

point of view

“We have to think more and more about multi-material systems”

interview



DR. MICHAEL EFFING,
CHAIRMAN OF THE BOARD
COMPOSITES GERMANY

As part of our automotive report, we wanted to know a little more about the perception and use of composite materials in the automotive sector in Germany, a country that is very advanced in terms of composites, with a well-established automotive know-how. Therefore, we approached Dr. Michael Effing, Chairman of the board of Composites Germany, who answered our questions. We thank him warmly for his contribution.

JEC Composites Magazine:
Selecting the most appropriate process is driven by multiple criteria such as the type of raw materials, initial investments, production costs, part complexity and production volumes. In this context, what are the reasons for choosing a composite solution?

DR. MICHAEL EFFING : Next to the traditional requirements for lightweight applications, the new focus on autonomous driving and electric mobility will require more functionalities and integrated solutions for cars. This is another great opportunity for composite materials as they provide several

major advantages compared to metals: functions such as radar transparency, air conditioning or sensors can be easily integrated through the use of these materials. Nevertheless, it is important to define what composites are – fibre-reinforced polymer systems can use a wide range of fibres, from glass to natural fibres or carbon. Processwise, composites need to be suitable for mass production. Major drivers for using composites are their design flexibility, integration/functionality potential and cost.

The automotive industry is perfectly aware of one thing: as long as the total cost of composite parts does not go down significantly, the expansion of composite applications will remain limited. What can you say to OEMs?

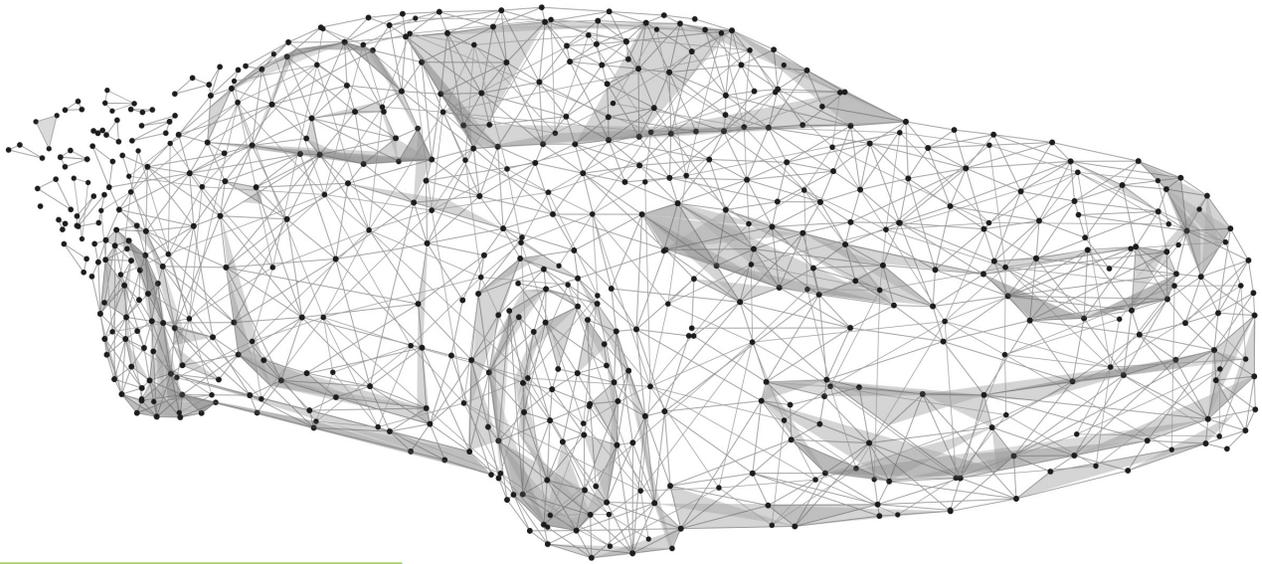
DR. M. E.: In the last couple of years, there was a real hype about carbon fibre that was actually very much driven by BMW and their i3 and i8 ranges. This was extremely motivating for the entire composite industry, but it could not be the final and unique solution due to the high cost of carbon fibre composites. In fact, mainly when using glass fibre reinforcements including sandwich constructions, very competitive solutions versus metal constructions can be achieved with a great potential to lower overall systems costs. It is actually very important to consider the investment in presses and tooling, which is significantly higher for metals than for composites. Moreover, the lifespan of vehicles is now shorter with the high level of model proliferation, and therefore the investment in equipment has to be depreciated over a more limited number of cars. This can also favour the use of composite materials.

The industrial use of composites has been a top-down process. According to you, what needs to be done to go to mass production?

