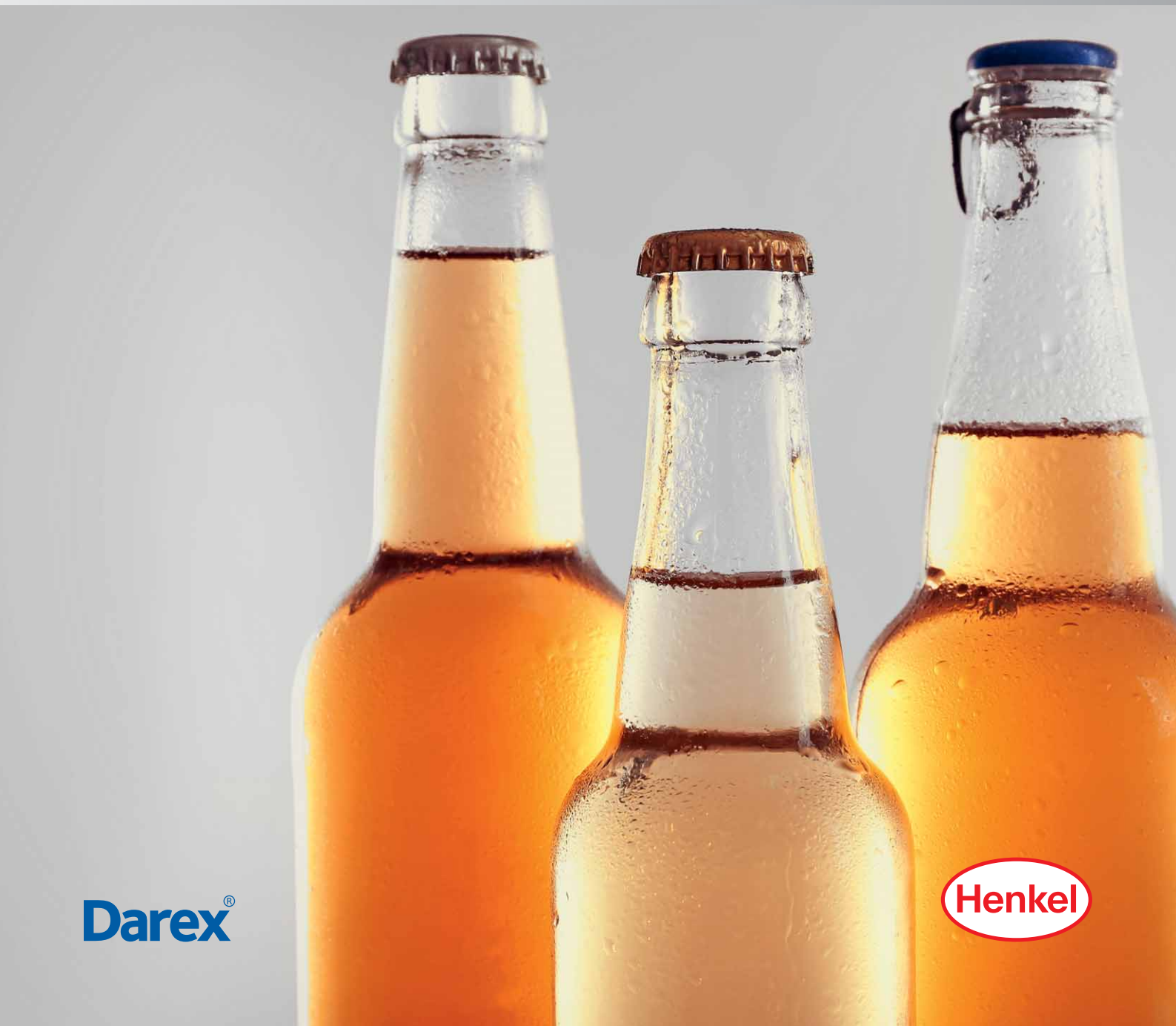
Oxygen Scavenger Compounds for Closures

DARAFORM | CELOX



Darex®

Henkel

Introduction

Henkel supplies a complete range of thermo-elastomer and PVC free closure sealants to meet the sealing requirements of the closure industry. The main purpose of PVC free closure sealants is to provide a sealing gasket for crowns, twist off crowns, ROPP or plastic caps, and to seal a bottle or jar for beverage applications: Beer, champagne, carbonated soft drinks, fruit juice, mineral water etc. The specific closure, sealant application method and type of beverage requires the selection of a specific sealant. Your Henkel representative can help you select the most appropriate material for your needs from our product portfolio.

To You, Oxygen is Life – but not so for Your Beverage

Beer, juice, tea, sports drinks. Once they are bottled, they are ready to be delivered fresh to the consumer. Right? Not exactly. Oxygen goes right to work, destroying the freshness and taste of your beverage from the minute the cap is sealed. Oxygen can be trapped in a bottle's headspace, dissolved in the beverage itself, or enter through the packaging — and even low levels of oxidation can result in stale beer, soured juice or spoiled tea. All of this leads to returned bottles, unhappy customers and a negative perception of your brand.

