

## Case Study

### Engine oil pan for trucks



Figure 1 Engine oil pan for Daimler Trucks

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

**OEM:** Daimler AG

**Grade:** Durethan® AKV 35 H2.0 901510

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.

---

Durethan® and Pocan® are registered trademarks of LANXESS Deutschland GmbH

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee, and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.

#### Typical Properties

Property data is provided as general information only. Property values are approximate and are not part of the product specifications.

#### Health and Safety

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling LANXESS products mentioned in this publication. Before working with these products, you must read and become familiar with the available information on their hazards, proper use, and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets (MSDS) and product labels. Consult your LANXESS Corporation representative or contact the Product Safety and Regulatory Affairs Department at LANXESS. For materials that are not LANXESS products, appropriate industrial hygiene and other safety precautions recommended by their manufacturer(s) must be followed.

#### Regulatory Compliance

Some of the end uses of the products described in this brochure must comply with applicable regulations, such as the FDA, NSF, USDA and CPSC. If you have any questions on the regulatory status of any LANXESS engineering thermoplastic, consult your LANXESS Corporation representative or contact the LANXESS Regulatory Affairs Manager.

#### Regrind

Where end-use requirements permit, regrind may be used with virgin material in quantities specified in individual product information bulletins, provided that the material is kept free of contamination and is properly dried (see maximum permissible quantities and drying conditions in product information bulletins). Any regrind used must be generated from properly molded/extruded parts, sprues, runners, trimmings and/or film. All regrind used must be clean, uncontaminated, and thoroughly blended with virgin resin prior to drying and processing. Under no circumstances should degraded, discolored, or contaminated material be used for regrind. Materials of this type should be discarded. Improperly mixed and/or dried regrind may diminish the desired properties of a particular LANXESS product. It is critical that you test finished parts produced with any amount of regrind to ensure that your end-use performance requirements are fully met. Regulatory or testing organizations (e.g., UL) may have specific requirements limiting the allowable amount of regrind. Because third party regrind generally does not have a traceable heat history or offer any assurance that proper temperatures, conditions, and/or materials were used in processing, extreme caution must be exercised in buying and using regrind from third parties. The use of regrind material should be avoided entirely in those applications where resin properties equivalent to virgin material are required, including but not limited to color quality, impact strength, resin purity, and/or load-bearing performance.

#### 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.