Driving with more plastics

The development of the automotive industry is linked to the progress of plastics and its applications. Of the many cars and automotive parts on display at the K fair, we show you some innovative highlights

China's Chery prepares to take on the world stage with globally compliant parts

European auto makers are the forerunners in adopting cutting-edge technologies to improve the performance of their cars. From engine efficiency to interior comfort to the shape of the car, Western car brands lead the pack.

With China now being the second largest car market in the world, and on track to taking first place in the near future, Chinese car makers are rising up to take on the international market.

Chinese brand Chery will be launching a new sports coupe A3CC which has adopted several of Sabic Innovative Plastics' solutions.

"Our five-year collaboration with Chery on the A3CC was clearly a success and showcases the innovative nature of Chery and their design of a new vehicle with high-performance plastics," said Gregory A. Adams, vice president, Automotive, Sabic Innovative Plastics. "Our diverse and growing portfolio of resins enabled Chery's designers to create this exciting new convertible with plastic materials used in applications ranging from Class A fenders to structural components, and supports the company's goal of ultimately competing on a global scale."

For instance, Chery is the first Chinese automotive OEM to make use of the Noryl GTX resin (a PPO and PS blend) for front fenders. Sabic IP said that by replacing steel body panels with Noryl GTX resin, Chery could cut fender weight by over 50% than if steel was used (1.37 kg vs 2.80 kg). The same material was also used for a fuel filler door. In both cases, the part can be painted along with the metal Body-In-White (BIW), avoiding the need for secondary operations, even a primer, and ensuring a colour match.

The front and rear energy absorbers were made from Xenoy resin (a PBT and PC blend); and an undertray was moulded from Stamax long glass-filled PP compound. These components – which meet European and US impact test requirements for low speed vehicle damageability – form a globally compliant bumper system. The rear bumper system will also incorporate an energy absorber made with Xenoy resin, and meets ECE and FMVSS low-speed vehicle damageability requirements.

One-piece solution

Can Bayer MaterialScience (BMS) convince carmakers and their suppliers that the tailgate of the future is one that is made almost entirely of polycarbonate?

At the K show, BMS unveiled a prototype of single-part tailgate whose seamless outer skin is made of coated polycarbonate. The sleek and shiny tailgate integrates LED backlights and brake light that shine through from behind. BMS believes that this concept has the potential to replace the conventional design of a metal carrier and a glass window.

"Our concept sets out to demonstrate the enormous design freedom offered by Makrolon (polycarbonate) compared with glass and metal for giving the rear of the vehicle a distinctive appearance," said Volkhard Krause, head of the Automotive Glazing team at BMS.

Add-on features on the tailgate are cleverly integrated during the initial design process. Non-transparent areas may be either back-printed in a dark colour or back-injected with a black frame material by two-component injection moulding. Fixings and guides for lightings such as tail lamps, indicators, brake lights license plate lights and raised brake lights are also integrated by two-component back-injection moulding. Since adhesives are no longer required, assembly and logistics can be simplified.

The prototype shown has a rear spoiler and two styling lines which were moulded on directly. "Both these features would have been impossible to produce in this way with metal and glass. The spoiler, for example, would have had to be mounted separately," Krause said.

He added: "According to our estimates, a weight saving of around 30% to 40% is achieved with the Makrolon part compared with the same part made of metal and glass."

However, a tailgate made of only polycarbonate would not be strong enough to meet load specifications. BMS tackled this issue by inserting simple strips of sheet metal in the grooves between the ribs and bonding them with an elastic adhesive (another BMS technology). Since these reinforcements are inserted on the inside, they may be placed at strategic points without interfering with design. By BMS's calculations, only a few metal inserts are needed to reach a high level of stiffness.

An all-polycarbonate tailgate prototype by Bayer MaterialScience opens up new styles and moulding options

Replacing metals

Adding reinforcements is a popular method of strengthening the physical and chemical properties of thermoplastics so that they can withstand the extreme conditions in automotives.

German chemicals company BASF adds to its portfolio its first long glass fibre polyamide grade. PA grades of Ultramid Structure LF may be filled with 40% to 60% long glass fibres, which strengthen the part across a wide temperature range. As a result, the material is well-suited for applications such as crash absorbers, where the part has to undergo controlled destruction upon impact so as to absorb as much energy as possible, and thus protect the rest of the vehicle.

For two years now, BASF has been operating a pultrusion line to produce the plastics strands containing endless glass fibres, which are then cut to a pellet length of 12 mm. The company is currently investing in an industrial-scale plant.

Making a hot seat

Faurecia of France, one of the world's largest automotive parts suppliers, BASF and Performance Materials Corporation (PMC) in the US have together developed a new car seat prototype that eliminates the use of metal support. Faurecia has named the product SUSCO 1.5, which stands for sustainable comfort, and expects installation in commercial car models in around four years' time.

The so-called "backbone" of the seat is made of a new BASF Ultramid PA grade, which replaces the metal structure and cuts down on foam and trim. The back has layers of continuous fibre-reinforced material overmoulded with Ultramid in a secondary step. As a result, the new seat weighs about 20% less and measures 30 mm thinner. With plastics, designers now have more flexibility, such as combining comfort with a modern thin-walled, high-end component and improving the feeling of space in the car interior.

Safety is the top priority in the design of an automotive. BASF used its simulation instrument Ultrasim to simulate crash behaviour during the development process. Data is collected and used to reliably predict the crash behaviour of components and the relationship between fibre content and anisotropy.