

## Case Study

### Polyamide 6 achieves Hazard Level 3



**Grade:** Durethan® DP BM 65 X FM30

**Manufacturer:** LANXESS, Germany

The requirements placed on flammable materials and components by the upcoming European standard on fire protection in rail vehicles are very strict for flame-retardant thermoplastics and virtually impossible to meet in some cases. Nonetheless, the polyamide 6 Durethan DP BM 65 X FM30 from [LANXESS](http://www.lanxess.com) passes the tests for the upcoming standard with the best possible rating “Hazard Level 3” for specific applications. This opens up numerous potential uses for the high-tech material in components employed in electrical equipment for rail vehicles at high risk of fire. These include chokes, voltage transformers, windings, contactors and switches. The relevant testing was carried out at the Fire Technology Department of Currenta GmbH & Co. OHG in Leverkusen, a test center accredited to DIN EN ISO/IEC 17025 and monitored and certified by the relevant German federal offices.

The measures and requirements for the upcoming standard on fire protection in rail vehicles are currently still defined in the technical specification CEN/TS 45545. The conditions that components or

materials need to fulfill in the tests laid down in this standard depend on the rail vehicle design and the type of rail transportation – referred to as the design and operation categories. This differentiation reflects how long passengers spend in the rail vehicle in the event of a fire and how much at risk they are as a result. A hazard level that classifies the potential risk is defined for each design category, depending on the operation category. Three hazard levels (HL 1-3) are defined in total, with HL 3 being the highest. The CEN/TS 45545 standard lists typical components and applications (“products”) in rail vehicles and assigns standardized fire protection test procedures for them. The relevant “product” must meet requirements of varying strictness in these tests, depending on the hazard level.

Among other things, Currenta Fire Technology conducted tests on smoke gas toxicity (NF X 70-100-1) and density (EN ISO 5659-2) and the oxygen index (ISO 4589-2) for the polyamide 6 in accordance with the CEN/TS 45545 standard. The specific optical smoke gas density  $D_s(\max)$  was found to be just

7 (total test duration 20 minutes). Hazard Level 3 is achieved for internal materials for  $D_s(\max)$  values  $\leq 150$ . A CIT (Conventional Index of Toxicity) value of 0.26 was determined for smoke gas toxicity. Hazard Level 3 classification is possible in this test for CIT values  $\leq 0.75$ . At 52.6 percent, the oxygen index OI was much higher than the minimum requirement for Hazard Level 3 of 32 percent.

The excellent fire resistance of Durethan DP BM 65 X FM30 is based on a halogen-, phos-

phorus- and antimony-free flame retardance package. The polyamide 6 has already proved a success in rail transportation and is used in the Channel Tunnel in holding elements for cable ducts, for example. It is reinforced with 65 percent glass fibers/mineral by weight. Its melt is nevertheless easy flowing (EasyFlow technology), which means it can be used for even relatively thin wall thicknesses and intricate component geometries.

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