

Recycling could cut carbon fibre cost by 50%

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Carbon fibre remains one of the most effective lightweighting solutions, and an effective recycling system could bring down the price. By Xavier Boucherat

Carbon fibre reinforced plastic (CFRP) remains the preserve of the premium vehicle maker. The raw cost of the material, coupled with the processing and manufacturing difficulties for OEMs that want to switch, makes it too expensive for effective use in serial production. OEMs and suppliers are looking at ways to bring down the cost – how effective would a recycling solution prove?

ELG Carbon Fibre has high hopes. The company, which specialises in carbon fibre recycling, is working with a number of OEMs on projects ranging from the development of end-of-use recycling for carbon fibre components and structures, to the demonstration of the economic and technical performance of recycled carbon fibre materials in lightweight vehicle applications.

Speaking to Automotive World, Managing Director Frazer Barnes says the company estimates current carbon fibre projects underway in the automotive industry today are costing manufacturers anywhere between €70/kg to €100/kg (US\$34/lb to US\$49/lb). The move towards higher volumes can bring this down to between €40/kg and €50/kg, but Barnes thinks there's potential with recycled carbon fibre to bring it even lower, to between €20/kg and €25/kg.

“Bringing down the cost is really our tagline,” he says. “If we can bring it down by 35% to 50%, what we’ll be offering is a cost-effective lightweighting solution.” The strongest carbon fibres can be up to five times stronger than steel. Potential applications, says Barnes, include closures such as hoods, tailgates and spare wheel wells. The ultimate goal remains body-in-white structural applications.

Easier said than done

But the challenges are ongoing. To date, says Barnes, none of the company's projects have reached maturity. “The main challenges are the availability of product forms for high-volume manufacturing and the lack of availability of design and manufacturing data.” These are issues that ELG's research, often done in conjunction with OEMs and Tier 1s, is currently addressing.

As with all new ideas, one of the challenges ahead for ELG will be creating recognition within the industry. Engineers are relatively familiar with carbon fibre in its virgin form, says Barnes, but use of a recycled product will require further industry education. Demonstration projects

are key in this regard. “We’re now working with certain OEMs, looking at applications, designing parts to meet those applications and building the experience we’ll need,” says Barnes.

The process is sophisticated. The material is first heated to remove resins and polymer fibres. Oxygen is then introduced to remove the char left on the fibres, leaving a clean fibre. “The challenges come before and after this process,” explains Barnes. “Firstly, classification and preparation of feedstock materials is vital to be able to ensure consistent quality in the finished product, but because of the nature of the materials, ELG had to develop its own test methods as industry standards don’t exist. Then, after the reclaiming process, the challenge is to convert the carbon fibres, which have a very different physical form compared to virgin fibres, into products that can be reused in existing manufacturing processes. This has proven complicated, as the equipment to make these product forms is not available off-the-shelf, and has to be specially developed.”

Waste not, want not

Barnes remains optimistic, however, and says the potential is there for whoever can exploit it. 30% of the carbon fibre manufactured worldwide each year becomes waste, which equates to around 18,000 tonnes annually. “The carbon fibre industry has moved away from being a niche industry only producing 100 tonnes a year,” says Barnes. “The waste issue has got to be solved. Returning the material to the market provides the possibility of a stable, long-term source of supply.”

OEMs are taking the idea seriously. In February 2016 Toyota Tsuho, a member of the Toyota Group, announced it would launch a joint initiative with chemicals group Toray to develop carbon fibre recycling capabilities. A new method will considerably lower the energy needed in the carbon fibre recycling process, specifically the thermal decomposition process which typically consumes the most energy. A pilot plant will be built at the Handa facility in Aichi, Japan.

“The carbon fibre industry has already seen one revolution,” Barnes concludes, “which was the widespread adoption of carbon fibre composites for the major structures of the Boeing 787 and Airbus A350XWB. This transformed the size of the industry. Now we’re waiting for the second revolution – the wide-scale use of carbon fibre in automotive applications. What is exciting is that recycled carbon fibre may be the key that makes this achievable.”