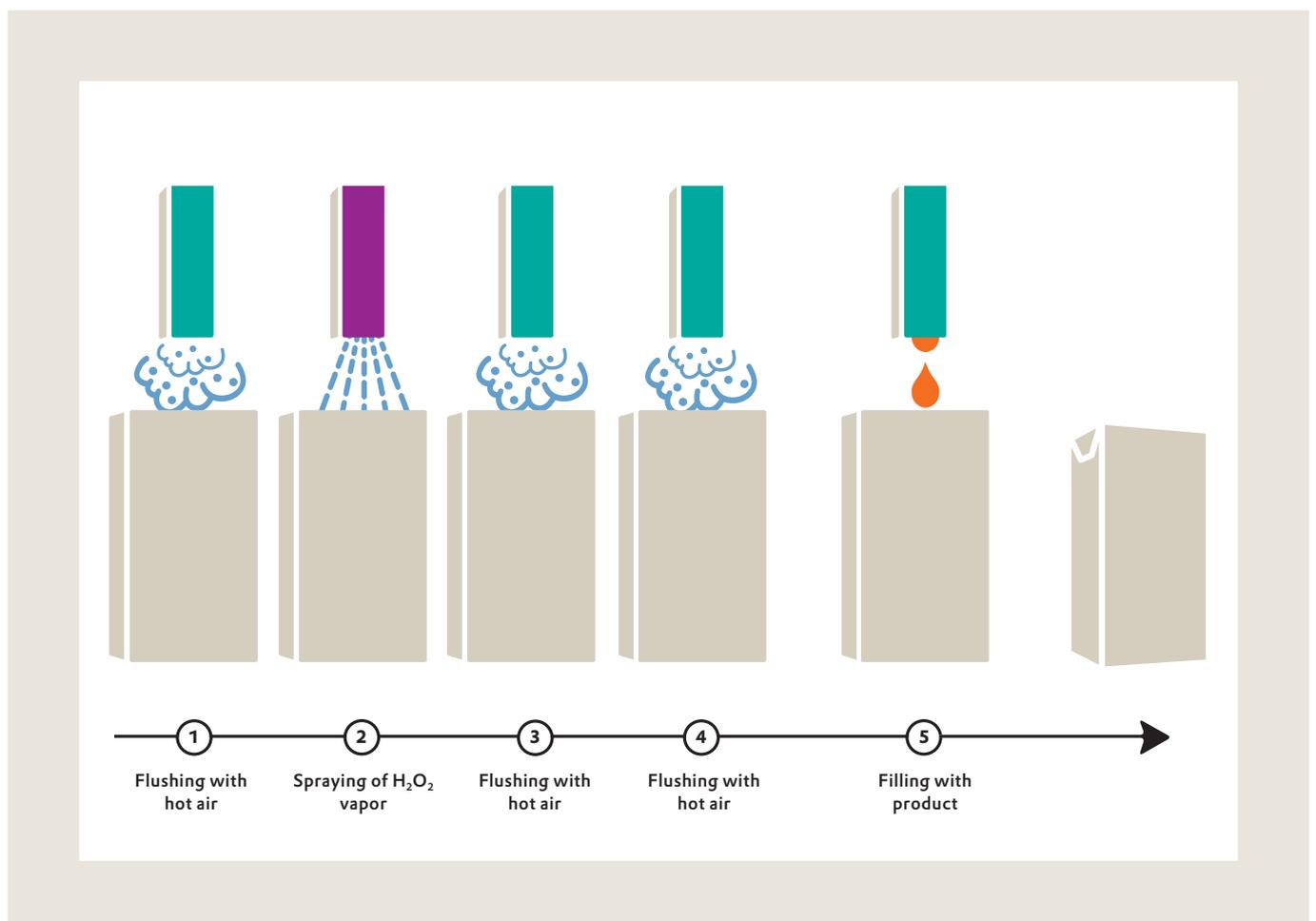
## *Immersion bath technology*

The still flat but printed packaging material (in this case always multilayer paperboard carton) is pulled through a heated bath of 35% H<sub>2</sub>O<sub>2</sub>. As there are only a few seconds of contact, the H<sub>2</sub>O<sub>2</sub> has to be heated up to a temperature of 70 - 85 °C to achieve an appropriate germ reduction. Remaining hydrogen peroxide is removed by pressurized air, then the carton is formed, the food filled in and the packaging unit sealed. It is a common effect that due to the bath temperature water is evaporated and thus the concentration of the remaining H<sub>2</sub>O<sub>2</sub> goes up above 40%. This trend turns around the moment there are enough impurities in the bath (e.g. coming with the paperboard) and the resulting decomposition is faster than the evaporation. In some machines there is an active dilution feature installed which feeds deionized water into the bath to keep the concentration below an upper limit. Current machines produce about 8,000 - 15,000 units per hour. The average consumption of H<sub>2</sub>O<sub>2</sub> 35% is about 0.2 ml per packaging unit.



