Charge air duct by MANN+HUMMEL made from the BASF high-temperature polyamide Ultramid® Endure BM

Case Study

High pressure at high temperatures: Pipes that are exposed to this challenge between the turbocharger and the charge air cooler can best be manufactured by blow molding with the BASF high-temperature polyamide Ultramid® Endure D5G3 BM. This is demonstrated by the new charge air duct which MANN+HUMMEL, Ludwigsburg, has manufactured for the 2.0-liter four-cylinder turbo engine of the BMW Group. The turbocharger with integrated charge air cooler is used in numerous vehicles, e.g. in the BMW 4, 5 and 7 series of the BMW Group.

With Ultramid® Endure D5G3 BM (BM = blow molding), charge air ducts can be efficiently manufactured by blow molding. The BASF polyamide 66 with 15% glass fibers has a high heat-aging resistance, can be processed easily and shows extraordinary acoustic properties. It is temperature resistant up to 220°C at continuous use, with possible peak temperature loads of up to 240°C. The blow molding type supplements the Ultramid® Endure portfolio for injection molding. Ultramid® Endure BM obtains its extraordinary heat stabilization through a well-established technology, which suppresses the oxidative attack by atmospheric oxygen. The protection is not limited to the surface, but pervades the material as a whole.

The tailor-made properties of Ultramid® Endure BM yield numerous benefits for molders and car manufacturers: favorable system costs due to lower processing temperatures and assembly costs, shorter cycle times, reduced energy consumption and component weight are combined with a high technical performance, which leads to durable and powerful engines. The high-temperature polyamide can replace pipes made from rolled aluminum sheets. Pipes made from the BASF material can also be blow-molded into different pipe forms. The interior surface remains smooth here, which leads to reduced air resistance compared to other plastics.

For blow molding, the plastic is also required to have a special melt strength and favorable swelling properties. As it also responds well to changes in the processing parameters, corrections can be made easily during the production process. Ultramid® Endure BM can be welded particularly well with PA66 components using e.g. infrared welding. Due to the reduced glass fiber content, the weld line can represent a weak spot, particularly after aging. The innovative stabilization mechanism in Ultramid® Endure BM not only protects the polymer itself, but also strengthens this potential weak spot.

Acoustics have become a relevant brand factor and are extremely important in the automotive industry. Ultramid® Endure BM shows excellent damping behavior and is therefore suitable for demanding acoustic requirements.