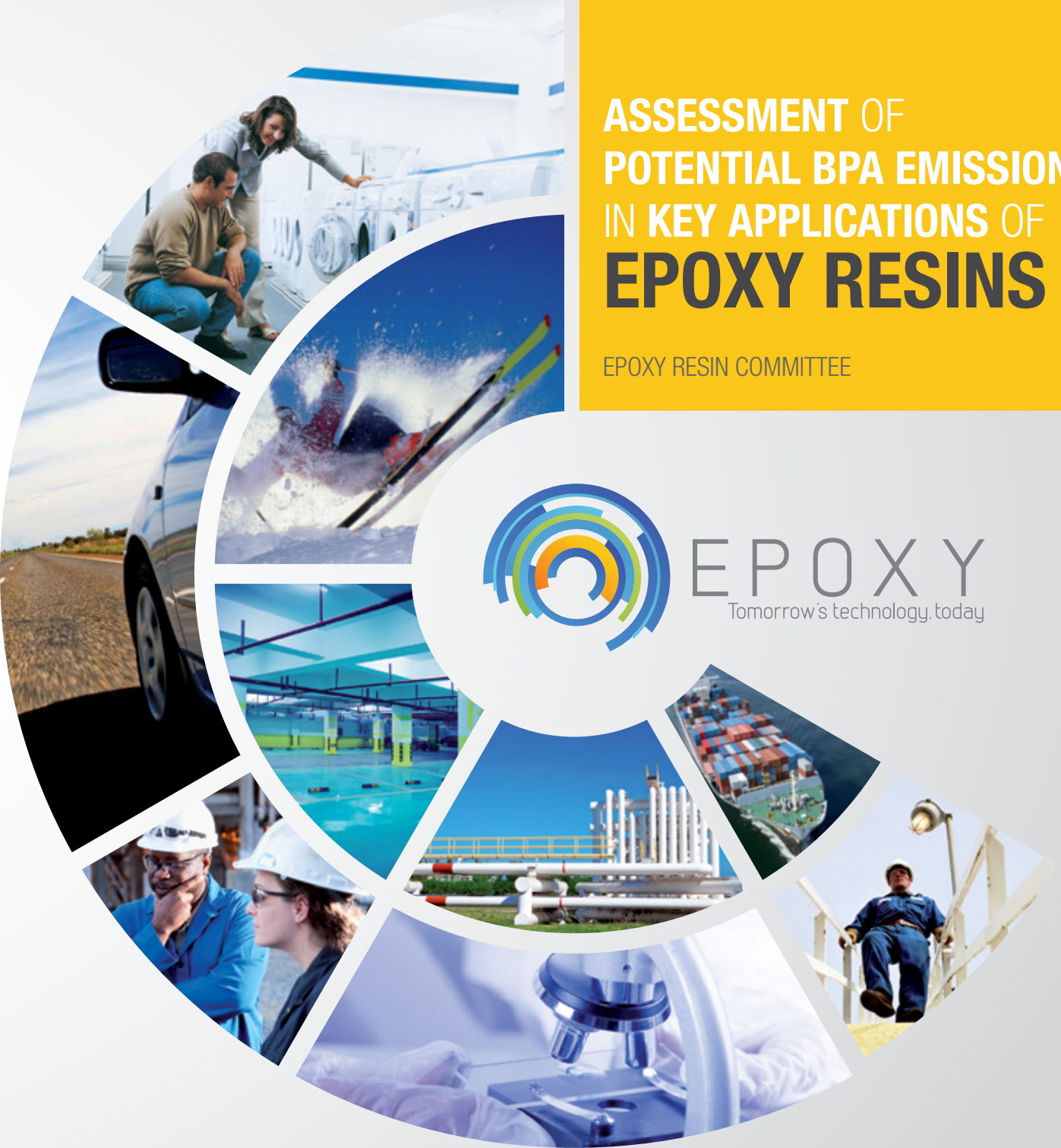
ASSESSMENT OF POTENTIAL BPA EMISSIONS IN KEY APPLICATIONS OF EPOXY RESINS

EPOXY RESIN COMMITTEE



EPOXY

Tomorrow's technology, today

ASSESSMENT OF POTENTIAL BPA EMISSIONS

Over the past decades, epoxy manufacturers have invested millions of Euros in order to ensure that the highest health, safety and environmental standards are maintained and, where possible, improved. Manufacturers work at every stage of the life-cycle of epoxy resins to combine greater safety with increased performance.