## Spraying technology

In this case the fully printed and preformed packaging units are sprayed with vaporized hydrogen peroxide. Besides the traditional multilayer paperboard carton those machines can also be designed to process cups, cans or small plastic bottles. The temperature of the vapor is about 150 - 200 °C to compensate the even shorter contact time compared to the immersion bath. Remaining disinfectant is removed by spraying hot steam afterwards. The foodstuff is then filled in and the unit is sealed. Available machines slightly vary in how to heat and dose the hydrogen peroxide. Current machines produce about 10,000 - 24,000 packaging units per hour, the average consumption of H<sub>2</sub>O<sub>2</sub> 35% is about 0.2 ml per packaging unit. Some of the PET bottle machines use a spraying step as well by dosing peracetic acid into a stream of hot steam. Consumption here is about 0.3 ml peracetic acid 5% per unit.



## *Dry disinfection*

The so-called dry disinfection is a further developed spraying technology, first applied for PET bottles. Hydrogen peroxide is sprayed into a bottle in a way that no condensation occurs at the inner walls of the packaging unit. Thus, removal of remaining disinfectant is much easier. Current PET bottle machines are much bigger than the paperboard machines described above. They usually start with the plain plastic granulates as raw material and include a blower module to produce the bottles on site. Their capacity goes up to 50,000 units per hour, consuming about 0.6 ml H<sub>2</sub>O<sub>2</sub> 35% per unit.

## *Rinser cold disinfection*

PET bottle packaging machines could also have a rinser instead of a dry disinfection module. This technology rinses the bottles (upside down) with an aqueous disinfectant solution, mostly based on peracetic acid as active chemical. A second washing step with clear water must follow to remove remaining disinfectant. The rinser approach does not need high temperatures and is also named cold aseptic. Average consumption of peracetic acid is about 0.2 - 0.5 ml per unit.





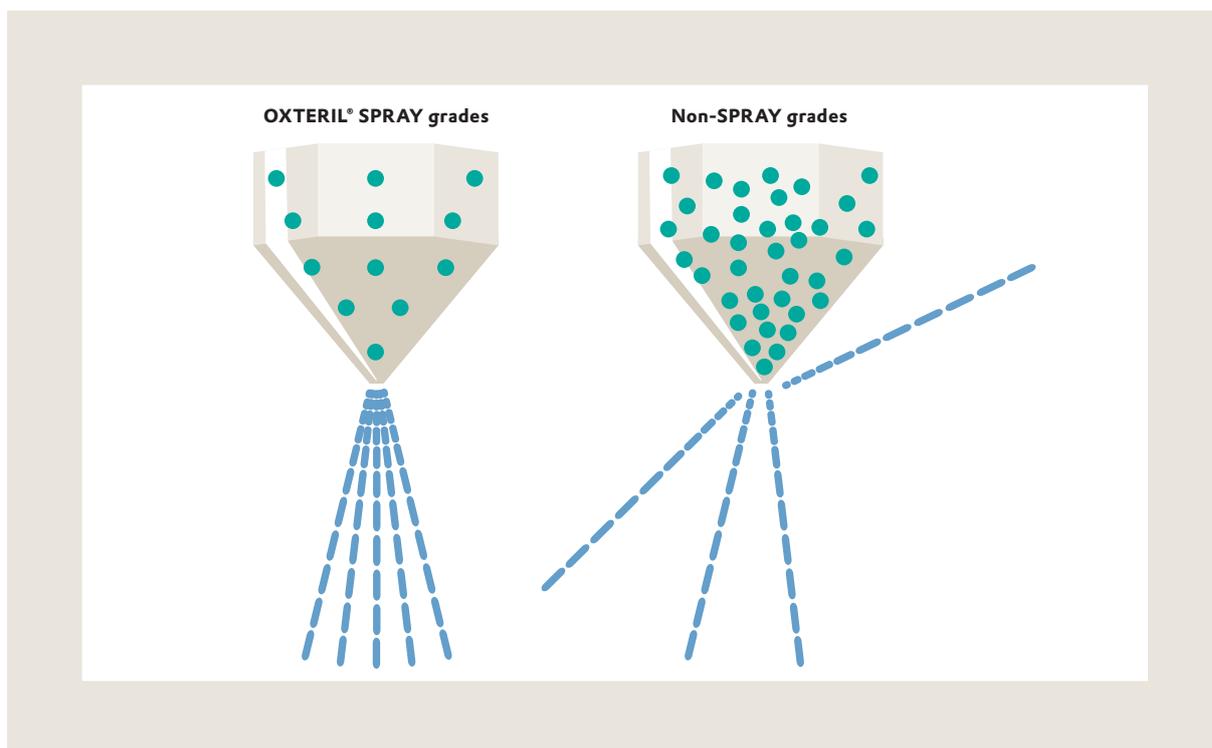
# EVONIK'S PORTFOLIO FOR ASEPTIC PACKAGING

The described aseptic packaging technologies allow diverse and tailor-made packaging options for today's market trends (e.g. fancy shaped packaging, "to-go" packaging, high sophisticated opening devices). In order to accompany these market trends and to meet the requirements of the industry, Evonik is constantly developing its products. We offer PERACLEAN® peracetic acid products and OXTERIL® hydrogen peroxide products, specially designed for the use in state-of-the-art aseptic packaging technologies.

