Disquiet before the Storm

Consequences and Opportunities for Plastics Processors Resulting from the Shift to Electromobility

The automotive industry is undergoing radical change and this will not be without consequences for the supply sectors as well. With this in mind, the 11th Kunststoff-Dia(hr)log conference held by Akro-Plastic GmbH was devoted precisely to this topic. In some respects, much may still seem a long way off but in others it may already be too late. New compounds were also announced at the conference, such as an expansion of the engineering plastics portfolio.

Electric vehicles are efficient, sustainable, and in demand. However, new concepts in terms of range extension, charging network, and price must be created so that this drive technology can win through. Many companies and research institutions worldwide are currently working on this (© Hanser/A. Stein)

How strongly and how quickly will the disruptive changes in auto manufacture impact on the plastics industry? This question lay at the heart of the 11th Akro Dia(hr)log conference held on May 9 and 10 in Niederzissen, Germany. Some 120 customers, development partners, and interested participants were welcomed by Akro-Plastic GmbH at their headquarters. With "Automotive industry, quo vadis?", Andreas Stuber, Managing Director of Akro-Plastic, chose a very general title referencing the bible. To the question "Lord, where are you going" asked by Peter in Chapter 13, verse 36 of St John's gospel, Jesus replied "Where I am going, you cannot follow now, but you will follow later." In the transferred sense, this could be an OEM replying to its suppliers. Above all, there was palpable nervousness among participants with regard to the changes arising from electromobility.

Shifting Focus from the Combustion Engine to the Battery

Long-standing experience of rapid, revolutionary changes is not always sufficient maintained Prof. Stefan Bratzel from the Center of Automotive Management GmbH & Co. KG, Bergisch Gladbach, Germany, right at the start of the conference. In his vision of the future, customers will want to use vehicles instead of owning them, be driven instead of driving themselves, and be powered by electric drives instead of combustion engines (**Title figure**). Besides automotive manufacturers, other companies have also discovered this for themselves and so traditional vehicle producers find themselves confronted by large global companies from the IT

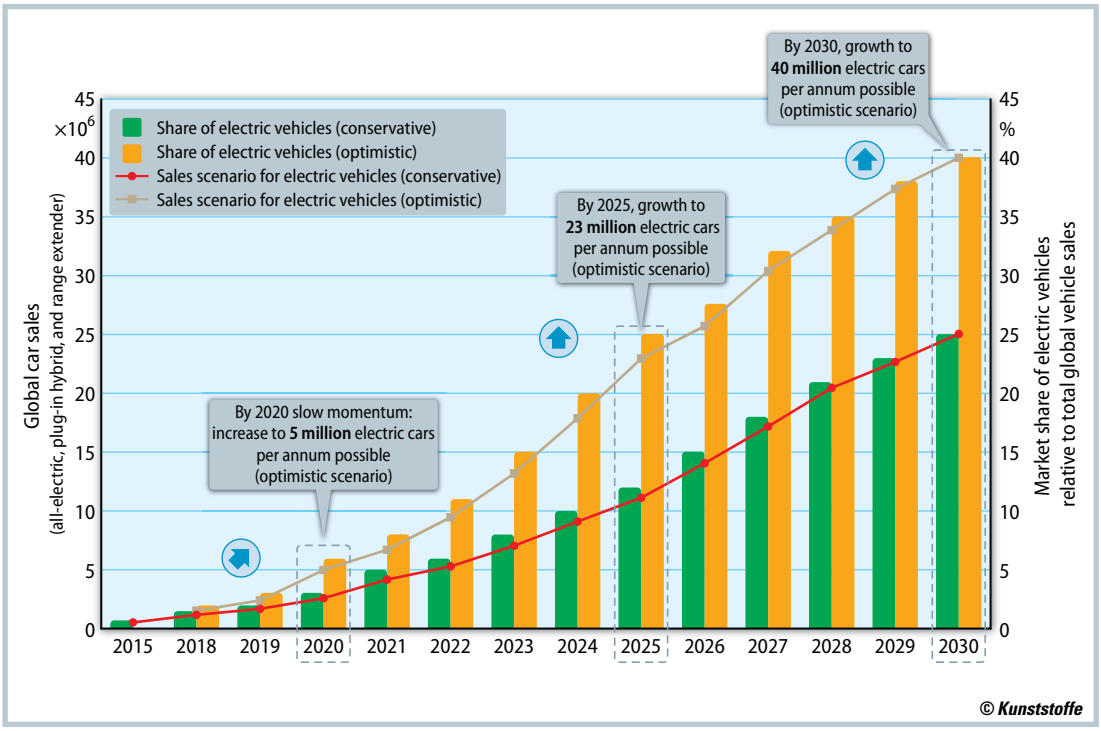

Fig. 1. The global sales forecast for electric vehicles shows an upward trend but opinion is divided over the speed at which this will happen. Prof. Stefan Bratzel points out in his presentation that the curve could also very quickly become steeper due to technological advances or legislative changes (including plug-in hybrid, status: Nov. 2016)

(source: CAM)

and software sector and agile startups such as Uber. The latter, for example, has achieved a market relevance similar to BMW in just three years. However, these companies are not seriously interested in building cars in the long term, according to Bratzel. Rather, they want to dominate the customer interface with an ecosystem of attractive services. Eventually, this would downgrade traditional auto manufacturers simply to suppliers. In this expert's assessment, the chances of this happening are still fifty-fifty. Whoever reacts most swiftly to changes and succeeds in generating the greatest customer benefit will win out in the end (**Fig. 1**).

