Material without Limits

Magna Exteriors Is Adjusting to New Vehicle Concepts and Working on Multi-Material Systems

A vehicle's external appearance determines the first impression. Tailgates, bumpers, front ends, etc., which used to be a preserve of metal, are increasingly being made of plastics today. The way this transformation is shaping up, and why the hood may soon be a thing of the past is explained by Johannes Götzelmann and Grahame Burrow of Magna Exteriors in an interview.

The cover of the bumper area front/rear for the Mercedes-Benz GLA X156 was developed by Magna Exteriors in cooperation with Engel Deutschland GmbH, MDA – Moldes de Azeméis, SA, and A. Schulman (© SPE)

In mid-October of last year, it was once again time for experts from the automotive, supplier and plastics industries to meet at the big Award Night for the 17th SPE Automotive Awards. As the many development engineers and their project partners stood by with their submitted components, ***Kunststoffe*** spoke to two of the subsequent award winners.

Kunststoffe: *Mr. Götzelmann, the interior of a car is an esthetic playing field for all kinds of plastic products. What is most important for the exterior?*

Johannes Götzelmann: As regards plastics in the exterior, we see a clear trend toward the individualization of cars. Every end customer wants his personal car. To individualize surfaces, we suppliers have to deal with very many different processing techniques. Of course, that includes painting, but also metallization, electroplating, PVD (physical vapor deposition), hot embossing of film or visible CFRP surfaces.

Kunststoffe: *Where does this trend come from and what requirements does it place on OEMs?*

Götzelmann: This trend quite clearly started with the interior, but now also extends to the exterior. We provide, for example, different radiator grille versions for one vehicle model. They differ according to color, decoration and visual appearance.

Kunststoffe: *What quantities are such components manufactured in?*

Götzelmann: If we're talking about high-volume cars in quantities of over 100,000 units per year, individual components may be of the order of 5000 to 10,000.

Kunststoffe: *What potential do plastics have in cars, and what else could be made of polymers in the future?*

Götzelmann: We are convinced that plastics will experience very high growth in the coming years, particularly for the exterior, mainly because of the lightweight design trend and the modularization of vehicles. That concerns large parts, such as traditional frontend modules, i.e. bumpers and their support structure, and tailgates. It can be extended to side doors, which we are working on more intensively, as well as the hood and fend- »

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ers. That means that the entire exterior will be increasingly made of plastics in the future.

Grahame Burrow: The trends are currently towards electric vehicles and autonomous driving. However, one thing is certain: In the future, every vehicle will still have an exterior. That will not change.

Kunststoffe: *Do you think that a car exterior will ever be made completely of plastics?*

Burrow: I believe there have already been one or two examples in the past in which the exterior was made of different plastic types. The crucial question, however, is rather whether something like that will be suitable for production in large volumes or will become mainstream. I think that, given the megatrends, it's possible. The trend toward reducing a car's unit weight will continue, and result in ever higher demands; autonomous driving could fundamentally change the structure of a vehicle.

Kunststoffe: *What are the biggest challenges for polymers in exteriors?*

Götzelmann: The mechanical properties of plastics still fall far short of those of metals. However, a lot has been done over the last decade as regards the development of the mechanical properties of, for example, polypropylene, an important material in automotive engineering. If this trend continues, many applications will be feasible in the future. At present, however, we can still not produce a polypropylene engine hood, but we can work on future materials and their combinations, such as combining carbon fibers with nylon or PP.

„Our customers have more and more vehicles under their umbrella. [...] There has to be a difference in styling for each individual vehicle type [...].“

About the Interviewee

Dipl.-Ing. Johannes Götzelmann studied plastics and elastomer technology at the University of Applied Sciences Würzburg-Schweinfurt, Germany, and has worked at the automotive supplier Magna since 2005. Among his responsibilities here were material and process development and research. Since June 2014, Götzelmann is responsible for the field of product & process development at Magna Exteriors in Europe as Director of Product & Process Development of Exteriors for Europe.

Kunststoffe: *Does the future lie with multi-material systems, such as carbon-fiber-reinforced plastics?*

Götzelmann: Definitively yes! At Magna Exteriors, we are working in a supervisory capacity both with our plastics and steel departments, and with Magna Steyr – a division that builds complete vehicles. This mainly involves strategies for materials such as steel, plastic, carbon fibers and composites. The aim is to use the material where it makes most sense.

Kunststoffe: *Is lightweight design still the driving argument for using plastics, or will other factors play a role in the future, too?*

Burrow: Lightweight design and price are currently the key drivers, since the automotive manufacturers expect high quality at low cost. Another important factor, which we don't hear so much about, is plastics' design freedom. There are theoretically no limits to the design of vehicles.

Götzelmann: That is surely not the most important reason for using plastics in cars, but it is a huge driver in the background. Our

customers have more and more vehicles under their umbrella. There is not only an A and a B class, rather many different variants are built on the same platform. There has to be a difference in styling for each individual vehicle type, and plastics are very suitable for achieving this. Steel, metal and aluminum each have their limits in terms of shaping – but plastics pose almost no restrictions.

Burrow: When we talk of costs, it is not only about the costs of the product, but also the costs of manufacturing the tool and the required processing operations. Plastics here often offer the best values.

