

## Case Study

Covers for ships' engines:

Thermoforming of polyamide 6 semi-finished products made of Durethan® BKV 315 Z H2.0



Figure 1 Thermoform from Durethan® BKV 315 Z H2.0

Glass fiber-reinforced polyamide 6 (PA 6) can also be processed using thermoforming techniques, as shown by various protective covers for ships' engines manufactured by [MTU Friedrichshafen GmbH](#). [Reiss Kunststofftechnik GmbH](#) based in Tettngang, Germany makes the covers from SUSTAVACU® 6 GF semi-finished products. These sheets are among the first thermoformable semi-finished products made of polyamide 6 available on the market. They are manufactured by [RÖCHLING SUSTAPLAST KG](#), Lahnstein, Germany, and consist of Durethan® BKV 315 Z H2.0 from LANXESS. Their high heat resistance compared with standard thermoformed materials was one of the features that made them particularly useful for ships' engines. Furthermore, vacuum thermoforming is the most cost-effective solution for this application. Compared with injection molding, molds can be built for a fraction of the cost – particularly when large components are to be produced.

**Material:** Durethan® BKV 315 Z H2.0

**Molder:** Reiss Kunststofftechnik GmbH, Germany  
Sustaplast KG, Germany

**OEM:** MTU Friedrichshafen GmbH, Germany

Another reason for using PA 6 semi-finished products is their high tensile strength and stiffness. Their stiffness allows the walls to be made thinner than is possible with other thermoformed materials. Although the engine covers are large, dimensional stability is high and warpage minimal. They are also highly resistant to breakage because the PA 6 has been modified for impact resistance. Along with their low weight, this is an important factor in withstanding the high dynamic loads caused by engine vibration. Thanks to the high heat resistance of PA 6, the cover components can withstand continuous working temperatures of 140 °C with short-term temperature peaks of 170 °C. For use in the engine room, they also have the necessary resistance to oil, grease, diesel fuel and many other chemicals typically found on board ships.



The engine covers partially replace earlier sheet metal structures. The largest cover component is 920 mm long, 400 mm wide and weighs 1.25 kg. Like the other parts, it is manufactured from five-millimeter-thick sheets in a thermoforming ratio of 1 : 2.5.

The Durethan® BKV 315 Z H2.0 used to manufacture the semi-finished products is a branched PA 6 with high pseudoplasticity, reinforced with 15 percent by weight glass fibers. This ensures a high melt stiffness which allows the sheets to be thermoformed.

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#### 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 August, 2008. Please contact LANXESS Corporation to determine if this publication has been revised.

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