

Highly integrated hybrid front-end module with adjustable air flow

Smartly designed with easy-flowing polyamide

- **Greater flexibility during processing**
- **Smaller injection molding machines with lower clamping forces**
- **Wall thickness reduced by 20% in component areas subject to lower loads**

Cologne – Thermoplastics with easy-flowing properties are usually somewhat more expensive than comparable standard materials; however, they offer advantages that ultimately pay off in terms of processing, production costs and freedom of design. This can be seen in the highly integrated bolster produced in plastic-metal composite technology (hybrid technology) for the Ford Kuga SUV. In addition to steel panels, the production of the highly loaded structural component includes polyamide 6, the easy-flowing, fiberglass-reinforced Durethan BKV30H2.0EF from LANXESS. The bolster and the fully assembled front-end module were developed and are produced by Montaplast GmbH, a global system supplier of the automotive industry, which has its headquarters in Morsbach, Germany.

Ulrich Dajek, hybrid design expert at LANXESS, explains: “Our easy-flowing polyamide 6 can be processed at lower injection pressures. For this reason, smaller injection molding machines with lower clamping forces can be used in the production of the hybrid bolster. This has a positive effect on the machine running costs and allows greater flexibility in terms of machine selection and production planning.”

Four integrated active grille shutters

The bolster houses an actively controllable unit consisting of four active grille shutters that ensure a demand-oriented supply of air to

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the engine cooling system. The bolster contains reinforcing metal inserts at the sides and in the upper chord. The latter accommodates the highly loaded hood latch. The main task of the hybrid design is to support the cooling systems and hold them in position. Numerous additional functions are also integrated in the bolster – such as guides, mounts for the adjustment drive and fasteners. “Our development engineers have succeeded in integrating all these elements, functions and interfaces so that the functional and load requirements are met. At the same time, they have ensured that the entire front-end module can be produced in different region-specific versions in an automated high-volume process in a cost-efficient manner,” comments Horst-Dieter Haltrich, Product Development Team Leader at Montaplast.

Direct threaded connections with greater stability thanks to polyamide 6

As a plastic component for the hybrid bolster, polyamide 6 has two main advantages over the possible alternative material, polypropylene (PP). The first advantage is that the component contains several direct threaded connections; these are more cost-efficient than using additional metal inserts. The threaded connections designed using polyamide 6 are significantly more stable, have a longer service life and are more reliable than with PP. The second advantage of polyamide is that it withstands the thermal loads that arise when the grille shutters are closed, in contrast to PP.

Easier to achieve filigree, thin-walled component areas

Due to the high flowability of polyamide 6, component areas with filigree geometries can be designed with thinner walls. “It was possible to reduce the wall thickness by around 20% in the areas subject to lower loads. Compared to a standard polyamide 6 with the same fiberglass content, this results in an appreciable weight saving,” according to Dajek. Due to the lower filling pressure, another benefit

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of the easy-flowing material is that components with lower stresses can be produced, minimizing the distortion.

Extensive HiAnt services

Ford, Montaplast and LANXESS worked closely together over the entire development process for the hybrid bolster right up to the start of series production. LANXESS also brought in its HiAnt engineering service. In one of several engineering studies, a component topology analysis was carried out to provide suggestions for the design and position of the reinforcing polyamide ribs that took account of the relevant load cases. Various calculations and simulations, such as analysing the rigidity of the radiator mount and the dynamic stability and noise vibration harshness (NVH) of the bolster, were also highly challenging. The load-bearing capacity of the metal-reinforced latch area (hood latch) as well as several insurance-relevant load cases – such as lower leg impact tests for pedestrian protection or the behavior of the overall assembly in the case of minor collisions, e.g. knocks while parking – were also simulated. In addition, LANXESS carried out tests on the prototype and series-production part to the specifications of Ford. Dajek: “For example, we allowed the complete assembly to ice up in a climatic chamber and tested the reliable opening and closing of the grille shutters.”

