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# EPOXY EUROPE

## NEWSLETTER

### CONCEPTS FOR SUSTAINABLE STRUCTURAL EPOXY RESINS



*Image source: Envato*

***What matters for the planet and people is to save  
the use of fossil resources***

#### **A complex industry**

Chemistry involves transforming substances and is essential to life and the universe. Using raw materials like oil, natural gas, and biomass, the chemical industry creates numerous compounds and materials that support countless companies in producing essential products. Chemical plants are interconnected through pipelines or logistics networks, allowing outputs from one process to serve as inputs for another. The entire mapping of chemical processes from raw materials to final products is highly complex.

The diagram below illustrates this complexity using the production of BPA-based epoxy resins as an example. It involves 10 transformation operations and 15 different key raw materials and

intermediates, which are also used to produce other chemicals.

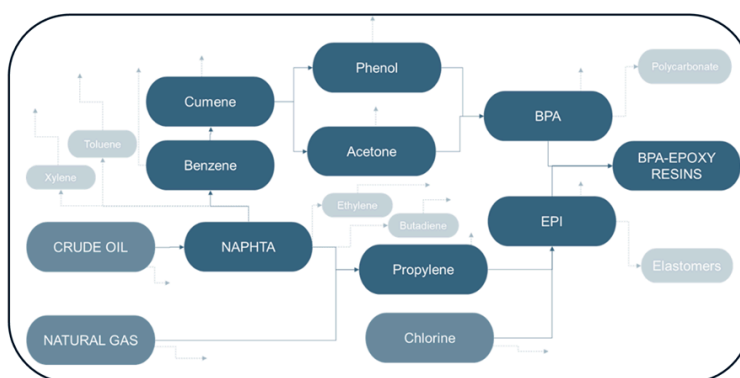


Image generated by Huntsman.

### Schematic view of the different stages in the manufacturing of bisphenol A-based epoxy resins

While traditional raw materials are generally fossil-based, the chemical industry is increasingly exploring bio-sourced alternatives. For example, BPA, used in epoxy resins, can be derived from lignin, a by-product of the paper industry. Bio-based epichlorohydrin can be produced from glycerol, which is obtainable from plants, animal tallow, or as a by-product of biodiesel production. However, many of these innovations have not yet reached industrial development levels that ensure sufficient volumes at affordable costs.

### Manufacturing sustainable products

When considering manufacturing sustainable products, two types of production schemes can exist:

*Dedicated Production:* This process keeps sustainable and fossil material flows separate, ensuring that sustainable materials are fully integrated into the product. This results in bio-based products. However, businesses producing both bio-based and fossil-based products would need separate production facilities, which is often uneconomical and unlikely to secure funding.

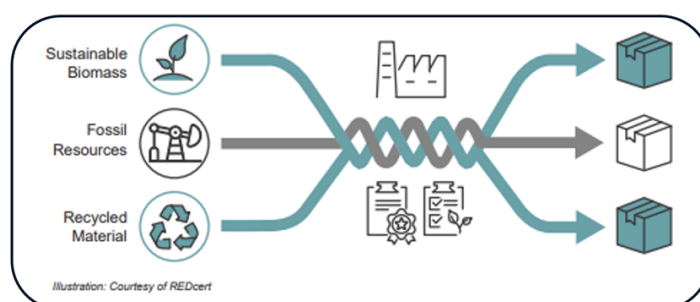
*Integrated Production:* This process uses a mix of sustainable and fossil materials without separating their flows. Sustainable materials like bio-naphtha, biogas, or used cooking oils are introduced at

various stages, diluting the bio-origin portion among the final products. As a result, it's difficult to guarantee a consistent level of bio-content in complex, multi-step processes. The mass balance methodology addresses this challenge.

### The Biomass balance approach

The Mass Balance Concept is about mixing, tracking and verifying. Fossil-based feedstocks and their equivalent from sustainable origin are co-processed in existing plants without the need for physical segregation in either location or time.