1 Epoxy Resin Manufacturing

The first step is the production of the epoxy resin itself. Depending on the application, it can be used either in solid form (e.g. in automotive coatings), liquid (e.g. in water pipes or flooring) or both (e.g. marine coatings or wind rotor blades). When used in both forms, the substance created by reacting BPA and ECH contains minimal residual traces of BPA.

Research has looked at potential environmental emissions from the 150,000 t of epoxy resins used every year in key application sectors in Europe. The maximum amount of BPA which may be released from the total is 573 kg. Calculations took into account the maximum release possible; hence the actual quantity is likely to be lower.

Part of the tonnage is likely to be degraded by microbes or UV rays although there are no available scientific studies specifying the fate of BPA entering the environment at this stage.

The study

In response to the regulatory and media scrutiny affecting Bisphenol A, the Epoxy Resin Committee has commissioned an independent research agency to perform a series of studies analysing their potential emissions during the life cycle of epoxy resins. The documents analysed epoxies in the most widely used applications and in the most probable sources of possible BPA losses: **water pipes, flooring, marine coatings, automotive, wind rotor blades**.

Results and more in depth information from the studies can be found on **www.epoxy-europe.eu.**

2 Applications Manufacturing

BPA losses during manufacturing of specific applications would depend on the process being used.

For example, scraps from liquid epoxy resin could be washed away and removed via waste water treatment. After being filtered by the factory's plants, as well as municipal wastewater, BPA would be absorbed by water bodies. There it would be subjected to further degradation by microbes or UV rays (similarly to what happens to BPA released during the manufacturing of the resin).

Other residues would be incinerated, and there would be nearly no release of BPA into the environment. It was not possible to develop reliable estimates during manufacturing of water pipes and wind rotor blades. With regard to other applications, it has been estimated that marine coating could release into the environment a maximum of 96 kg of BPA annually, automotive manufacturing a total of 105 kg, while flooring production could release up to 0.2 kg.

LIFE CYCLE STEPS OF EPOXY RESIN PRODUCTS

1. Manufacturing of liquid and semi-solid epoxy resin
2. Manufacturing of products using epoxy resins, e.g. wind blades
3. Service life of the epoxy resin products
4. End-of-life stage of the epoxy resin products, e.g. disposal ways

3 Service Life

Epoxy resins were developed to increase the performance of specific products. When properly installed and maintained, the risk of releasing BPA from epoxy resins into the environment is minimised.

Automotive coatings are the only application sector for which an estimation was possible: about 15 kg of BPA could be released annually by all cars registered in Europe via paint losses due to chipping or abrasion of the paint. For all other applications – especially water pipes – proper installation will minimise or neutralise environmental losses.

4 End-of-Life

The waste stage is the most difficult stage at which to determine the potential release of BPA due to a high number of uncertainties, thus the research does not present precise calculations of BPA losses. This is because waste practices differ significantly across EU countries. Recycling, landfilling and incineration quotas vary greatly between the EU28.

While some applications would be treated as construction and demolition waste (water pipes, flooring), others do not have well-established disposal measures (e.g. wind blades) or follow other specific regulations (cars). Ultimately, a certain percentage will end up in landfills (thus possibly subjected to UV or microbial degradation) or be thermally degraded.

