

Case Study

High-current circuit breakers

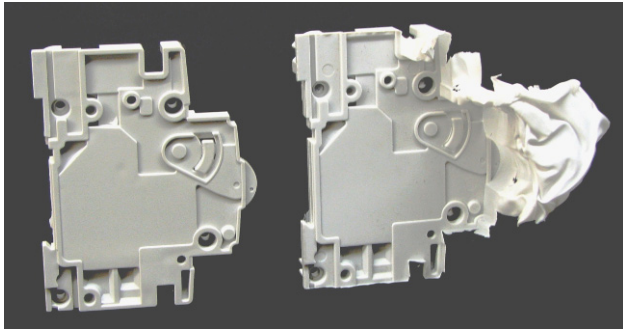


Figure 1 High-current circuit breakers

This example of a mass-produced, high-current circuit breaker manufactured from Durethan® DP BM 65 X FM30, a material based on polyamide 6, demonstrates that customized polyamide 6 and 66 grades can also meet the stringent demands made on electrical safety components. This halogen, phosphorous, and antimony-free flame retardant material offers more than just excellent mechanical and electrical properties. The main reason for selecting this material was that it reduced processing costs. That in turn led to an overall reduction in the cost of the finished components.

One factor that has paid off when it comes to the production of the high-current circuit-breaker is the fact that the cycle times for the polyamide – which is reinforced with 65 percent mineral/glass fibers by weight – are far shorter than those for urea and polyester resins. In addition, the component is flash-free. With thermosets, flash necessitates laborious and often costly secondary finishing operations.

Until now, high-current circuit breakers have been made mainly from urea and polyester resins. These thermoset materials were used for a number of reasons, including their high dielectric strength and track-

Grade: Durethan® DP BM 65 X FM30

ing resistance, flame retardance, good resistance to temperature peaks, and low mold and material costs.

Compared with thermosets, highly reinforced thermoplastics typically exhibit certain disadvantages in terms of flow behavior. However, the new XtremeFlow technology from LANXESS means this thermoplastic is very easy flowing and can therefore be used even for very thin walls. As an added benefit, the nearly isotropic shrinkage of this grade means that the finished parts have very low warpage. One further argument in favor of this material is that the flame-retardant package releases virtually no substances that could contaminate the contacts of the circuit-breaker over time. The material fulfills fire safety standard UL 94 (Underwriters Laboratories) with a V-0 classification at a wall thickness of 0.75 millimeters. It passes the IEC 60695-2-12 glow wire test with a GWFI (Glow Wire Flammability Index) value of 960 °C on a test piece 0.75 mm thick. The GWIT (Glow Wire Ignition Temperature) value according to IEC 60695-2-13 is 775 °C for a test piece of the same thickness. As a result, the material even meets the requirements in the section of the IEC/EN 60335-1 standard for domestic appliances relating to plastics in unsupervised appliances (rated current > 0.2 A).

The electrical properties are equally impressive. For example, the material has a tracking resistance (Comparative Tracking Index, IEC 60112) of over 600 volts.

The material's high arc resistance represents an additional bonus in terms of electrical safety. This means the risk of short circuits and associated damage is very low.

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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.