Kunststoffe: *How do your orient your production to such multi-material systems, and therefore towards ever more complicated processes?*

Götzelmann: I have to understand what my current process is capable of, and how it has to develop in order to meet customer requirements in future. To become involved in the process at the earliest possible stage, we start discussions with our customers, including on questions such as digitalization and Industry 4.0.

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„The trend toward reducing a car's unit weight will continue, and result in ever higher demands."

Kunststoffe: *What are your tasks and what creative scope do you have in product development, between the OEM's requirements and the Tier 2 suppliers? How much is already decided for you and how much can you intervene yourself, for example in the design?*

Götzelmann: (*smiles*) That differs from customer to customer, I could tell you a different story about each one. In principle, the customer has an idea, or a design, about what his future vehicle should look like and how much it should cost. Then he gathers the best possible proposals from various internal and external companies, and weighs up what the module or part contributes in weight and costs, and how much scope it offers Afterwards, we have a very large influence on plastics-optimized design, particularly for sub-components. That often diverges from what the customer might have envisioned, perhaps with typical metals.

Kunststoffe: *Are automotive manufacturers open to changes in component design?*

Götzelmann: We try to work together with the customer at a very early stage in order to exert an influence on the design. Not only when he is just about to start production and all the material and process models have been decided. Otherwise, a solution emerges at the end of the process that might not be optimized for the product and material.

Kunststoffe: *What role do recyclates and biopolymers play for you?* »

About the Interviewee

Grahame Burrow has been Global President of Magna Exteriors since October 2014. He has over 30 years' experience in the auto industry and has held positions at the Ford Motor Company and Pebra Inc., among others.

Award-Winning Exterior

Magna Exteriors, Vienna, Austria, a wholly owned subsidiary of Magna International Inc., Aurora, Canada, entered the SPE Awards 2016 with a total of four components. The focus was on weight reduction and functional design. The design panel as skid plate ultimately won the first prize in the category "body exterior." The part, injection molded with cascade filling from PP (copolymer, type Polyfort, manufacturer: A. Schulman) with 10 % silver metallic filler, won over the jury thanks to its bright metallic surface with no surface defects such as tiger stripes or flow lines). The radiator grille shutter for a Mercedes-Benz E Class, also submitted by Magna, took second place in this category. It can open or close depending on the running and operating state, thereby improving the vehicle's aerodynamics. In addition, a Class-A CFRP engine hood for the Cadillac ATS-V, which is about 30 % lighter than an aluminum hood, took fourth place for "body exterior." A CFRP radiator grille opening reinforcement also took fourth place, though in the "powertrain" category. The component connects the upper longitudinal member plane of the radiator grille to the lower plane and was manufactured completely in a multi-cavity mold. The required stiffness can thereby be achieved without metal reinforcement, with 30 % less weight and 75 % lower investment costs.
A picture gallery of this and other winning components can be found at:
↘ www.kunststoffe.de/2262486

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Götzelmann: We are considering bio-based plastics for exteriors, but don't see a large potential for them in the next five years. They don't meet the mechanical and chemical requirements for exterior applications. Recyclates, however, have huge potential. We have a very large number of recycled products in which we both carry out our own recycling, for example by reprocessing sprues, and buy in recyclates. Apart from this, we work together with customers on recycling concepts, particularly as regards carbon fibers, in order to incorporate them back into our products.

Kunststoffe: *What challenges does electromobility present for a Tier 1 supplier such as Magna?*
Götzelmann: It has a big impact on us, because the general specifications and approval procedures for an electric car are different from those for a vehicle with an internal combustion engine. There are more opportunities for using plastics in the exterior. The entire center of gravity of the vehicle is changed by the fact that the engine is no longer at the front but the battery is at the rear. To compensate, weight must be saved at the rear, for example on the tailgate. A BMW with rear-wheel drive that has an engine at the front is completely differently balanced in terms of weight. Due to the center of gravity, it doesn't offer the same opportunity to save weight at the rear but, on the contrary, even needs extra weight at some points. Since electric vehicles also no longer have an engine at the front, the requirements for the engine hood are also different. It may no longer be a flap, but only a panel that is integrated with the front bumpers. In other discussions, electric cars are often combined with autonomous driving as trend cars. In an ideal case there will be no more accidents and therefore no crashworthiness specifications. That could further increase the proportion of plastics compared to conventional vehicles.

Kunststoffe: *We wait with baited breath! Thank you for the interview!*

Interview: Franziska Gründel, editor

Understanding the Effects of Films

Display and Surface Demonstrator

Covestro AG, Leverkusen, Germany, has a wide range of films for car interiors in its portfolio. The focus is on displays and operating panels that are protected by scratch-resistant films. The films can be matte or high gloss, with defined optical properties, including anti-glare effect. The current top issue is the process of seamlessly integrating displays into the large, three-dimensional surfaces of instrument panels and central consoles.

In order to better explain the various aspects of its current film developments Covestro has constructed a display and surface demonstrator which premiered at the plastics trade fair K2016 in Düsseldorf, Germany.

Using Covestro's film solutions enables new lighting effects and the integration of functions into the instrument panel. They are part of a new concept for vehicle interiors that also takes account of trends such as increasing networking and customization, electric mobility and autonomous driving. The newly developed display and surface demonstrator helps to understand the application and function of the different film solutions.

To the manufacturer's product presentation:
www.kunststoffe-international.com/2779226