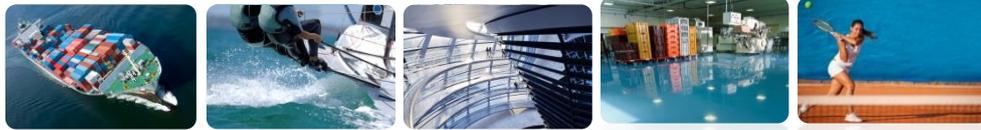


# EPOXIES AND FOOD PACKAGING

EPOXY RESIN COMMITTEE



Epoxy-based resins are key to food and beverage containers' long shelf life.

## Long-lasting, highly protected foods

Since the 1950s, epoxies have been used in the internal coating of cans to endure a long shelf life for canned goods, preserving them for up to five years.

Their use benefits both consumers, who can store food for long periods after purchase, and producers, who can export local, seasonal food all year-round, using lightweight and affordable packaging while preserving taste, texture and colour.

Canned products also contribute to improving food security, of particular importance in countries where seasonal food production can vary considerably from year to year. Cans are hermetically sealed, keeping out bacteria and insects, as well as preventing deterioration due to oxidation. Non-transparent cans halt the effect of light and UV rays, critical in tropical and sub-Saharan countries.

Epoxy-based resins provide another advantage: creating a protective layer separating foods and drinks from the metal used to make the cans. Without epoxies, the metal could be corroded and bacteria could penetrate the cans, harming the safety of their contents, but also their freshness, nutritional properties and organoleptic properties such as taste and smell.<sup>1</sup>

Glass packaging also relies on epoxy resins to protect lids from corrosion in bottles and jars, in order to comply with the European Union tight regulation on food packaging.

## High-engineering processes to deliver greatest safety

What may appear as simple food containers are actually advanced devices whose engineering precision has been likened to the one needed for the production of aircraft wings and space vehicles.<sup>2</sup>

Food cans can work as pressure vessels filled with raw food which is then processed and cooked. A robust internal epoxy coating allows for completely safe sterilisation at high temperatures and an airtight seal. In general, beer and other beverages undergo a 20-30 minutes cycle at about 65°C. Foods are often cooked at a minimum of 120°C under pressure for up to 90 minutes.

Epoxies are also able to withstand the numerous shape-shifting processes withstood by cans. Despite the enormous pressure, cans will not break, crack or lose metallic adherence during this processes and later, while being transported, consumed or accidentally dropped or dented.

<sup>1</sup> [Metal Packaging industry comment on Bisphenol A and epoxy-based coatings for the internal protection of food and beverage cans and closures](#), European Metal Packaging Food Contact Commission, 2011

<sup>2</sup> Hosford and Duncan, 1994, cited in Can coatings for foods and beverages: issues and options, J.S. LaKind in Int. J. Technology, Policy and Management, Vol. 13, No. 1, pp.80-95, 2013

The most significant technical achievement is perhaps the versatility of the coating. It works for foods with differing corrosive qualities, while maintaining low production costs. For example, without epoxy internal coating, peas and beans would interact with the metallic surface of a can and blacken it, while tomato concentrate would make it red. Krauts or pickles might weaken a can because they contain high levels of salt and acidity levels.

Scientists have developed specific safety packaging tests, often lasting several years, which evaluate the cans' performance through the course of time. At the same time, they have continued refining the production process to ensure cans remain lightweight, produced at high speed and at low cost.

Cans must also have minimal environmental impact and should be easily recyclable. According to the North American Packaging Alliance, frozen products require about 70% more energy than metal packaged foods.<sup>3</sup> Cans are very lightweight, resulting into fewer CO2 emissions during their transportation when compared to heavier materials (such as for example glass). Metal cans and glass containers are 100% recyclable, without losing strength or quality. Overall, epoxy-based coatings require a complex production process which delivers significant performance and safety advantages, not to mention their affordability.<sup>4</sup>

The [chemistry](#) involved in the production of epoxies is no different from the one used to produce epoxies destined to other uses. It involves a reaction between two substances: epichlorohydrin and Bisphenol A (BPA). The latter is later found in minimal traces in the resin which is finally used to produce the coating and is further reduced during the curing process. For more information, visit the [European information Centre on Bisphenol A](#).

### **Protecting food, drinks and the machines which manufacture them**

Epoxies are also used in industrial food processing equipment. Thanks to their high degree of protection, they can protect metal coverings of containers, pipelines and storage tanks in food processing plants for years, even if used sporadically. This is particularly useful in the case of foods which would absorb and chemically alter metal coverings.

Epoxy coatings also help keeping the metal used in food packaging lubricated when being processed in the production line, hence preventing damage to the industrial machinery. Without epoxies, the high-speed production process – which can turn out hundreds of cans per minute – would wear down the production line more rapidly.

***Did you know?*** According to recent data, the EU food and drink packaging industry employs 60 to 70,000 employees. Processing machinery for this sector is manufactured by some 6,000 companies creating 110,000 jobs. These sectors use 17,600 tonnes of epoxy resins sold by ERC members every year in the food and water industries (which include water delivery applications).<sup>5</sup>

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<sup>3</sup> [Benefits of Metal Packaging](#), North American Metal Packaging Alliance, Inc.

<sup>4</sup> [No Clear Winner In Race To Find Non-BPA Can Linings](#), C&EN, 2013

<sup>5</sup> 'The Socio-economic Value of Epoxy Resins', 2015