Environmental benefits of Fibre Reinforced Plastics (FRP)

Environmental benefits of weight reduction

Products made from composite FRP materials offer significant environmental benefits because of their characteristically low weight, good mechanical properties and excellent resistance to corrosion. For example, composites used in cars can substantially reduce overall weight – by as much as 40% compared to steel. Over the lifetime of the car, this means many thousands of litres of fuel saved and consequent reductions in harmful exhaust emissions. Many automotive manufacturers therefore use composite body parts – not just in lower series vehicles such as MPVs (minivans), estate cars and sports / utility vehicles (4x4s) - but also in higher series models.

Life Cycle Analysis comparison puts FRP above steel and aluminium

In 2003, the European Alliance for SMC together with BASF undertook a comprehensive eco-efficiency analysis on a composite part (a boot lid for Mercedes), versus the equivalent part in steel and aluminium. The study considered the entire 'ecological fingerprint' from manufacture of the raw material to recycling of the finished part. Economy and ecology were ranked as equally important in this sustainability study. The composite part came out as most favourable overall.

A Mercedes boot lid was used as a reference part in an extensive Life Cycle Analysis study.

The Renault Espace is a vehicle that has made extensive use of FRP composite body parts throughout its long history.

Truck producers harness FRP benefits

Commercial vehicle producers were the first group in the automotive sector to fully exploit the benefits of FRP as a structural material for building truck cabs and air deflectors. Every kilogram saved in the weight of a cab means a kilogram increase in payload carrying capacity.

Greener engines thanks to composites

When it comes to under the bonnet applications, FRP composites are also an environmentally attractive alternative to metals. For engine oil sumps and valve covers, for example, FRP fulfils all the mechanical strength requirements (e.g. a sump must be able to support the weight of the engine), but also delivers added-value environmental benefits. These include a reduction in noise and harshness levels and improved engine efficiency, since the engine warms up faster and reaches operational efficiency sooner. The result is less fuel wasted during cold starting and also during operation, due to the lower weight of the engine.

Many engine manufacturers use SMC (sheet moulding compound) for oil sumps and valve covers. The SMC components have a similar coefficient of expansion to metals, so a gas-tight seal is ensured at the interface with other mechanical parts.

(continued)

Alternative energy

Wind farms are becoming a prominent feature on land and off-shore throughout the world. Windmills the size of those that we see today with blades of around 60 metres would have been almost impossible to build without FRP. Steel blades of this size would be so heavy they would require hurricane force winds to move them.

Helping to conserve tropical hardwoods with FRP

FRP doors are becoming increasingly popular for new buildings and home renovations. They faithfully reproduce the look and solid feel of tropical hardwoods, such as mahogany, without the need for a single ancient tree to be felled. FRP doors also bring added security as they are extremely strong and resistant to break-in. Composite doors are also highly durable, they will not rot, warp or splinter - and, what's more, they never need painting.

Is FRP an environmentally sustainable solution?

The environmental benefits of FRP composite, in its many applications, is proven. However questions are often asked about the material itself and the environmental impact of manufacturing and working with the constituent materials.

Issues that affect the industry include; health & safety; the emission of volatile organic compounds (VOCs); energy consumption & toxicity from the manufacturing process; and the recycling of production waste and end-of-life parts. Compliance with strict environmental legislation and codes of practice, combined with the adoption of alternative materials and technologies (such as closed mould processes, natural fibres and low-styrene resins) have largely addressed these environmental issues.

As far as recycling is concerned, The European Composite Recycling Services Company (ECRC), a European-wide consortium, is actively developing composites recycling initiatives and solutions that meet European Union directives. Solutions include energy recovery through incineration, and recycling end-of-life composite parts via collection, shredding and milling down into fractions. The resulting 'recyclate' can be reused as a filler in new FRP formulations and has other industrial uses, as does the 'grate ash' residue from incineration.

Recycling FRP waste

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