Analogue to hydrogen peroxide, peracetic acid belongs to the group of oxidative disinfectants acting on microbes by oxidizing their proteins and cells. Typical products are PERACLEAN® 5 and PERACLEAN® 15 with an peracetic acid content of 5% and 15%, but several other grades and concentrations are available as well. OXTERIL® is a 35% aqueous solution of highly purified high quality hydrogen peroxide that forms little to no residue on the packaging machines. OXTERIL® 350 BATH and OXTERIL® 350 SPRAY are tailor made for the individual immersion bath or spray process with regards to product stability, residues and packaging line effectiveness.

OXTERIL® 350 COMBI is designed especially for customers who run both immersion bath and spraying machines and feed the H<sub>2</sub>O<sub>2</sub> out of one storage unit. OXTERIL® 350 SPRAY S is a high performance product characterized by extremely low evaporation residues, increased machine running times and reduced cleaning efforts. Therefore, this grade is especially suitable for dry disinfection processes. In order to meet the stringent requirements of the latest generation of high throughput packaging machines the stabilizer content in OXTERIL® 350 Spray S has been reduced to a minimum. Consequently, the use of the product in production has to be controlled thoroughly and any contact with stainless steel or other sources of possible contamination has to be kept at a minimum.

To guarantee a smooth and safe production at the customer site, it is key to choose the suitable product for each machine and process. If, for instance, a non-spray grade is used on spraying machines, the nozzles which apply the hydrogen peroxide onto the packaging surface can be blocked. This may lead to non-sterile conditions. Additionally, the high residues will build up in the evaporation unit resulting in higher energy consumption and superheating of the liquid.



**Table 1: Application guide**

Product	Active substance	Application/process	Main packaging material
OXTERIL® 350 BATH	Hydrogen peroxide	Immersion	Carton
OXTERIL® 350 COMBI	Hydrogen peroxide	Spraying/dry disinfection and immersion	Carton, PET, PE
OXTERIL® 350 SPRAY	Hydrogen peroxide	Spraying/dry disinfection	Carton, PET, PE
OXTERIL® 350 SPRAY S	Hydrogen peroxide	Spraying/dry disinfection	Carton, PET, PE
PERACLEAN® 5	Peracetic acid	Rinser cold disinfection	PET, PE
PERACLEAN® 15	Peracetic acid	Rinser cold disinfection	PET, PE

Use biocides safely. Always read the labeling and the product information before use.

The table below shows an extract of specified and typical values of the four OXTERIL® grades and their compliance with the monograph of the Food Chemicals Codex (FCC).

**Table 2: OXTERIL® product properties**

Product	Unit	OXTERIL® 350 BATH	OXTERIL® 350 COMBI	OXTERIL® 350 SPRAY	OXTERIL® 350 SPRAY S	FCC Monograph
<b>Specified</b>						
H <sub>2</sub> O <sub>2</sub> -content	%	35 - 36	35 - 36	35 - 36	35 - 36	
Non-volatile residue	ppm	< 30	< 25	< 20	< 10	< 60
<b>Typical</b>						
Acidity (as H <sub>2</sub> SO <sub>4</sub> )	%	< 0.025	< 0.025	< 0.025	< 0.025	< 0.03
Phosphate (as PO <sub>4</sub> )	ppm	< 10	< 10	< 10	< 5	< 50
Lead (Pb)	ppm	< 0.02	< 0.02	< 0.02	< 0.02	< 4
Iron (Fe)	ppm	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5
Tin (Sn)	ppm	< 10	< 0.1	< 0.1	< 0.1	< 10

# BIOCIDAL PRODUCT REGISTRATION (BPR)

The aim of the BPR is to harmonize the European rules for biocidal products and their active substances. Through risk assessment, it intends to provide a high level of protection for people, animals and the environment and to ensure that products are sufficiently effective against the target species. The BPR stipulates a two-step process, in which the active substance evaluation is followed by a product authorization of individual biocidal products. Biocidal products from Evonik containing peracetic acid and/or hydrogen peroxide fulfil the obligations of the European Biocidal Products Regulation

(BPR) (EU) No. 528/2012 and are therefore actively supported in the product registration under the BPR. In the transitional period the existing biocidal products are marketed with existing national biocidal registrations. In accordance with BPR, aseptic packaging represents a biocidal application, which is classified in "Main Group 1: Disinfectants, Product type 4 – Food and feed area." Evonik applies for the Union Authorization under the BPR, including product type 4. **Please contact us if you have any questions or need support with your registration.**





# LABELING AND TRANSPORTATION

Hydrogen peroxide solutions with concentration higher than 8% by weight as well as aqueous solutions of peracetic acid are dangerous substances, e.g. according to Global Harmonized System (GHS) and the European Regulation No. 1272/2008. They must be labeled and handled correspondingly.

