Case Study

Engine oil pan fur trucks

Figure 1 Engine oil pan for Daimler Trucks

OEM: Daimler AG

Grade: Durethan® AKV 35 H2.0 901510

Oil pans fitted in the 12.8 liter Euro 6 engines for the Mercedes Actros from Daimler are up to 120 cm long, 40 cm wide and 35 cm deep. To date, they are the largest engine oil pans for trucks to be made of polyamide 6 and 66. They are manufactured by Marbach-based BBP Kunststoffwerk Marbach Baier GmbH using Durethan. LANXESS used a series of calculations and simulations to confirm the feasibility of the oil pans in advance, helping to ensure that the pans could be designed properly and cost-effectively over a relatively short development period.

In this particular application, polyamide offers an alternative to aluminum, steel and sheet molding compounds (SMC). It produces far lighter components than die-cast aluminum, for example. In addition, polyamide components made using injection molding processes are ready for use straight from the mold. In contrast, die-cast and SMC parts often have to undergo labor-intensive and costly additional processing in order to remove burring, for example.

One variant of the oil pan for the 12.8 liter engine is made of heat-stabilized polyamide 66 Durethan AKV 35 H2.0 filled with 35 percent glass fibers, while the other is manufactured using the corresponding polyamide 6 grade Durethan BKV 35 EF H2.0. In the course of the joint development work, it was found that polyamide 6, is also able to cope with the high demands made on these large components that are exposed to a range of temperatures and pressures. Durethan BKV 35 EF H2.0 offers an additional advantage, since its glass fibers are less visible on the part surface. This ensures a high degree of tightness in the groove areas and improved removal from the mold.

During the development of these oil pans, LANXESS provided its partners with comprehensive support in the form of calculations and simulations. This included structural optimization to improve the acoustic behavior of the pans, as well as simulation to examine resistance to stone chips and deformation due to sealing forces. Simulations were also carried out for the filling of the injection molds and the post-mold warpage behavior of the oil pans. These calculations helped LANXESS to ensure the molds could be filled evenly, particularly in the flange area, minimizing warpage.

Other studies examined how the oil pans would behave if the entire engine block, including the transmission, was removed and set down for maintenance work or repairs. In this instance, the pans would have to bear a weight of around 1.6 metric tons. Integrative simulation was used to provide detailed analysis of the anisotropic thermal expansion around the flanges resulting from the varying fiber orientation in the component. This information was used to improve the design to ensure the tightness of the flange under all the potential temperatures and pressures.

The simulations and calculations conducted by LANXESS as part of the development of the two engine oil pans are all part of HiAnt. This brand incorporates all the services received by customers worldwide as part of the development of innovative system solutions. HiAnt stands for the know-how in the development of products, applications, processes and technology. This in-depth expertise is what truly sets LANXESS apart from many of its competitors.

Note:
The information contained in this publication is current as of January, 2012. Please contact LANXESS Corporation to determine if this publication has been revised.