You can find more information about LANXESS products, developments, technologies and services that use polyamides, polyesters and thermoplastic composites for new forms of transportation and particularly electromobility at <https://new-mobility.lanxess.com> and www.hiant.lanxess.com.

LANXESS is a leading specialty chemicals company with sales of EUR 6.8 billion in 2019. The company currently has about 14,300 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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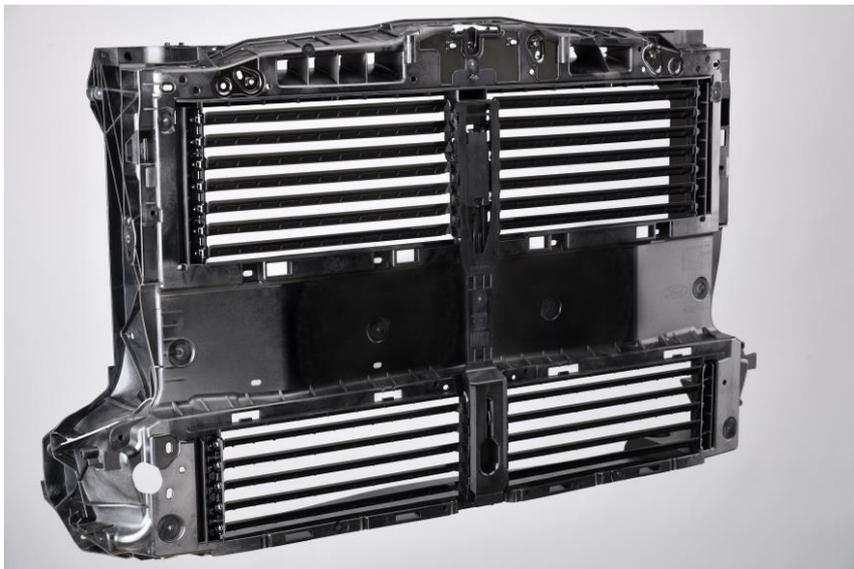
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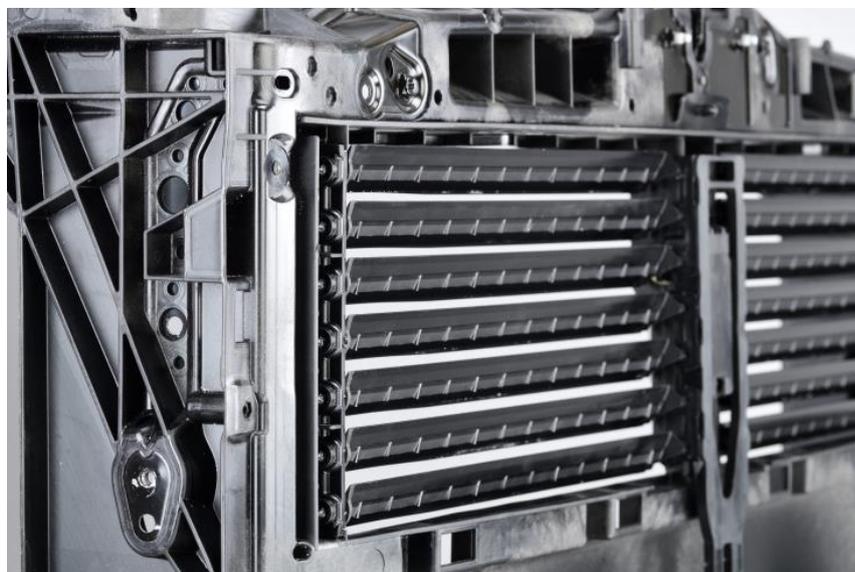
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The Ford Kuga is equipped with a highly integrated bolster which is manufactured in hybrid technology from steel panels and the easy-flowing, fiberglass-reinforced polyamide 6 Durethan BKV30H2.0EF. Photo: Ford



The bolster houses an actively controllable unit consisting of four active grille shutters that ensure a demand-oriented supply of air to the engine cooling system. Photo: LANXESS AG



The bolster is also reinforced at the sides with metal inserts.
Photo: LANXESS AG

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