Notably, large ships are dismantled outside of Europe, making it difficult to track what happens to epoxy resin coatings. Harmonised EU waste legislation would reduce potential releases into the environment.

CONSUMER SAFETY

Applications and objects using epoxies are safe and pose no risk to human health. The most recent scientific opinion by the European Food Safety Authority decreed that the use of Bisphenol A in current applications is safe.

The levels of BPA in products is in fact very low and well below the safety limit for all age groups. BPA-based products – including epoxy resins in all its current uses - are safe for consumers. Similar conclusions were drawn by American and Canadian authorities.

Any regulatory action substituting epoxies with substances whose effects on human health and the environment have been subject to less research than epoxies would be driven by reasons other than scientific research and would lower food and consumer safety.

How to handle epoxy resins

Epoxies are completely safe once they are processed and applied. While handling the unreacted material- whether in a factory or at home - epoxy resins need to be handled with the greatest care and following strict safety measures.

Protect your eyes: Avoid splashing or spilling the resin, inhaling fumes and using wrong tools. Always use protective goggles.

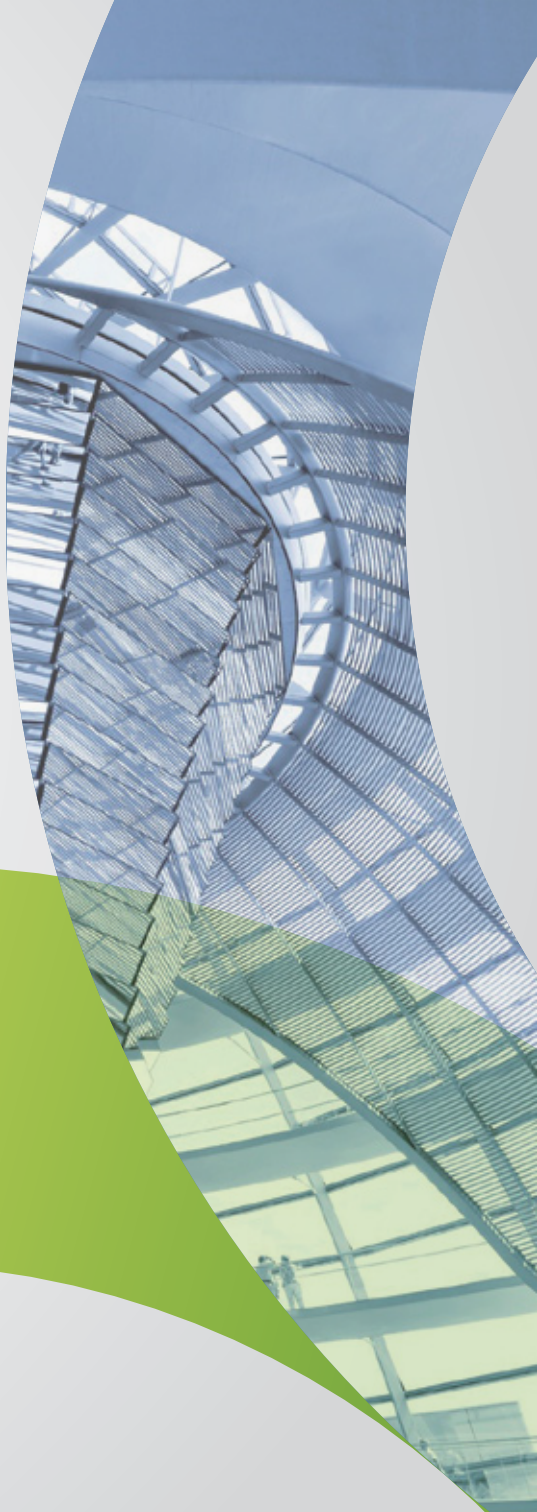
Cover your skin & wear gloves: Epoxies should never come into direct contact with human skin. The correct equipment should always be used, from ready-to-use combi-packages or large containers to protective lids and mixing stations.

