Unreinforced Durethan® polyamides for tank systems

Use of melt filters

Fuel tanks and high-pressure storage systems (such as Compressed Natural Gas (CNG) tanks) are safety-relevant components. If fuel should leak in the event of damage, an elevated safety risk exists that must not only be taken into account during the design and development of the tank, but also when developing its manufacturing processes.

The components of a tank system must be subjected to critical loading conditions during the design and testing phase so that the effects can be evaluated. One example of a critical load case for a motorcycle tank would be a crash or accident in which the component is exposed to impact forces. As a substitute for real-world tests, the tank must at least pass a pendulum impact test, usually under extreme conditions (low temperature, non-conditioned material) in order to ensure the suitability of the component for use in production vehicles. During the testing phase, critical areas with maximum stress and strain must be identified. Computer simulation of load conditions (e.g. via finite-element analysis) can provide additional information on these critical locations.

To minimize safety risks, highly stressed areas must be detected, and an appropriate check of the quality of these areas must be integrated into the production process. Manufacturing defects must be identified especially in areas of high stress by using suitable methods, e.g. spectrography. As these defects are identified during the manufacturing process, appropriate action must be taken to keep these parts from being used in production vehicles.

In addition, the possibility of material contamination must be taken into account during the entire manufacturing process. To minimize the contamination risk for the raw material (compound), LANXESS has implemented special precautions in the manufacturing process of selected products. They involve special preparation and cleaning sequences prior to compounding, and intense monitoring of downstream processes all the way through to packaging. Products fabricated by this method have “DUSXBL” added to their product name. Despite these measures, contamination cannot be ruled out 100% of the time on the way to the finished component.

We therefore recommend the use of melt filters. By using melt filters, contaminants larger than the selected mesh sizes of the filter can be effectively retained.

In addition, filtration can achieve thermal and material homogenization, and filter out any residual, unmelted plastics.

Filtration is particularly necessary for high-pressure systems, and suitable quality inspections must be established.

Apart from the possibility of contamination, local material inhomogeneity can occur in highly impact-modified grades due to the complexity of the formulations. High-molecular weight or partially cross-linked polymer fractions generated during polymerization, compounding and processing, which are incorporated into the matrix (so-called gel bodies), may cause effects on the visible surface. These effects can occur with processing techniques like extrusion blow molding because the pressure of the plastic against the surface of the mold is much lower than with injection molding. In addition, the heat extraction rate is reduced because the inside of the component does not have contact with the mold. These pressure and thermal conditions can lead to visible pitting on the surface.

These sporadic surface effects can also be reduced by appropriate melt filtration.

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