

Glass fibre reinforced thermosets: recyclable and compliant with the EU legislation

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The European Plastics Converters (EuPC), the European Composites Industry Association (EuCIA) and the European Composite Recycling Service Company (ECRC) welcome the End-of-Life of Vehicles Directive (2000/53/EC) and the Waste Framework Directive (2008/98/EC): **glass fibre reinforced thermosets are both material and energy recyclable through the cement kiln route and compliant with the EU legislation.**

Glass fibre reinforced thermosets

The high range of major industrial sectors such as automotive & transport, building and construction, electrics & electronics, sport & leisure, wind energy and energy conservation are demanding various materials during the manufacturing process. The material choice is dependent on several factors such as material properties, price, and availability and lower environmental impact. The use of composites material solutions increased significantly during the last years, because of optimal combinations between mechanical strength, design flexibility, reduced weight and costs attached.

Composites are composed of a fibrous material and a resinous matrix. In many applications glass fibre is used as reinforcement material. The resinous matrix is frequently a thermosetting polymer, such as unsaturated polyester resins or epoxy resins. Inorganic fillers, such as calcium carbonate, can be used to adapt material properties and in some cases to reduce the cost price.

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The recycling of glass fibre reinforced thermosets parts has been studied extensively for many years. Fundamentally, three recycling technologies have been researched and yield potential waste management solutions:

- **Material recycling:** Which involves grinding of glass fibre reinforced thermoset parts to a recycle that can be used as a new raw material with reinforcing properties in composite parts and in other products that need reinforcement. It can also be used as filler.
- **Chemical recycling:** Chemically dissolve the polyester and re-use it in new polyester. Fibers can be used for reinforcing purposes.
- **Co-processing:** The use of waste materials in the Cement Industry, as a substitute for fossil fuels and natural resources. Co-processing is both material and energy recycling.

The cement kiln route – best option for glass fibre reinforced thermosets recycling

In the publication "*Sustainable Cement Production – Co-processing of alternative fuels and raw materials in the European cement industry*"(2009), released by the European Cement Association (CEMBUREAU) it is noted the following:

"Cement is an essential product, providing society with what it needs in terms of safe, comfortable housing and reliable modern infrastructure. Co-processing in the cement industry is the optimum way of recovering energy and material from waste. It offers a safe and sound solution for society, the environment and the cement industry, by substituting non renewable resources with societal waste under strictly controlled conditions. The co-processing of alternative fuels provides a solution in terms of reducing fossil fuel dependency as well as a contribution towards the lowering of emissions. The use of alternative raw materials also has numerous benefits, including a reduced need for quarrying and an improved environmental footprint of such activities. Substitution of clinker in cement is an example of the positive contribution of the European cement industry to resource management. The use of alternative materials in the cement industry lowers global CO2 emissions and does not have a negative impact on production process emissions, nor on the environmental and technical quality of the final product. Furthermore, co-processing in the cement industry is carried out in a safe and sound manner, thus not affecting the health & safety of its workers or neighbourhood."

The Composites Industry supported and founded several projects which showed that glass fibre reinforced thermosets **parts are recyclable and can successfully be fed into a cement kiln as a substitute for other raw materials and for primary fuel**. With the developed cement kiln route, the waste parts are co-processed into valuable new material finding its way in the final cement. The cement kiln route is a recycling process compliant with the recycling definition in the Waste Framework Directive (Art.3 (17)).

“Recycling means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations”.

When recycling glass fibre reinforced thermosets through the cement kiln route, most of the material (approx. 2/3rd) is transferred into material for cement production. A small part of the waste, the organic part (approx. 1/3rd) generates energy. This process translates as **energy recovery** according to the recycling definition.

The cement kiln route is not used to generate energy from burning glass fibre reinforced thermosets waste. When feeding composite waste in a cement kiln, the main part of the material is turned into cement or a useful part of the cement composition. This process translates as **reprocessing into materials or substances whether for the original or for other purposes** in the recycling definition. And it is also compliant with Article 3 (15).

“Recovery means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.”

Following the outcomes of the recycling technologies developed so far, the European composites industry considers the cement kiln route to be the most sustainable solution for waste management of glass fibre reinforced thermoset parts.

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