Important to note that we used the “bio-origin” wording; indeed the sustainable raw materials saving the use of fossil resources are often, even if not only, basic feedstocks introduced at the early stages of the manufacturing chain (such as Bio-gas, Bio-Naphta). While the precise physical content of bio-atoms in an individual unit of production cannot be guaranteed, the approach guarantees that there is a probability of the presence of such atoms. Statistically, we can say with confidence that bio-feedstock will be present in Mass-Balanced products, but it will not be possible to guarantee a level of Bio-Content. Nevertheless, Mass-balanced products exhibit a certain **degree of substitution** that can reach up to 100% and this is what matters for the planet.



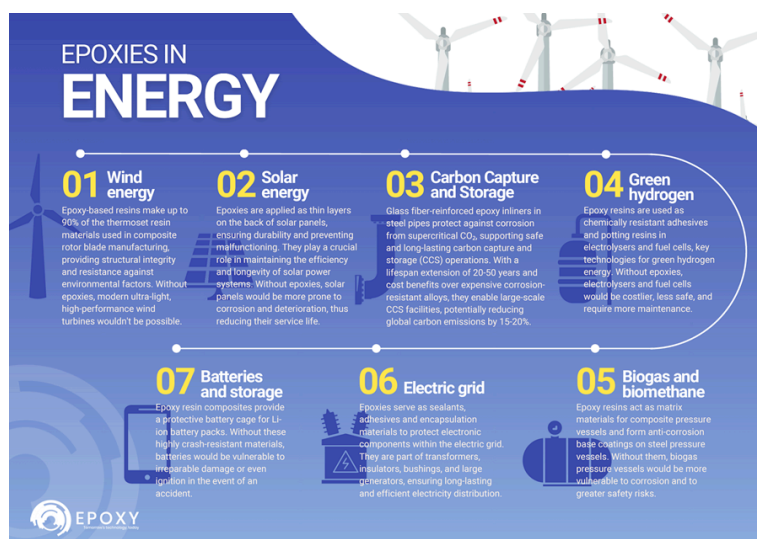
*The mass balance concept. Illustration courtesy of REDcert.*

This degree represents the proportion of fossil-based raw materials that have been replaced with sustainably certified feedstock. These products are referred to as bio-attributed, never as Bio-based. Certification schemes offer the possibility of a proven and audited system to maximize the amount of materials from bio-origin in the production of chemicals, without having to build

separate production plants throughout the value chain to keep sustainable materials and fossil-based materials separated.

The Mass Balance Concept has been implemented over the past few years by several epoxy manufacturers. It enables these businesses to prove that a certain quantity of fossil-based raw materials used in manufacturing their resins has been replaced by certified sustainable biomass during one or more stages of the production process. Mass Balance certified resins are produced with reduced fossil resource usage and are referred to as "fossil resource-saving" products. They can achieve up to 100% bio-attribution and sometimes more than 100% reduction of CO<sub>2</sub>-equivalent emissions, without negatively affecting other environmental parameters, if raw materials are selected carefully

## NEW FACTSHEETS



*One of the series of factsheets*

We have published a comprehensive series of factsheets that underscore the significant impact of epoxy resins in diverse sectors. These detailed visuals explore the essential roles that epoxies play, not only within households where they enhance durability and aesthetic appeal of surfaces and structures, but also in critical industries such as aviation and shipping. In aviation, epoxies contribute to the structural integrity and the

lightweight of an aircraft, which are crucial for fuel efficiency and safety.

Meanwhile, in the maritime sector, epoxy coatings protect vessels from harsh marine environments, preventing corrosion and biofouling. This collection of factsheets serves as resource for industry professionals, offering technical insights and underscoring the indispensable nature of epoxy resins in modern industrial applications.

**SEE ALL FACTSHEETS**

### **Epoxy Europe & the European Boating Industry**

We released a new video featuring Philip Easthill from the European boating industry, discussing the critical role of epoxy resins in the maritime sector. He also highlights the epoxies' contribution to vessel durability, corrosion resistance, and sustainability.

Epoxy Europe is fostering partnerships and strengthening collaborations across broader sectors, to showcase how epoxies, although sometimes unnoticed, are crucial to a wide range of industries in Europe.



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