Freshness vs. Oxidation: Make Sure Freshness Wins

It is a fact: oxidation will occur unless you take steps to prevent it. Barrier bottles and sealants alone will not work. You need Oxygen Scavenger to keep your oxygen-sensitive beverages fresh, preserve their taste, reduce returns and protect the brand you have worked so hard to build.

Oxygen Ingress via the Crown Liner

Problem from Oxygen in Beer

- Flavor deterioration
- Color Change
- Nutrient depletion
- Haze formation

Sources of Oxygen in Beer

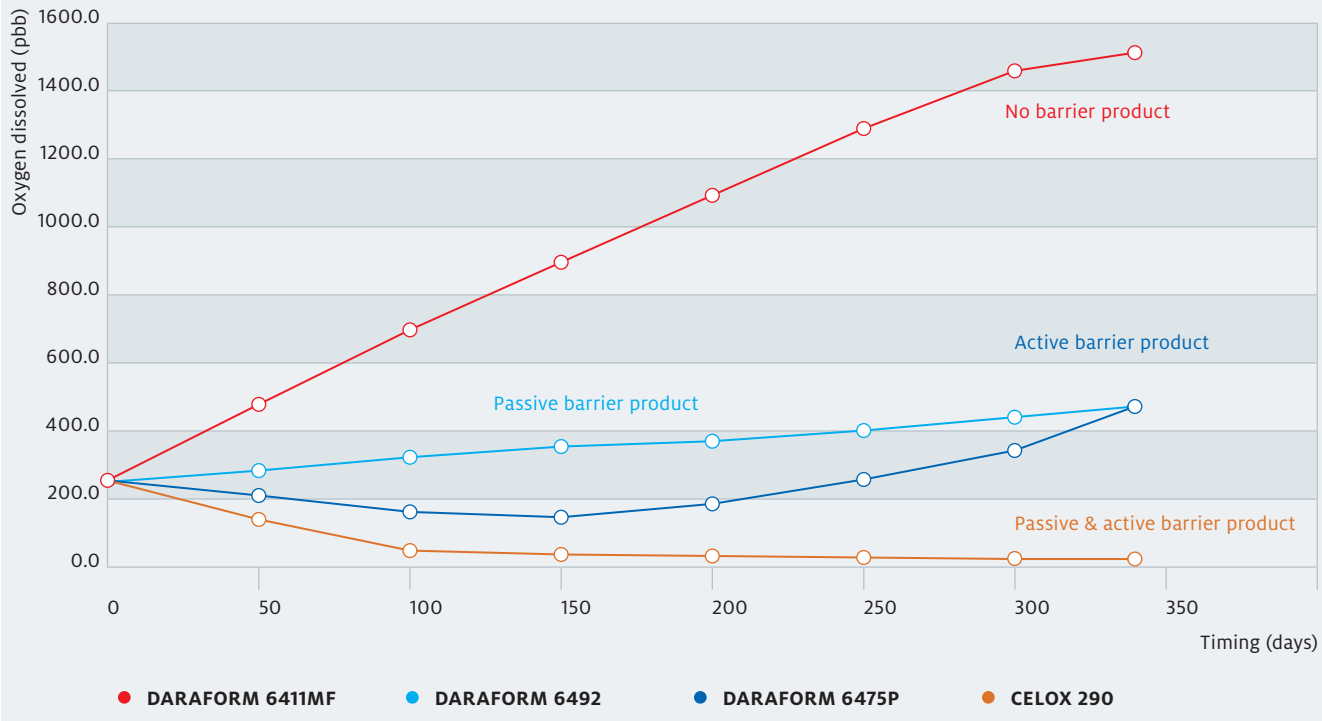
- Dissolved in beer
- Included air during fill
- Permeation through package

Oxygen Scavenger Measurement

Benefit of Oxygen Scavenger in Metal Crown

Oxygen Measurement on 250ml Glass Bottles Closed with Lined Crowns

Pack test stored at 22°C



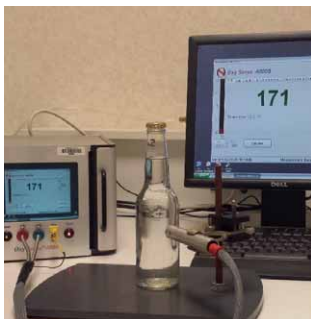
Henkel Capabilities

We have designed equipment to support a wide range of new customer applications, including pack tests (or sealing performances), providing information on scavenger technology, and by performing feasibility tests. Pack tests can be performed in a closed environment with controlled oxygen levels. All types of packages can be tested with this current equipment, including bottles and jars. The packages are then pasteurized in accordance with the customer's specifications.

Oxygen measurements are performed on shaken samples in a non-invasive method with the OXYSENSE analyzer system that utilizes an optical methodology to determine the oxygen concentration within a sealed package (in liquid or headspace phases).

