Carbon fibre composites are well established in limited-edition cars. The development of materials and processes to enable their use in high volume vehicles is the challenge. In this article we review some of the developments announced in 2012.

According to the Frost & Sullivan report Supply Chain Analysis of the Automotive Carbon Fibre Composites Market (www.reinforcedplastics.com/view/26941/study-forecasts-impressive-growth-for-carbon-composites-in-automotive-market), the automotive carbon fibre composites market is likely to grow to US$95.5 million by 2017 at a compound annual growth rate (CAGR) of 30.6%. The market saw revenues of $14.7 million in 2010.

The report states that fuel efficiency and low carbon emission regulations are playing a major role in raising demand for light-weight automotive composite components to replace metal parts. Carbon composites are also being widely adopted in alternative vehicles such as electric/hybrid and fuel cell vehicles (www.reinforcedplastics.com/view/8044/electric-cars-need-lightweight-composites).

However, Frost & Sullivan notes that barriers to growth include the high cost of carbon fibre and existing production techniques that result in higher manufacturing cycle times (and low-volume production), and concerns over providing a waste disposal/recycling system for carbon composite parts. There is also a lack of general engineering experience among OEMs that are reluctant to move away from the metal-based assembly lines, which they have already heavily invested in, it says.

10 automotive composite developments in 2012

2012 saw numerous developments and collaborations in the automotive composites sector. Here are 10 key ones (listed in chronological order).

1. In March, carbon fibre producer Zoltek and Magna Exteriors and Interiors, a
Ford has developed a carbon fibre bonnet for the Ford Focus. It says production time for an individual carbon composite bonnet is fast enough to be employed on a production line. (Picture © Ford Motor Company.)

Ford has developed a carbon fibre bonnet for the Ford Focus. It says production time for an individual carbon composite in 2013 (the BMW i3 and i8). As part of the collaboration, Boeing and BMW will also share information on carbon fibre manufacturing process simulations and manufacturing automation.

1. In April, Ford and Dow Automotive Systems announced a strategic alliance to co-operate on the development, production and commercialisation of thermoplastic composite materials suitable for high-volume vehicle production (www.reinforcedplastics.com/view/29011/basf-and-tencate-team-up-on-automotive-thermoplastic-composites). TenCate is one of the founding partners of the newly-established European Thermoplastic Automotive Composites consortium (eTAC), which aims to promote the use of thermoplastic composites in the automotive sector. (The other partners are Dutch Thermoplastic Components (DTC), Kok & Van Engelen, NLR (National Aerospace Laboratory of the Netherlands), and VARIO)


3. TenCate Advanced Composites announced a strategic alliance to cooperate on the development, production and commercialisation of thermoplastic composite materials suitable for high-volume vehicle production (www.reinforcedplastics.com/view/29011/basf-and-tencate-team-up-on-automotive-thermoplastic-composites). TenCate is one of the founding partners of the newly-established European Thermoplastic Automotive Composites consortium (eTAC), which aims to promote the use of thermoplastic composites in the automotive sector. (The other partners are Dutch Thermoplastic Components (DTC), Kok & Van Engelen, NLR (National Aerospace Laboratory of the Netherlands), and VARIO)

4. In June, SABIC Innovative Plastics announced that it was “significantly boosting” capacity for its STAMAX long glass fibre reinforced polypropylene composite to meet growing demand from automotive customers. The new production line is scheduled to start up in the second half of 2013 (www.reinforcedplastics.com/view/27186/sabic-increases-stamax-thermoplastic-composite-capacity-to-meet-automotive-demand).

5. In August, Cytec, an established supplier of advanced composite materials to the aerospace sector, announced a collaboration with UK-headquartered Jaguar Land Rover (part of India’s Tata Motors) to develop designs, materials and manufacturing concepts for the cost-effective use of composites materials in automotive structures (www.reinforcedplastics.com/view/27573/cytec-collaborates-with-jaguar-land-rover-to-develop-automotive-composites). In this venture Cytec will leverage the expertise of its recent acquisition Umeco, which has more than 30 years’ experience in the manufacture of prepregs for the automotive sector.

6. In October, chemicals company BASF and TenCate Advanced Composites announced a strategic alliance to co-operate on the development, production and commercialisation of thermoplastic composite materials suitable for high-volume vehicle production (www.reinforcedplastics.com/view/29011/basf-and-tencate-team-up-on-automotive-thermoplastic-composites). TenCate is one of the founding partners of the newly-established European Thermoplastic Automotive Composites consortium (eTAC), which aims to promote the use of thermoplastic composites in the automotive sector. (The other partners are Dutch Thermoplastic Components (DTC), Kok & Van Engelen, NLR (National Aerospace Laboratory of the Netherlands), and VARIO)

7. In October, Ford announced it had developed a prototype carbon fibre composite bonnet for the Ford Focus which weighs more than 50% less than a standard steel version. It reports that production times are also significantly reduced (www.reinforcedplastics.com/view/28778/ford-develops-prototype-carbon-composite-bonnet). The composite bonnet is a sandwich construction comprising a foam core material between two layers of carbon fibre reinforced plastic (CFRP) and was developed as part of the European Hightech.NRW research project.
8. In the same month, BASF and the SGL Group announced plans to develop a composite material based on carbon fibre and a reactive polyamide system intended for the mass production of automotive components (www.reinforcedplastics.com/view/16457/teijin-establishes-mass-production-technologies-for-carbon-fibre-composite). In December 2011, Teijin and General Motors (GM) announced plans to co-develop carbon fibre composite technologies for potential use in high-volume GM vehicles.

