

## Case Study

### Extremely flat, yet very stiff

Gear box oil pan in polyamide 6 for high-performance sports car

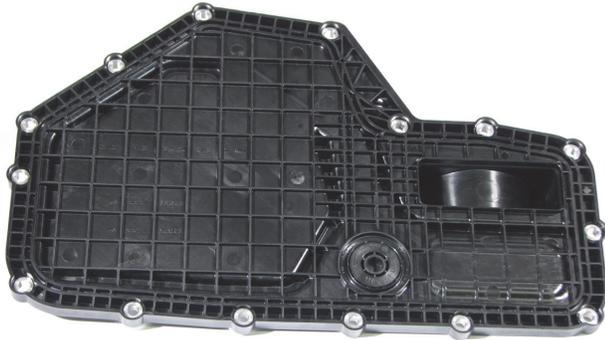


Figure 1 Gear box oil pan DL800 made from Durethan DP BKV 60 H2.0 EF

Gear box oil pans can also be made of polyamide 6 rather than sheet metal or die-cast aluminum. One example is the S tronic<sup>®</sup> transmission in the Audi R8. Its oil pan is made of Durethan DP BKV 60 H2.0 EF resin from LANXESS, which is highly reinforced with 60 percent glass fibers. This high-tech material was chosen because its extremely high stiffness ensures good sealing despite the very flat design of the oil pan. Furthermore, it is very well suited for welding to polyamide 66, from which the oil filter cover is made. The system supplier for the completely assembled transmission oil pan is [IBS-Filtran GmbH](#) in Morsbach, Germany.

The oil pan is less than 20 millimeters tall, enabling the entire engine to be mounted in a lower position. This lowers the vehicle's center of gravity, which contributes to the outstanding grip and road handling of the Audi R8. Another consequence of the flat oil pan is a low flange height. If a typical polyamide 6 was used for the injection molding of the oil pan, the flanges could creep and deform on exposure to sealing force, causing leaks. Durethan DP BKV 60 H2.0 EF resin, on the other hand, has superior creep resistance. Even at 150 °C, it is twice as stiff as a standard polyamide 6

**OEM:** Audi  
**Grade:** Durethan<sup>®</sup> DP BKV 60 H2.0 EF  
Durethan<sup>®</sup> AKV 30 H2.0  
**Manufacturer:** IBS-Filtran GmbH, Germany

reinforced with 30 percent glass fibers. In addition, it also has a reduced tendency to warp, which also has a positive effect on the sealing of the flanges.

In addition to an oil displacer and a socket for the oil drain plug, the oil filter has been injection molded directly into the oil pan using a patented technology from IBS-Filtran. If the component were made of metal, the oil filter would have to be fabricated separately using multiple components. Not only would the costs be higher, the oil pan would also be significantly taller, violating design space constraints. Another argument against sheet metal in this application is that the oil displacer could not be deep-drawn because the draw ratios are too high.

The oil filter cover is made of Durethan AKV 30 H2.0, a polyamide 66 filled with 30 percent glass fibers by weight. It is welded directly to the oil pan. The resulting weld is high strength and meets sealing requirements. This underscores the fact that that contrary to popular belief, polyamide 6 and 66 can be welded together effectively. LANXESS provided IBS-Filtran with comprehensive support in the development of the transmission oil pan. For example, the creep behavior

of the highly-reinforced polyamide 6 and the sealing of the flanges when exposed to internal pressure were computed. In addition, long-term storage at 150 °C during component testing demonstrated the excellent chemical resistance of the material to transmission oil.

The High Performance Materials business unit of LANXESS provides customers with tailored technical service based on its expertise in polyamide and PBT materials, part design, computer simulation and process engineering under the HiAnt brand.



The ability to save weight in vehicles by using plastics such as Durethan®, Pocan® and TEPEX® makes an important contribution to saving fuel and, linked to this, reducing CO<sub>2</sub> emissions.

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#### Note:

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