



Carbon composites continue to find new markets

FEATURE

Mark Holmes

Carbon fiber manufacturers are adding production capacity to meet an increasing number of high performance applications. Reinforced plastics reports on activities at some leading producers.

Market forecasts for composites continue to predict significant potential for carbon material. The most recent study from Carbon Composites e.V. – *The Global CFRP Market 2016* – assumes a growth rate of 11–12% in coming years across all industries. Leading carbon fiber manufacturers are finding different ways to develop their businesses and expand the role of carbon fiber composites in an increasing number of applications.

The approach of SGL Group is to bundle its fiber and materials operations and offer customers a one-stop shop, as well as supporting them to develop new material solutions based on automated production processes. ‘We believe that carbon fiber reinforced plastics—and composite materials in general – will not replace aluminum and steel, but will find their place as part of the material mix of the future,’ says Andreas Wüllner, Head of Business Unit Composites – Fibers & Materials at SGL Group. ‘In particular, they will be used where the advantages of the material have the biggest impact and where, at the same time, integration into existing production processes is as easy as possible. In this way, composites will become increasingly established materials in many industries. However, new developments do not happen overnight. In the automotive sector the innovative use of carbon fiber reinforced plastics, for example in the BMW 7 series, have been developed over a certain period of time and are showing the way forward. The right material as well as a suitable component concept are crucial factors for success. Therefore, it is of particular importance that the material specialist and the customer work together very closely during the planning and realization of projects.’

In order to meet these objectives, SGL Group has established a Lightweight and Application Center at its Meitingen site, near Augsburg in Germany. The center promotes the development of processes and products, as well as producing prototypes and small series components. In addition, in February this year SGL Group combined its activities in the field of fibers and materials for lightweight applications. The composites business of SGL Group and the activities of SGL Automotive Carbon Fibers – the joint venture between SGL Group and BMW Group – have been brought together in a single business unit, known as Composites – Fibers and Materials (CFM) headed by Andreas Wüllner.

‘By bundling our activities in the CFM business unit, we offer our services as a one-stop shop,’ explains Andreas Wüllner. ‘Since the beginning of 2016, single points of contact are available to our customers in the automotive, aerospace, wind energy, and acrylic

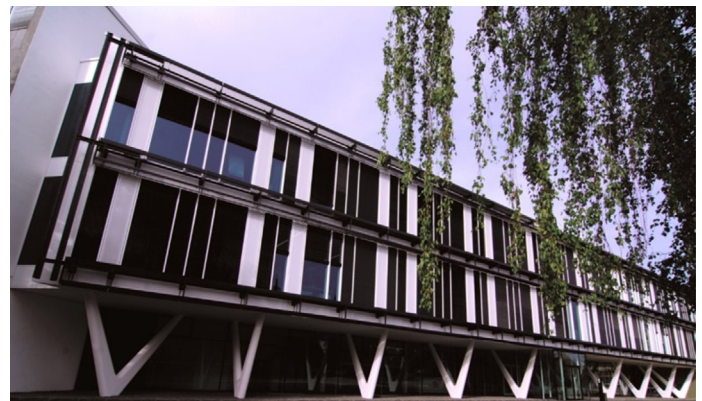


FIGURE 1

The headquarters of SGL Group's CFM operation in Meitingen, Germany.

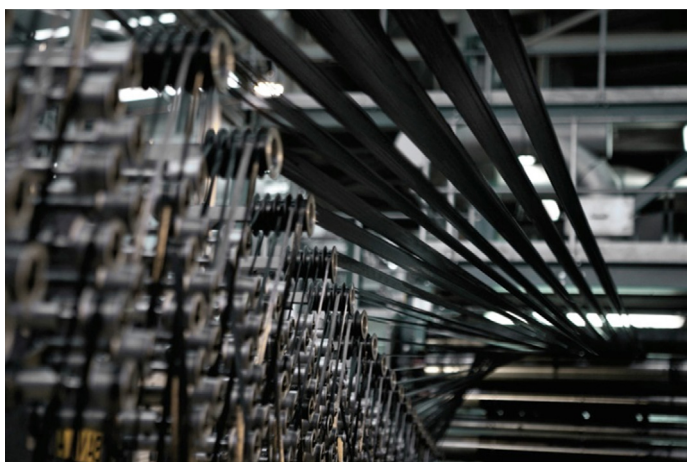
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**FIGURE 2**

Carbon core body of the new BMW 7 series.
Source: BMW Group.

fibers segments. Other industry areas are being handled worldwide by regional sales teams. The business unit will additionally support its customers through the new Lightweight and Applications Center (LAC) to enable them to optimize the use of fibers and materials for composites. For example, the LAC will facilitate the development of processes, products, prototypes, as well as small-lot production. In addition, SGL Group will now offer the material that SGL ACF once produced in Moses Lake exclusively for BMW to customers in other industries too. Building on the experience gained in using heavy-tow fibers for the automotive sector, we will also leverage its expertise in other industrial sectors, such as the aerospace industry.'

New material hybrids employing the 'Carbon Core' elements used for the body structure of the new BMW 7 series is one way in which SGL Group believes that carbon fiber can help expand the use of composites. In this serial application, carbon fiber-based braids are used in combination with aluminum in the roof frames of the new model series. The braids are produced by SGL Group in a fully automated process and then supplied directly to the BMW Group as preforms for component manufacture.

**FIGURE 3**

Carbonized PAN (carbon) fiber being collected on spools at SGL Group.

One of the major challenges at present for the composites industry, according to Andreas Wüllner, is the need to manufacture composite materials in an automated manner and integrate them into existing production methods. 'Processes with a focus on large scale production will prevail in manufacturing,' he adds. 'Materials from SGL Group are already found in all common serial applications of composite components. Efficiency gains are to be achieved by shorter cycle times and optimized use of materials. A key to reduce costs lies in the coordination of the ideal component concept with the optimum material set-up, and the processing technology of the composite material.'

SGL Group has also developed smart material hybrid concepts that highlight specific new possibilities for the combined use of different materials in automotive engineering of the future. These include pre-impregnated fiber bundles – SIGRAPREG® TowPregs based on 50k continuous carbon fiber tow. These are claimed to be particularly suitable for automated production processes because of their width stability and good winding behavior. For example, they can be combined with new rapid-curing prepreg resins, such as the 'snap cure' E420 epoxy resin system recently developed by SGL Group. The E420 material tool box offers the advantages of rapid curing times (less than 3 min at 150°C) and good storage stability (four weeks at room temperature). The pre-impregnated semi-finished products also have optimized tack for automated processing. The high glass transition temperature of 140–150°C enables the component to be demolded at high temperatures.

According to the company, various materials in the tool box can be flexibly combined and processed, so offering maximum design freedom to users. At the same time, they reduce the complexity involved in the qualification and production of components. This is because they are based on the same resin system, enabling a high degree of standardization to be achieved and ensuring good compatibility between different semi-finished products. With materials from the tool box, SGL Group says that users only have to go through the costly and time-consuming qualification process for the matrix system once (for example, adhesive compatibility and EDC suitability), but then have a diverse range of semi-finished products at their disposal. New lightweight design concepts exploiting the particular advantages of individual semi-finished

**FIGURE 4**

Carbon fiber in production.
Source: SGL Group.

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