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How can I register to this event? I see a major setback to the composite engineers around the world from this webinar

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1st December 2017, Coseley

Interview with Marco Gehr, Chief Operations Officer, ELG Carbon Fibre

* comment

ELG Carbon Fibre, a leading supplier of carbon fibre products, participated in the Go Carbon Fibre conference, which took place in Munich, in October, discussing the future of carbon fibre recycling.

The company operates a large carbon fibre recovery plant in Coseley, West Midlands, in the UK. Whilst it continues to optimise the patented carbon fibre reclaiming process, the primary focus of the company is to develop and industrialise the conversion technologies to manufacture recycled carbon fibre products that can be reintroduced to the composites and compounding industries.

Inside Composites: ELG has been recycling carbon fibre now since 2011. In your presentation at the recent Go Carbon Fibre conference in Munich, you observed that carbon fibre recycling is an industry whose time has come. Why now?

Marco Gehr: One major reason is that the transportation sector is looking to adopt carbon fibre composites to a significant extent, and the very positive benefits that recycled products can contribute. If you look at the life-cycle trade-offs that are involved in making the switch from metals to new carbon composites in the first place, the savings are all late in the use phase, with a significantly negative impact both in the production of carbon fibre and at end of life, assuming the composites are not recycled.



In the aerospace industry, a break-even point can be realised after 70,000 km due to the significant weight reduction carbon composites bring compared to aluminium. In automotive, however, the break-even point from making a switch from steel to composites based on virgin carbon fibre can vary between 132,000-180,000 km depending on the vehicle and part involved.

Recycled carbon fibre enables you to already be competitive to traditional materials early in the use phase, since you are not carrying over a negative burden from the production phase.



IC: So the automotive industry needs cheaper carbon fibre?

MG: Yes, and materials suitable for high volume production. Furthermore a stable supply chain for such products is very important. This is what ELG can deliver as we reclaim fibres from various waste streams – dry, prepreg, laminate – based on long-term agreements. In comparison to other companies that are competing for dry fibre waste with limited availability, we can provide supply chain security for cost effective carbon fibre products suitable for use in the compounding and composites industries.

IC: What benefits are achieved?

MG: The majority of energy consumption in the life cycle of virgin carbon fibre occurs in the production phase and recycling requires only a tenth of this energy, so there are immediate LCA benefits. There is similar weight saving potential but significantly lower material cost – typically up to a 40% saving. The cost of virgin carbon fibre can vary significantly, from \$13 per kg for large tow up to \$50 kg for small tow.

Various studies have shown that \$5 or less per extra kilogram of weight reduced is when products become attractive to the automotive industry, so that's what we're aiming for.

The properties of the fibres are similar to those of virgin carbon fibre, with maximum 10% reduction in tensile strength and unchanged tensile modulus.

In addition, they can make a solid contribution to reducing the waste-to-landfill footprint of the composites industry.



IC: How much waste is generated by the carbon fibre composites industry?

MG: There is currently around 24,000 tons generated annually from manufacturing waste, much of this coming from long term programmes using high quality fibres.

Large volumes are still being consigned to landfill or incineration, and the priority of the composites industry is to deal with these waste streams. We estimate that less than 10% of manufacturing waste is currently recycled.

There are stable sources of raw material from existing manufacturing programmes and availability will grow as the carbon fibre industry expands and existing products reach end-of-life.

IC: What are the keys to successful adoption and what stage are you currently at?

MG: It's on the applications side that things are behind. During 2016, we began manufacturing a range of nonwoven mats on a new production line at our HQ in the UK's West Midlands which is specifically designed to process recycled carbon fibres. The mats are available in widths up to 2.7 metres at fibre areal weights from 100gsm to 500gsm. The new machine can produce a variety of nonwoven materials including 100% recycled carbon fibre mats and thermoplastic blends such as carbon fibre mixed with PP, PA, PPS fibres.

However, the availability of design data remains one of the main barriers to the consideration of these materials.



IC: What are you doing to address this?

MG: Data generation is currently the main focus of our activities and making it available in software tools for material selection processes, in order to foster successful and accelerated adoption of these new products

We have numerous in-house and external testing programmes underway, including validating the short term properties under static and dynamic loading and the long term effects of fatigue and environmental exposure.

We now have various case studies which demonstrate the commercial viability of cost-effective lightweighting with recycled carbon fibre materials.

We have also expanded our technical services department which now consists of some very experienced composite, textiles and chemical engineers, who assist customers with the use of our products.

IC: Can you provide an example of one of these test cases?

MG: We've developed, for example, a seat frame for a battery electric vehicle to replace a seat that weighs 9kg, consists of 34 parts and costs €42. Our seat design was based on a Carbisio 60% PA6 SM45D thermoplastic mat and is a one piece structure made by compression moulding. It reduces the weight of the frame to 2.5kg. At a cost of €63, the cost per kg of weight saving is €3.10, so it comes in well below the acceptable figure of €5 per kg. We have a number of similar case studies for other components.



IC: And you now have a Body in White application on Gordon Murray's TVR Sports car.

MG: Yes, Murray's iStream consists of carbon fibre panels bonded to a tubular steel frame to considerably reduce the weight. The panels are made using liquid injection and compression moulding processes in cycle times of 100 seconds per part. Each vehicle contains over 30kg of recycled carbon fibre nonwovens and the cost per part is just 10% of the initial concept proposed, which was based on virgin carbon fibre.

IC: What would you like to say in summary?

MG: Carbon fibre recycling has now been established by ELG at an industrial scale and recycled carbon fibre products suitable for use in high volume, low cost manufacturing processes have been developed.

We are working on the design data and case studies to confirm the technical and commercial viability of these products and anticipate an increasing number of commercial applications in the near future.

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