This technique allows us to evaluate the performance of our products in scavenging oxygen in time within a given package.

The Technical Centers can also perform several analytical studies. High tech equipment is used to support Henkel's customers in sealants and active packaging business, from infrared spectrometry to gas chromatography with specified injector.



Our Oxygen Scavenging Technology (OST) provides a solution to problems of oxygen ingress during the filling process and oxygen ingress over time. This technology can be used in several applications, including lined crowns for beer bottles, aluminum RO/ROPP or in the center panel within plastic caps. In addition, an OST masterbatch has been developped to be incorporated in other packaging type.

	Pry Off	Twist Off	Passive Barrier	Scaven-ger	Retum-able Bottles	White	Clear	Blue	Grey	Comments
Metal Crown Applications										
DARAFORM 6475P	●			●	●	●	●			
CELOX 290	●		●	●		●				Passive Barrier & Oxygen Scavenger
CELOX 410		●		●	●	●				
RO/ROPP Applications										
DARAFORM 6601		●		●				●	●	For Aluminium Bottles
Plastic Closures										
DARAFORM 6601				●				●	●	For PET Bottles
DARAFORM 6475P				●	●	●	●			For Center Panel
CELOX 300				●	●	●				Higher Scavenger Content for Center Panel
Master Batch										
CELOX MB 2002				●						Additive for PE/PP matrix

Additional properties and handling information can be found in corresponding Product Information sheets (PI) and Material Safety Data Sheets (MSDS).

Innovation

Active and Passive Liner for Crowns – CELOX 290

Over time, sensitive beverages can be oxidized by oxygen and contaminated by chemicals. Sources of chemicals could be initiated during the treatment on wood pallets, from external contamination during the storage such as in containers during sea transportations and from odor contamination or contaminated atmosphere. In addition to oxygen scavenger material as an active barrier, beverages need a passive barrier to prevent ingress of taints and odor. CELOX 290 combines both technologies as an excellent barrier to ingress from chemicals such as TCA, and is also an excellent oxygen scavenger. In addition, it can scavenge residual oxygen in the headspace.

Liner Oxygen Performance Matrix

	Non-Scavenger Liner	Passive Barrier Liner	CELOX Scavenger Liner
Protection Against O_2 Ingress	●	●	●
Address O_2 in Headspace	●	●	●
Extend "Freshness" of Beer Flavor Stability	●	●	●
Extend "Freshness" of Beer Aroma Stability	●	●	●
Preserve Color of Beer	●	●	●
Reduce Staling Aldehydes	●	●	●

CELOX liners ensure your consumers have the freshest beer

● Standard ● Better ● Best

Coating Recommendations

APPERTA and DAREX Coatings, Non-BPA Closure Coatings

For more than 80 years, we have built a world-class reputation of total customer focus and innovative packaging solutions. As a major global supplier to the packaged food and beverage industry, our DAREX Packaging Technologies have always been an expert on changes in the dynamic packaging industry.

Henkel is one of the few suppliers of coatings and sealants for the closures industry, and is focused on the needs of the beverage industry. We have built a robust portfolio of non-BPA closure coatings for PVC free sealants which are available today, providing our customers with total flexibility in the choice of raw materials.

To ensure optimal performance, it is recommended that the product is used in conjunction with the adhesion lacquer DAREX AL 1700 or DAREX AL 2002 for metal closure or aluminum closures applications.

Storage & Handling, Cautions & Limitations

We strongly recommend storing non-PVC sealants in the original closed containers. When not in use, the pellets should be stored with their orginal packaging closed. The storage place must be dry (especially for oxygen scavenging sealants) < 85% RH. The storage place must not exceed 40°C and be without direct sunlight.

Compatibility with specific beverages and post lining closures treatment processes should be verified.

Products must be stored separately from materials with a strong odor, such as solvents, gasoline, paint, wood treatment products, treated wood.

Henkel AG & Co. KGaA
(Headquarter)
Henkelstrasse 67
40589 Düsseldorf
Germany
Tel.: +49 211 797 0

North America
Henkel Corporation –
Darex Packaging Technologies
62 Whittemore Ave.
Cambridge, MA 02140/USA
Tel.: +1 617 498 4987

Europe
Henkel Corporation –
Darex Packaging Technologies
In der Hollerhecke 1
67545 Worms/Germany
Tel.: +49 6241 403 00

Latin America
Henkel Corporation –
Darex Packaging Technologies
Rua Albion, 229 –
10o andar, cj 104
Lapa, São Paulo – SP/Brasil
Cep 05077-130
Tel.: +55 11 3133 2704

Asia/Pacific
Henkel Corporation –
Darex Packaging Technologies
Building 7 & Building 6 (5F-7F), The Springs Center
No.99 Jiang Wan Cheng Road
Yang Pu District
Shanghai 200438
China

www.henkel-adhesives.com/metals