Case Study

Blow-molded charge-air tubes

Figure 1 Blow-molded charge-air tubes

Grade: Durethan® AKV 325 H2.0

As a material for engine air management components, pseudoplastic polyamide 6 and 66 grades are increasingly becoming an attractively priced alternative to elastomer combinations and special-purpose thermoplastics. Using extrusion and suction blow molding processes, they can be cost-effectively processed into products such as air ducts, charge-air tubes and clean air lines. A new example of this trend is the charge-air tube of a four-cylinder gasoline engine with turbocharger for the mid-class sedan of a U.S. automaker.

It consists of Durethan AKV 325 H2.0, one of the few pseudoplastic polyamide 66 grades available on the market with 25 percent glass-fiber reinforcement. This component is one of the first blow-molded charge-air tubes made from this material to be used on the “hot side” of the charge-air cooler in series production. Thanks to its stiffness, the polyamide 66 can withstand the high pressures and temperatures that come about when the vehicle is moving, while its melt viscosity enables excellent process reliability and productivity for blow molding. It also meets the surface quality requirements of a component that is highly visible in the engine.

The molded part, which is approximately one meter long and has cross-sections in the region of 50 millimeters, connects the turbocharger to the charge-air cooler. It is therefore on the “hot side” of the charge-air cooler and is particularly exposed to significant long-term thermal loading, as well as high compressive forces. Durethan AKV 325 H2.0 copes with this demand thanks to its special heat stabilization. It boasts high thermal aging stability and heat resistance and withstands temperature peaks of up to 200 °C. A further benefit of polyamide 66 is that pinch-off edges and flash that occur in processing can easily be recycled. The recycled materials can be compounded with virgin material into regranulates that can be fed back into the production process with no significant detrimental effects on material properties.

Pseudoplastic polyamides are highly viscous at low shear rates. They can therefore be processed very easily using 3D methods such as suction blow molding and blow molding with parison manipulation. The extruded parisons show only minimal sagging under their own weight prior to inflation in the mold.

For example, despite the high glass fiber content, Durethan AKV 325 H2.0 can be used to manufacture and blow-mold parisons weighing up to eight kilograms. The material is thus also suitable for producing large, air-ducting blow-molded parts for engines used in, for example, all-terrain and commercial vehicles. At high sheer rates, on the other hand, pseudoplastic polyamides are only about as viscous as standard polyamides, which means they are also suitable for injection molding.

LANXESS has developed a wide range of pseudoplastic polyamide 6 and 66 grades for blow-molded parts in engine air management systems. It includes non-reinforced and filled materials with glass fiber contents of 15 and 25 percent.

All the materials are colored black and heat-stabilized. Their tensile modulus varies from around 210 to 5,300 MPa (conditioned). The range also includes impact-resistant modified grades. The non-reinforced polyamide 6 Durethan BC 700 HTS offers significant potential savings. It has an elasticity modulus of only around 210 MPa (conditioned) and, by employing suction blow molding, it can be used to produce charge-air tubes with integrated soft bellows as a single-material solution. This provides a further cost effective alternative to laborious sequential blow molding involving two polyamides of differing hardness. Detailed information on the product range for blow molding can be found at www.durethan.com.