Case Study

Automotive engine oil pan in polyamide 66

Weight savings of 50 percent

Figure 1 Engine oil pan made from Durethan AKV 35 H2.0

OEM: Audi, VW

Grade: Durethan® AKV 35 H2.0 901510

Manufacturer: Polytec Plastics GmbH & Co. KG, Germany

Compared with steel sheet or die cast aluminum, polyamides provide tremendous opportunities for reducing weight in the production of automotive engine oil pans. This is demonstrated by the 1.8 and 2.0-liter turbocharged gasoline engines used in the Audi A3, A4 and A6 as well as in the Volkswagen Passat, for example. These pans are made from Durethan AKV 35 H2.0, a polyamide 66 from LANXESS, and weigh roughly one kilogram less than the previous steel component. They are also around 50 percent lighter than an equivalent aluminum oil pan. Not only do weight savings of this magnitude appreciably reduce the vehicles' fuel consumption and CO_2 emissions, they also improve handling since the weight savings occur near the front axle. The oil pans are manufactured by POLYTEC PLASTICS Germany GmbH & Co KG based in Lohne, Germany.

There is a general trend toward compact engines with increasingly smaller and more complex packaging space. This results in oil pans with geometries that could only be produced with great effort in sheet metal. With deep parts, in particular, steel quickly bumps up against its design limits due to unfavorable draw ratios. Injection-molded polyamide allows much greater design freedom. In addition to the potential weight savings, its primary advantage over aluminum is that it can be used to produce ready-to-assemble injection-molded parts. Oil pans made of die cast aluminum, on the other hand, must undergo post-molding treatment, such as deburring or machining of the flanges to improve flatness. This additional work quickly becomes a large portion of the production costs.

Other advantages of polyamide over metal are the opportunities that injection molding offers for reducing costs through functional integration. In the case of an engine oil pan for turbocharged engines, for example, the sockets for the oil level sensor and the oil drain plug were molded directly into the component. When many functions can be integrated, significant cost savings over aluminum construction can be achieved, because separate welding and finishing steps can be eliminated. Possible candidates for integrated functionality in engine oil pans include sockets for oil cooling and filtration, side pockets for expanding the vol-

ume of oil, and oil return lines or reinforcing features in the area of the transmission support.

Durethan AKV 35 H2.0 is reinforced with 35 percent glass fibers. Despite this, it can be used to produce low-warpage oil pans whose flanges remain tight. The plastic's high toughness, stiffness and strength contribute to the pan's ability to safely withstand stone impacts and bottoming out on high curbs. The thermal stabilization of the polyamide ensures excellent dimensional stability of the components under typical sustained thermal loads.

GREEN MOBILITY™
ENERGIZED BY LANXESS

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_2 emissions.

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 July, 2013. Please contact LANXESS Corporation to determine if this publication has been revised.