DR. M. E.: For mass production, OEMs require very robust and fast processes. This can be achieved by using either technologies such as injection or hybrid moulding, or press mould-



The automotive industry requires robust manufacturing processes like Hybrid Thermoplastic Molding and HP-SMC at prices competitive with the steel and aluminium solutions.



Electric mobility goes hand-in-hand with lightweight technology, but this won't be enough to cope with all upcoming challenges. Increased functionalities like integrated sensors, antennas or air-condition within the composites parts become USPs (unique selling positions).

ing processes like SMC and BMC with matched metal tooling. The potential of composites is especially high where integrated processes are applied, for example when producing thermoplastic composite inserts from thermoplastic tapes or organosheets to reinforce injection-moulded parts, the so-called hybrid moulding process, or with integrated processes like high-performance SMC/BMC or others. These technologies unveil new potentials for highly automated mass production, which can even be applied in high labour cost regions such as Europe. Combinations of thermosets with thermoplastic moulding are also possible, such as the laser-assisted Optolight process developed at AZL in Aachen in cooperation with BMW and others, which already won several innovation awards.

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Purchasing a lot of equipment that could be obsolete in a few years due to technology changes (the composite industry is evolving very fast) is also a challenge. What message should be sent to users?

DR. M. E.: I think the traditional manufacturers of complete solutions combining injection or press moulding with robot-assisted handling or joining have made great progress in the last couple of years. This industry will remain the foundation of mass production for composite parts. Sophisticated injection and press moulding equipment and modern pultrusion lines will be and remain the back core of robotics-assisted manufacturing processes and new technologies such as laser-assisted tape placement,

just to name a few. The core processes will remain for a long time, only features will be added or adapted such as new handling systems, dividing or joining systems, or laser-optics robots for finishing or grinding. But composites will not be the only solution. We have to think more and more about multi-material systems and the processes that have been and will be developed to combine and join metals and composites into a multi-material design.

What is behind lightweighting? What are the other advantages that should be emphasized?

DR. M. E.: Lightweighting will continue to play an important role in electric vehicles and autonomous driving, but the automotive industry will also focus on other elements such as increased functionalities that can be easily integrated into composites, due to the requirements for radar transparency or integrated antennas, for sensors, wires and cabling as well as air condition systems or safety devices. The need for lightweighting is of course higher for long-distance driving than for city vehicles with 150km ranges.

Cars should be designed to sustain crashes and to prevent injuries to the passengers. Do composites meet this requirement?

DR. M. E.: As we know from the Formula 1 industry, carbon fibre-reinforced chassis are much safer and not a single pilot has been killed since their introduction. Also in traditional auto design, composite applications can be safer than their metallic equivalents. For example, for a bonnet/hood, reduced head injury criterion (HIC) values can be achieved due to reduced local stiffness under the bonnet while the overall stiffness is increased and thus, vibration while driving can be almost completely avoided.

For OEMs, the more complex the supply chain is, the harder it is to achieve the right level of coordination to secure capacity, quality and price. Can the composite industry reassure OEMs about this?

DR. M. E.: In general, the value chain is very fragmented with a lot of material intermediate steps. We plan to establish a more consolidated material supply chain using new standards such as thermoplastic tapes or prepreg systems that will be provided by large material suppliers. This will shorten and simplify the supply chain.

Addressing the automotive aftermarket constraints, as well as recycling issues, is a real challenge for the composite industry. What can you tell us about this?

DR. M. E.: Thermoplastics have a great ecological potential since they can already be easily recycled and reused. As regards thermosets, recycling is in fact more difficult but a lot of technological developments have taken place in the past and huge progress could be made. For example,



Multi-material systems are the key to successful designs. The combination of metals and composites with advanced joining methods via laser techniques are becoming state of the art. We need to have the right material as the right place in the car design.

thermosets can be reintegrated as a filler material. Further steps are being undertaken by industrial players.

In your opinion, is the development of electric and autonomous vehicles a real opportunity for composite solutions?

DR. M. E.: See the reply above: lightweighting is certainly not the only driver, but for buses and long-range vehicles, for example, integrated functionalities are even more important.

Do you, as some OEMs, think that the growth prospects for composites in the automotive sector are optimistic and will range between 3 and 4%?

DR. M. E.: Yes, this is what we are foreseeing due to the drive for more functionalities, design and cost reduction potential.

In general, what are the reasons to believe in the development of composites in the automotive sector?

DR. M. E.: Certainly, the great combination potential of so many different features that are made available by composites for the desired application. This can be design freedom, integrated functionalities, further weight reductions to reduce CO₂ emissions, safety parameters and quick developments. But, once again, I do believe in the future of multi-material combinations, combining the best of all worlds, from composites, over aluminium and other materials. □

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