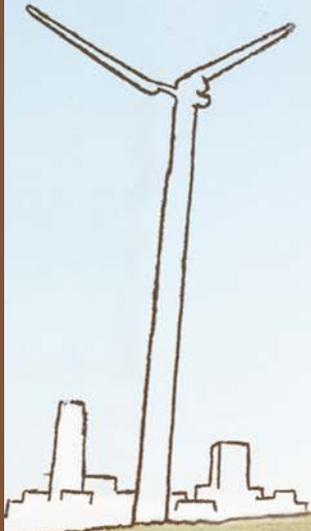


Factsheet

UP Resins

& you



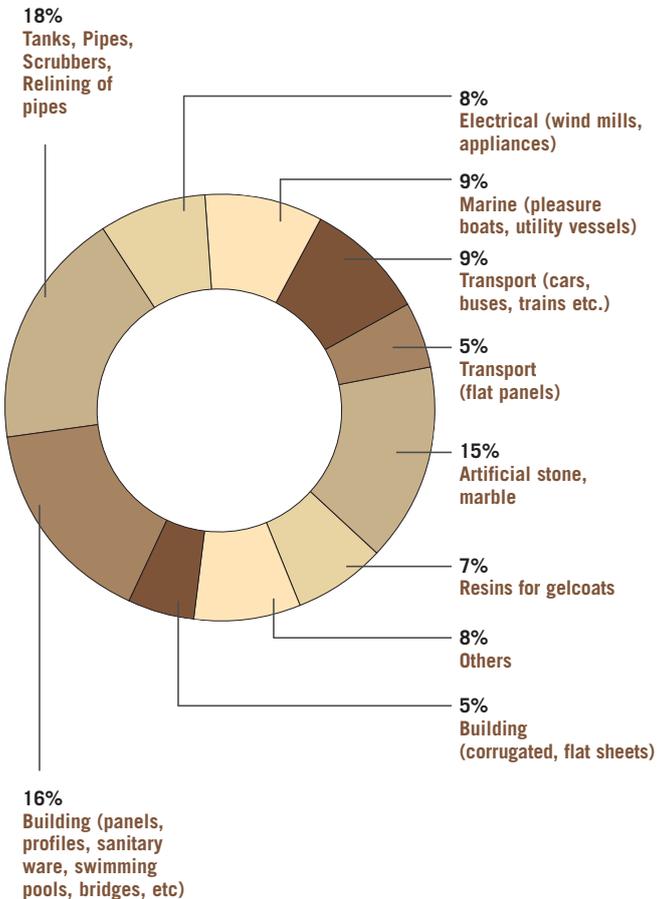
COMPOSITE MATERIALS – UP RESINS

What is a UP Resin?

Unsaturated Polyester Resins (UP Resins) are durable, resinous polymers dissolved in styrene. They are used in combination with fibrous materials, such as glass fibres or carbon fibres, to make reinforced composite products. The final composite product is formed when the resinous polymer reacts with styrene and then hardens.

These resins are used over a broad range of industries. They have transformed the boat-building industry, especially the leisure boat sector, by providing greater flexibility, superior performance and faster production speed. They have also been integral in enabling innovation in many sectors such as construction and transport.

Market Segmentation



Why make a composite material?

UP Resin-based composite materials offer unique characteristics of strength, high performance, versatile design properties and durability that keep maintenance costs low.

For example composites made from UP Resins and glass fibres have the following characteristics:

- Light weight
- High strength-to-weight ratio (kilo-for-kilo composites can be stronger than steel)
- Rigid
- Resistant to chemicals
- Good electrical insulating properties
- Temperature resistance (retain dimensional stability across a wide range of temperatures)

Why is the UP Resins market important in Europe?

The UP Resins market in the European Union includes approximately 8,000 companies. That is approximately 100,000 direct employees and an added value of €60 billion that is expected to grow to €85 billion by 2020¹. The UP Resins sector makes an irreplaceable contribution to a number of sectors.



STYRENE

What is Styrene?

Styrene is found naturally in fruits, vegetables and nuts at very low levels and is produced synthetically from petroleum and natural gas by-products for use by industry.

Manufactured styrene is a liquid, used to make resins, composite materials and plastic products. It's used in a great variety of products from food containers and packaging materials to cars, boats, and computers.

Why is Styrene important?

5% of the styrene used in Europe supports a €60 billion market that is expected to grow to €85 billion by 2020.

Styrene, through its vital role in composite products, contributes to the broader EU goals of energy security, emissions reductions and encouraging entrepreneurship.

It is used to turn wind into electricity, clean emissions in coal plants, and improve fuel efficiency in cars, trucks, boats and trains. Its application can be found in a diverse range of industries from the food industry to the armoury industry.

What is Styrene used for?

Although only 5% of the total styrene use by volume, styrene is an essential component of UP Resins used to make composite products.

Everyday uses of styrene-based materials include food packaging, building insulation, cushioning foams, luggage, and electrical goods such as televisions and videos.

Use of Styrene	Vol (%)
Polystyrene	50%
Expanded polystyrene	19%
Styrene Copolymers (ABS, SAN, etc)	11%
Styrene butadiene rubber	5%
Styrene butadiene lactice	5%
Unsaturated polyester (UP) resins	5%

Styrene is safe for the environment and consumers

The EU risk assessment of styrene found that it is safe for the environment, is safe for humans exposed via the environment, is safe in consumer goods such as building materials, carpets, food packaging and chewing gum and is safe for consumers through combined exposure of the environment and consumer products.

The risk assessment suggested measures to limit risks for workers in the Glass Reinforced Plastics manufacture and the production of UP Resins.