In the light of the forecasts regarding electric vehicles, the great process of weighing up and comparing components for the combustion engine and electric motor is secretly starting. Some manufacturers are already specifically examining their product portfolios for possible applications in electromobility and new opportunities for the use of plastics. In his presentation, Stefan Oberle from IMS Gear SE & Co. KGaA, Donaueschingen, Germany, compared assemblies such as the steering, braking system and clutch for the two types of drive. "The present combustion engine not only drives the vehicle but also supplies the power for auxiliary units such as power steering, the alternator, air conditioning, heating, and ventilation," said Oberle. Since these functions are also used in electric vehicles, they will give rise to many new components.

Johannes Strasser from Festo AG & Co. KG, Esslingen, Germany, even sees plastics as the key to battery production. Although the requirement for the drive train will decrease, the demand for battery modules will grow. Because of the risk of fire, battery producers will, for example, want to avoid the use of copper. Brass replacement materials are therefore needed. Strasser illustrated this presenting a pre-controlled sliding valve, in which a cartridge system, including a slider made of brass, would be replaced by plastics. Together with efficient production, that would also reduce the price, which would go down particularly well with large Asian customers. He recommended that suppliers should shift the focus from the power train to the battery. Battery producers intend to invest some EUR 70 billion in expanding lithium ion battery factories over the next ten years. Automation specialists like Festo are already being overrun by the large demand, according to Strasser.

Within Akro-Plastic, too, those responsible, such as Thilo Stier, Sales and Innovation Director at Akro-Plastic, are adapting to electric vehicles – and not just by installing an electric vehicle charging station on the company's site. Rather, Stier announced a modified polyamide that is resistant to battery acid.

Tensile Shear Testing of Hybrid Specimens

The Plasma-SealTight (PST) bonding method developed together with Plasmatreat GmbH, Steinhagen, Germany, was explained not just in the form of a presentation but also with a live demonstration at Akro's technical center. This plastic-to-metal bonding technology was introduced by the two compa- »

Fig. 2. Profile of the pilot plant. The metal test specimen is picked up by the robot (left), cleaned, then surface-coated with plasma. After this, a second handling system takes over (center), the test specimen is heated to more than 220 °C and is placed in the mold (right). There, the plasma-pretreated insert is overmolded with polyamide (© Hanser/F. Gründel)

nies at K2016. In this technology, the development partners have succeeded in finding the right combination of plasma coating, plastic, and process to achieve tensile strengths they claim are significantly higher than those obtainable with other bonding methods available on the market. The process can be described in four stages: after the metal surface has been cleaned with plasma, it is plasma-coated with a precursor and heated to at least 220 °C. Then the metal insert is overmolded with plastic in an injection mold to create an ultra-strong material bond. The precursor contains silicon and promotes coating adhesion to the metal or metal oxide. In addition, the silicon oxide also present ensures a good sealing effect and media resistance. Organic constituents in the plasma coating effect adhesion to the polymer. For this application, Akro supplies compounds in the PST product range. In developing these formulations, particular attention was paid to the different linear expansion coefficients of plastic and metal as well as to the chemical/physical bond with the plasma polymer layer. The process is currently being trialed with the polyamide material Akromid B3 GF 30 PST. Because at present the tensile tests are still giving rise to widely varying values (outliers in tensile test results of up to 8 kN), a pilot plant has been set up in Niederzissen since May 2017 (**Fig. 2**). There, tensile shear test specimens can be produced fully automatically and long-term characteristic values determined. The developers of this bonding method have two areas of application particularly in mind: firstly, the high strength values make this process very suitable for hybrid lightweight construction, while secondly the tight molecular bond achieved could be of interest for sealing systems. The latter idea was especially well received by participants involved in the production of electronic components such as plugs or connectors.

Naturally, the hosts also used the opportunity to highlight their own developments. Particularly far-reaching was the announcement that, alongside its comprehensive polyamide portfolio, the company intended to supply a PBT range as well from January 1st, 2018. These new compounds, like the polyamides, will be supplied in three different viscosities and blend variants with polyethylene terephthalate (PET), polycarbonate (PC), acrylonitrile-styrene-acrylic ester (ASA), and styrene-acrylonitrile or acrylonitrile-butadiene-styrene (ABS) under the trade name Precite. In this way, Akro-Plastic's range of engineering plastics is being systematically extended. The compounder's production volume is increasing overall. Whereas last year the 70,000 t mark was exceeded, the amount that will be produced in 2017 is expected to reach 75,000 t. If the good economic situation continues, "we could even exceed the 80,000 t mark," according to Managing Director Stuber.

Despite the many forecast changes and uncertainties, conference organizer Leander Bergmann, Marketing Director at Akro-Plastic, drew a positive conclusion for the industry. Although business will shift in the course of electromobility, "we need not fear what lies ahead of us," according to Bergmann. The widely varying opinions and attitudes regarding this were apparent in the discussions during the breaks. One thing is certain: the dialog between raw material producers, processors and OEM will not stop and can, quite specifically, be resumed on May 15 and 16, 2018 at Akro-Plastic in Niederzissen. ■

Franziska Gründel, editor

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