

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](#) 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 described 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 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 $D_s(\text{max})$ was found to be just 7 (total test duration 20 minutes). Hazard Level 3 is achieved for internal materials for $D_s(\text{max})$ values ≤ 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 ≤ 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, phosphorus and antimony-free flame retardance package. This grade of polyamide 6 has already been proven successful 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. Despite this, its melt is easy flowing (EasyFlow technology), which means it can be used for even relatively thin wall thicknesses and intricate component geometries.

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Developmental Product

Any product designated as a developmental product is not considered part of the LANXESS Corporation line of standard commercial products. Complete commercialization and continued supply are not assured. The purchaser/user agrees that LANXESS Corporation reserves the right to discontinue this product without prior notice.

Typical Properties

Property data is provided as general information only. Property values are approximate and are not part of the product specifications.

Flammability

Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.

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.

Color and visual effects

Type and quantity of pigments or additives used to obtain certain colors and special visual effects can affect mechanical properties.

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.