5% of the Styrene used in Europe supports a €60 billion market

The UP Resins market in the EU includes approximately 8,000 companies

The UP Resins industry daily demonstrates that workers can safely work with styrene using recommended protective equipment and by limiting possible exposure to emissions



GLOSSARY

Styrene

It is a basic building block for the manufacture of a broad range of materials used in thousands of products throughout the world.

UP Resins

Unsaturated polyester resins are polymeric substances dissolved in styrene that form durable solid products after processing and hardening.

Composite Material

Strong lightweight material produced by combining unsaturated polyester resins with reinforcing fibres or fillers. Within the composite matrix it is still possible to tell the different materials apart. They do not tend to blend or dissolve into each other.

Enabling Environment Protection

Composite materials made with styrene-based UP Resins are used to make the blades of wind turbines which harness renewable energy to produce electricity without damaging the planet. Other examples of environmental protection enabled by these materials include fibre glass tanks used to store petroleum fuels underground and scrubbers used to reduce emissions from coal-burning power plants.

Energy Efficiency

Composite materials made with styrene-based UP resins enable lighter, more versatile bodywork for cars, boats, buses, trucks and trains significantly increasing their energy efficiency.

Encouraging Entrepreneurship

The UP Resins sector includes approximately 8,000 companies in Europe of which most are SMEs and bring a combined direct added value of approximately €60 billion to the EU's economy. As this industry is highly integrated with other industries, its indirect input into Europe's economy is exponentially greater. Currently, the industry employs approximately 100,000 Europeans.



UP RESINS INDUSTRY PROMOTES BEST PRACTICES

We care about worker safety

As an industry, we have made considerable investments in carrying out studies to understand the possible risks that our workers may face. On the bases of these studies² we have developed handling guides and fact sheets on all aspects of UP Resins and Styrene. Additionally we continue to invest in low emission applications including where possible closed mould systems, low styrene emission resins and low styrene content resins.

What is the risk?

The UP Resins industry daily demonstrates that workers can safely work with styrene using recommended protective equipment and by limiting possible exposure to emissions. Styrene is flammable and toxic. If handled incorrectly, styrene vapours can irritate the skin, eyes and respiratory system. For this reason, manufacturers are very careful to minimise exposure to vapours in the work place.

Long-term studies covering 55,000 workers in the EU and USA over a 45-year period show no significant health risk through using Styrene.

How we keep workers safe

The main risk of occupational exposure is seen when using open mould techniques. As a result the industry has put great effort into lowering exposure to styrene. Workers are provided with protective equipment and workplace safety guidelines.

In 2008, the industry conducted a pilot study in a number of countries to validate a system that would enable the better qualification of exposure levels³. As an industry we are fully committed to reducing possible risks to our workers alongside regulators.

Other activities include:

- the development of **low styrene emission (LSE) resins**;
- the development of **low styrene content (LSC) resins**;
- the **improvement of spray equipment**;
- the promotion of **closed mould techniques**, and;
- the production of a series of **guidelines** that cover issues such as handling, monitoring exposure and workplace ventilation.

¹ "The value for composites industry was estimated in 2008 at €63 bil. for a volume of 8.2 million tons" - JEC Magazine, March-April 2009

² The European Composites Recycling Services Company (ECRC) was set up by several Composites Industry stakeholders with the intent to develop outlets and opportunities for reusing composite waste materials.

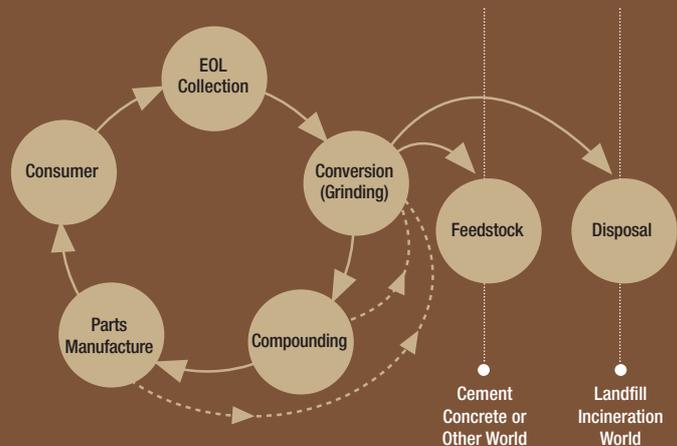
³ "Trends in Occupational Exposure to Styrene in the European Glass Fibre-Reinforced Plastics Industry" - J. G. M. Van Rooij, A. Kasper, G. Triebigo, P. Werner, F. J. Jongeneelen and H. Kromhout

Occupational exposure

Occupational exposure levels for styrene are currently set at the national level and therefore differ across the EU. Threshold Limit Values set over an 8-hour average range from 10 ppm in Sweden for new or modified facilities to 100 ppm in the UK.

A harmonised European OEL of 20 ppm reflecting the current technical possibilities of open mould processing, which is around 50% of the total market, would create a level playing field and simplify the ability of the industry to ensure compliance.

Life-cycle & Sustainability



The European Composites Recycling Services Company (ECRC) was set up by several Composites Industry stakeholders with the intent to develop outlets and opportunities for reusing composite waste materials.

Working since 2003, ECRC has successfully set up a recycling route for using waste in cement manufacturing, and has demonstrated its reuse in sheet moulding compounds and bulk moulding compounds. Additional outlets in thermoplastic compounds, concrete reinforcement and others are under active development.

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● Provides high strength, light weight materials for industrial manufacturing

● Worldwide over 300 bridges incorporate composite materials

● Improves boat-building by allowing greater design freedom

● Allows for high performance and versatile design of trains