New cars sport carbon fibre

In April, BMW unveiled a third i brand model – the BMW i8 Spyder two-seat sports car. As with the i3 and i8 models this features a CFRP passenger cell. Like the i8 coupe, the i8 Spyder is a plug-in hybrid vehicle (www.reinforcedplastics.com/view/29410/bmw-unveils-i8-spyder).


McLaren Automotive launched its 12C Spider sports car in July, 12 months since its MP4-12C model went on sale (www.reinforcedplastics.com/view/26760/mclaren-p1-debuts-at-paris-motor-show). Both cars are based on McLaren’s one-piece Monocell carbon composite chassis. In September, the company introduced the McLaren P1 ‘supercar’, that features a carbon fibre monocoque and roof structure safety cage concept called MonoCage, a development of the MonoCell. All the P1’s body panels are carbon fibre composite to reduce weight (www.reinforcedplastics.com/view/28494/mclaren-p1-debuts-at-paris-motor-show).


Chrysler’s 2013 SRT Viper® was named the winner of 2012 Vehicle Engineering Team Award by the Automotive Division of the Society of Plastics Engineers (SPE) in November. The car features carbon parts to less than 1 minute (www.reinforcedplastics.com/view/16457/teijin-establishes-mass-production-technologies-for-carbon-fibre-composite). In December 2011, Teijin and General Motors (GM) announced plans to co-develop carbon fibre composite technologies for potential use in high-volume GM vehicles.

Top 5 Reinforced Plastics automotive stories of 2012

The following automotive articles were the most read on the Reinforced Plastics website during 2012.


5. Rebounding automotive industry is welcome news for FRP sector (www.reinforcedplastics.com/view/14833/rebounding-automotive-industry-is-welcome-news-for-frp-sector).

Chrysler’s award-winning 2013 SRT Viper® features a number of composite parts.
composite body panels. The Class A hood assembly is reported to be the largest Class A carbon composite part provided to a mainstream OEM at volumes of up to 3000 vehicle sets/year (www.reinforcedplastics.com/view/29236/composites-intensive-chrysler-srt-viper-wins-spe-award). It was produced using a vacuum bag/autoclave cure process.

**Thermoset or thermoplastic?**

The dynamic automotive composites sector is continuing to attract investment from materials suppliers and vehicle manufacturers alike.

This year we've seen aerospace materials specialists Cytec and TenCate setting their sights on the automotive automotive market. Chemicals giant BASF, already a big supplier of plastics to the automotive industry, is putting an increased focus on composites. The carbon fibre makers have also been active. Teijin is continuing to develop its thermoplastics process, while SGL, a key partner in BMW's composites efforts, is also investigating thermoplastics in partnership with BASF. Dow, a new entry to the carbon fibre market, has secured a partnership with Ford.

As can be seen from the developments listed here, a variety of materials and processes are being researched. According to our recent survey on the Reinforced Plastics LinkedIn Group (www.linkedin.com/groups/Reinforced-Plastics-magazine-2351928) thermoplastic composites and thermoset composites are seen as equally promising materials (see chart above). This survey created a lot of debate, and here are just a few of the comments posted:

- “I think thermoplastics will be used in small and complex parts while thermosets should be used for body panels”
- “Speed of process is the important factor currently favouring thermoplastics rather than recyclability, as there are now EU compliant solutions for recycling both thermoplastic and thermosets.”
- “Speed of production will be a driving force in mass production. But we also have to analyse the actual usage of each material. Exterior parts that see high loading may not be appropriate for a material that has creep as one of its functions over time. While easy bonding or welding processes of thermoplastics will also have certain advantages.”
- “In my opinion the resin matrix will have to be a thermoset; actually I believe it must be nearly exactly the same as what Boeing, Airbus and the many other aerospace giants are now using to build the new generation ultralight aircraft. They chose toughened epoxy for a really good reason ... it can survive all of the above for the life of the aircraft. Zero concerns about creep, stress corrosion, fatigue, galvanic corrosion. The major hurdle is development of cost effective methods for producing automotive production volumes. Boeing and Airbus are developing manufacturing technology capable of producing a few aircraft per month. A typical automotive assembly plant is producing on-average one thousand vehicles per day.”
- “The part and volume will dictate what material/materials are chosen. Many look at the market as all TS or all TP, but as is common both have a place, especially when material cost, tooling cost, energy, labour, volume, etc., comes into play.”

You can review all the comments, and join the debate, on the Reinforced Plastics LinkedIn Group.