The exact classification of the particular product depends on the concentration of hydrogen peroxide and peracetic acid. The table below represents the classification of the aseptic products. **Please refer to our Material Safety Data Sheet for further details.**

**Table 3: Classification of aqueous hydrogen peroxide solutions and peracetic acid according to the European Regulation No. 1272/2008**

**OXTERIL® 350 BATH food grade / OXTERIL® 350 SPRAY food grade  
OXTERIL® 350 COMBI food grade / OXTERIL® 350 SPRAY S food grade**

Hazard statements	H302	Harmful if swallowed.
	H315	Causes skin irritation.
Prevention statements	H318	Causes serious eye damage.
	H332	Harmful if inhaled.
	H335	May cause respiratory irritation.
	P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
	P302 + P352	IF ON SKIN: Wash with plenty of water/soap.
Prevention statements	P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
	P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.



**PERACLEAN® 5**

Hazard statements	H242	Heating may cause a fire.	
	H290	May be corrosive to metals.	
	H302	Harmful if swallowed.	
	H312	Harmful in contact with skin.	
	H314	Causes severe skin burns and eye damage.	
	H332	Harmful if inhaled.	
	H335	May cause respiratory irritation.	
	H410	Very toxic to aquatic life with long lasting effects.	
	Prevention statements	EUH071	Corrosive to the respiratory tract.
		P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P234		Keep only in original container.	
P273		Avoid release to the environment.	
Prevention statements	P280	Wear protective gloves/protective clothing/eye protection/face protection.	
	P302 + P352	IF ON SKIN: Wash with plenty of water/soap.	
	P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
	P308 + P311	IF exposed or concerned: Call a POISON CENTER/doctor.	



**PERACLEAN® 15**

Hazard statements	H242	Heating may cause a fire.	
	H290	May be corrosive to metals.	
	H302	Harmful if swallowed.	
	H312	Harmful in contact with skin.	
	H314	Causes severe skin burns and eye damage.	
	H332	Harmful if inhaled.	
	H335	May cause respiratory irritation.	
	H410	Very toxic to aquatic life with long lasting effects.	
	Prevention statements	EUH071	Corrosive to the respiratory tract.
		P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P273		Avoid release to the environment.	
P280		Wear protective gloves/protective clothing/eye protection/face protection.	
Prevention statements	P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.	
	P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
	P308 + P311	IF exposed or concerned: Call a POISON CENTER/doctor.	
	P391	Collect spillage.	



## *ESHQ*

Our environment, safety, health and quality values set out our commitments in these areas. Together with more detailed guidelines and procedures, they form a binding framework. The ESHQ values define protection of people and the environment as central elements of our activities. Evonik is committed to the global Responsible Care initiative, and we constantly strive to improve our performance in health, safety, environment and product stewardship. Our manufacturing facilities worldwide are certified according to the ISO 9001 as well as 14001 and 50001 series.

## *Packaging and storage*

Depending on customer, grade, region and other requirements, the shipment of hydrogen peroxide and peracetic acid is made in small to large containers. For consumers of large quantities, the installation of a storage tank is recommended. It is our declared policy to pass on our many years of experience with hydrogen peroxide and peracetic acid to our customers. This includes the planning and construction of tank installations.

### **Our service can cover:**

- Initial consultation
- Project planning and construction work
- Start-up
- Repair and modification work on
- Hydrogen peroxide installations
- Pre-delivery inspection

### **Common forms of packaging for hydrogen peroxide and peracetic acid are:**

- Plastic canister: depending on product and concentration: 30 kg, 65 kg can (other sizes upon request)
- IBC (Intermediate Bulk Container): 1000 - 1200 kg
- Road tanker: up to 25 tonnes
- Overseas ISO container: 20 tonnes

In Germany, plastic packaging of hazardous products can be returned by the use of the RIGK-G-SYSTEM free of charge. The packaging is conveyed to a recovery system in accordance with the terms of the German Closed Substance Cycle Act (Kreislaufwirtschaftsgesetz [KrWG]). For more information and contact data please visit [www.rigk.de](http://www.rigk.de).

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