

Lightweight load compartment well for luxury sedans

- **On-board power supply battery remains firmly secured even in case of a crash**
- **Lighter than sheet metal**
- **High degree of strength and stiffness**
- **Precision forming of the large-format composite insert**

Cologne, October 8, 2021 – Tepex dynalite continuous-fiber-reinforced thermoplastic composite materials are increasingly being used as an alternative to metal in light-weight design. One new application for these composites from LANXESS is in the manufacture of the load compartment well installed in the Mercedes-Benz S-Class for accommodating the 48V on-board power supply battery. The composite components can withstand high mechanical stresses and are around 30% lighter than comparable sheet metal components. “In the event of a crash, the battery must not penetrate or in any way damage the recess wall. This is ensured by the high strength and stiffness of our fabric-based composite material,” says Dr. Klaus Vonberg, an application expert for Tepex at LANXESS. “The composite design also ensures that the load compartment well is leaktight, preventing the ingress and egress of fluids like water and battery electrolyte.”

Cost-cutting functional integration

The safety component is manufactured economically in a hybrid molding process using a blank that is around 110 x 80 centimeters large produced by a water cutting machine. The blank is made from polyamide-6-based Tepex dynalite 102-RG600(2), which is reinforced with two layers of continuous-glass-fiber fabrics. The easy-flowing polyamide 6 Durethan BKV60H2.0EF DUS060 from LANXESS is used as a back-injection material for the cost-saving integration of fasteners, but also of reinforcing ribs. Sixty percent of its mass comprises short glass fibers, which also make it extremely strong and stiff and a perfect match for the Tepex.

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Complex forming process

Forming (draping) of the blank is performed by a stamp and is a highly complex process, among other things due to the high draw ratios. This is because the composite material does not expand plastically like sheet metal but undergoes deformation in response to the movement (draping) of the fibrous material, which means that the composite material has to be supplied from outside continuously during the forming process. If the movement is too great, the fibers can inhibit the forming process, breaking as a result and impacting the rest of the process.

Integrative simulation saves development costs

LANXESS employs a range of calculation models, allowing it to precisely simulate the draping process and so predict and analyze the forming effects and respond accordingly. Not only can LANXESS determine the optimum 2D cutting geometries of the blank, but the forming behavior of the blank can be analyzed virtually and in line with the customer's tooling concept so that weaknesses can be identified and eliminated early on. This generates huge savings potential in the design of these processes. "For the load compartment well, we also determined when the critical shearing angle of the fabric is reached during forming, where wrinkles form and when fibers start to break," says Vonberg. "Our calculations and simulations also helped to ensure that the rounded corners of the component can withstand the expected loads." The local orientation of the continuous fibers themselves in component areas with a pronounced 3D contour (e.g. in the rounded corners) was also simulated. This is a prerequisite for precisely predicting mechanical component behavior in terms of integrative simulation. "All this is part of our service offering under the HiAnt brand with which we supported our customers' development experts in designing the load compartment well," says Vonberg.

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Further series applications

In the Mercedes-Benz C-Class, Tepex dynalite is now also used for manufacturing load compartment wells designed to accommodate the on-board power supply battery. “We also see huge potential in electric vehicles – so for safety devices, complete battery system housings or components for the stowage space now available under the ‘hood’ – because our lightweight structural material is much lighter than metal and so helps to extend the range of electric vehicles,” says Vonberg, looking to the future.

You can find more detailed information about the products and technologies from LANXESS for new mobility and lightweight construction at <https://new-mobility.lanxess.com> and www.lightweight.lanxess.com.

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Images



The load compartment well can withstand high mechanical stresses and is around 30% lighter than comparable sheet metal designs.

Photo: LANXESS

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News Release

LANXESS is a leading specialty chemicals company with sales of EUR 6.1 billion in 2020. The company currently has about 14,800 employees in 33 countries. The core business of LANXESS is the development, manufacturing and marketing of chemical intermediates, additives, specialty chemicals and plastics. LANXESS is listed in the leading sustainability indices Dow Jones Sustainability Index (DJSI World and Europe) and FTSE4Good.

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