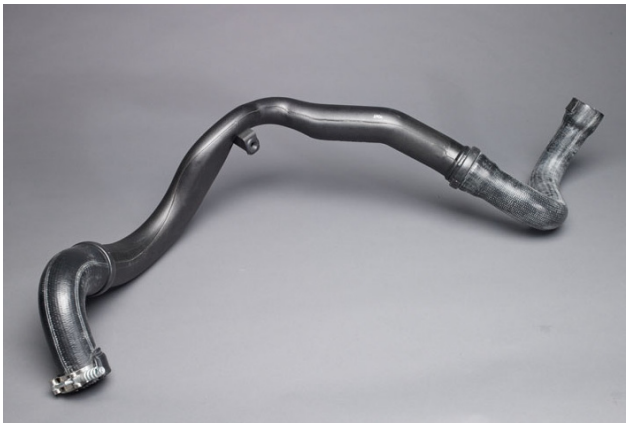
Case Study

Blow-molded charge-air tubes



Grade: Durethan® AKV 325 H2.0

Figure 1 Blow-molded charge-air tubes

As a material for engine air management components, structurally-viscous polyamide 6 and 66 grades are 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 structurally-viscous 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 in production 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 occur 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 of around 50 millimeters, connects the turbocharger to the charge-air cooler. It is therefore on the “hot side” of the charge-air cooler and is 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.

Structurally-viscous 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 shear rates, on the other hand, structurally-viscous 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 structurally-viscous 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 modulus of elasticity 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 labor-intensive sequential blow molding involving two polyamides of differing hardness. Detailed information on the product range for blow molding can be found at www.us.durethan.com.

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.

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