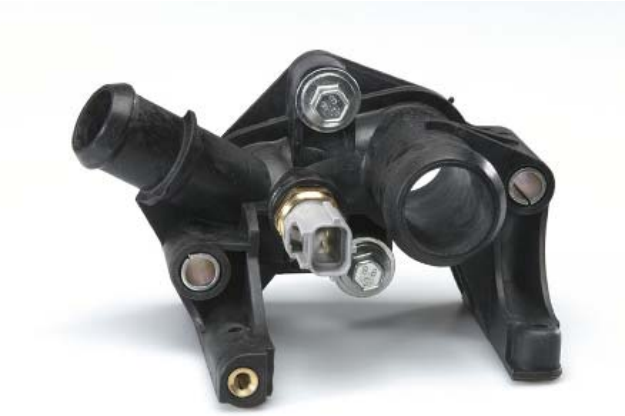
Case Study

Durethan® DP AKV 50 HR H2.0 for coolant manifold



Material: Durethan® DP AKV 50 HR H2.0

Manufacturer: Eaton, England

Figure 1 Coolant manifold

Highly reinforced polyamide 66 (PA 66) is becoming increasingly popular in the automotive industry for the production of components for the cooling system. One example is the coolant manifold shown in Fig. 1, which is used in various Ford Sigma engines in some of the company's new models like the Fiesta. The part is made of Durethan® DP AKV 50 HR H2.0, a PA 66 from LANXESS reinforced with 50 percent glass fibers. The high stiffness of this material means that the ignition coil can be attached to the coolant manifold via an integrated support. This compact design enables a reduction in the space required for the engine.

The fully assembled coolant manifold is produced by the systems supplier Eaton at its Brierley Hill plant in England.

Because the ignition coil is attached to the coolant manifold, high leverage forces act on the fairly long subassembly due to engine vibrations and jarring caused by potholes, etc. Despite this, the part must not show any signs of deformation, otherwise the flanges and outlet connections may begin to leak. The PA 66 combines high stiffness and strength with excellent impact resistance, allowing it to meet the manufacturer's stringent requirements at a lower weight than other designs. At room temperature in the conditioned state, this material has a very high elastic modulus of 10,600 MPa, which is around one third stiffer than a comparable standard PA 66 with 30 percent glass reinforcement. Because the fibers in the polyamide matrix are evenly distributed, the material properties are evenly distributed throughout the part.

Screw threads for other add-on components such as a temperature sensor are integrated directly into the molded part with the aid of inserts, facilitating subsequent assembly. When injection molding the part, the highly glass fibre reinforced material has the advantage that it can be demolded sooner due to its

high thermal conductivity and good stiffness at high temperatures. This ensures cost-effective manufacture with short cycle times.

In view of the ever higher temperatures encountered in the cooling circuit, a further advantage of this hydrolysis-resistant and heat-stabilized PA 66 is its good long-term resistance to hot cooling media. This was also confirmed by comparative tests using the standard Durethan® AKV 50 material as a reference. Specimens of both materials were immersed for over 500 hours in a water-glycol mixture (1:1) at 130 °C and a pressure of 2 bar, after which their mechanical properties were measured. These tests showed that after immersion, Durethan® DP AKV 50 HR H2.0 has flexural modulus and flexural strain values that are over 50 percent better and impact strength values that are 70 percent better than the standard material.

Note:
The information contained in this publication is current as of August, 2009. Please contact LANXESS Corporation to determine if this publication has been revised.