Remain clean: Use tools that increase the distance between yourself and the material, such as pail carriers, scrapers or rollers with a splash protector.

Clean up properly: Clean handles and tools, store components in sealed containers and in a cool and dry place. Empty and dispose of single-use containers.

Safety instructions: Read the product information available in the material safety data sheet of each product, especially when dealing with pressurised equipment for epoxy resin injection.

More safety recommendations and explanations available on **www.epoxy-europe.eu**



EPOXY RESINS

Epoxy resins are a family of plastic materials used in coatings, adhesives, sealants and matrices for composite materials, such as in the reinforcement of carbon fibres.

The most common epoxy resins are produced by reacting Epichlorohydrin (ECH) with Bisphenol A (BPA). This reaction produces BADGE or DGEBA, which represents the smallest unit of a typical epoxy resin.

The properties of the cured epoxy resins are determined by a chemical process called curing or hardening. It involves mixing the resin with (poly)amines, aminoamides, phenolic compounds or other reactive chemicals. This curing process will determine many of the properties of epoxy resin such as its adhesion to other materials, durability, resistance and versatility.

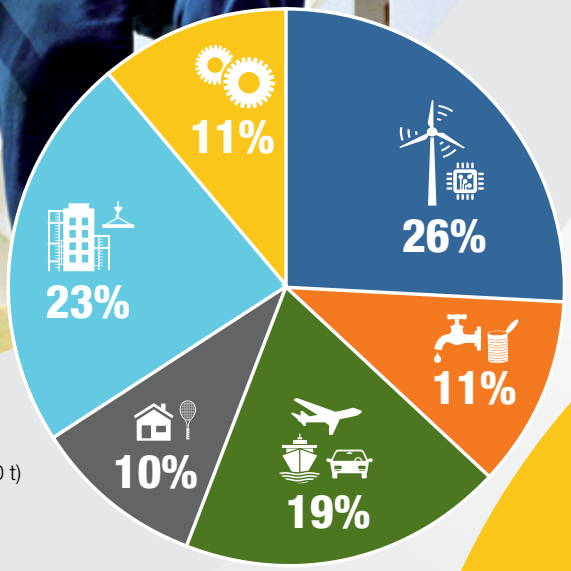
WHAT IS BPA?

BISPHENOL A IS AN ORGANIC CHEMICAL COMPOUND WHICH FUNCTIONS AS A MAIN BUILDING BLOCK FOR EPOXY RESINS. BADGE UNITS CONTAIN LESS THAN 10 PPM OF UNREACTED BPA, WHICH IS CHEMICALLY BOUND TO THE MATRIX OF THE EPOXY RESIN. THIS REPRESENTS A SMALL AND SAFE AMOUNT OF RESIDUAL BPA.

KEY APPLICATIONS

Mostly used for protection and functioning of reinforcement, epoxy resins are key to the function of electronic appliances, food packaging and many other everyday objects. Windmills generating green energy, the car that takes us home after work or easy-to-clean flooring in a public hospital are all made thanks to epoxy resins.

259.000 TONNES
PRODUCED EVERY YEAR IN EUROPE



- Energy - 26% (69.000 t)
- Food & Water - 11% (28.000 t)
- Transport - 19% (49.000 t)
- Home & Leisure - 10% (25.000 t)
- Construction - 23% (60.000 t)
- Other uses - 11% (28.000 t)

THE EPOXY RESIN COMMITTEE

The Epoxy Resin Commitee (ERC) is a non-profit industry group of major European epoxy resins producers organised under Plastics Europe, the Association of Plastics Manufacturers in Europe.

The ERC acts as a source of action and information on issues and initiatives related to health, safety and environmental topics, and provides analysis on other factors affecting the industry to develop positions and policies aimed at creating a constructive dialogue with all interested groups.

Ciech Sarzyna

DOW

EMS EMS-GRILTECH

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leuna harze

SPOLCHEMIE

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