Case Study

Airbag housing using nylon composite sheet technology

Over 30 percent less weight

Figure 1 Airbag housing with PA 6 composite sheet

Grade: Durethan® DP BKV 240 H2.0
TEPEX® *dynalite* 102-RG600

Manufacturer: Takata AG, Germany

In automotive design, parts subjected to high loads, such as plastic/metal hybrid front-end structures, can show substantial weight savings when selected metal stampings are replaced with polyamide 6 (PA 6) composite sheet. This material can also be used to make all-plastic structures significantly lighter. One example of this is the housing for a passenger airbag module. The use of PA 6 composite sheet cuts the weight of the housing by over 30 percent compared with a mass produced, injection-molded version (also made of polyamide 6). The lightweight construction potential of PA 6 composite sheet technology can also be applied to plastic parts to considerably lower the weight, emissions and fuel consumption of vehicles in the spirit of Green Mobility. The airbag housing shown above was designed as part of a joint advanced engineering project between LANXESS, Takata AG of Aschaffenburg, KraussMaffei Technologies GmbH of Munich, Bond-Laminates GmbH of Brilon and Christian Karl Siebenwurst GmbH & Co. KG of Dietfurt.

The airbag housing accommodates the gas generator and the folded airbag. Until now, such components were made mainly of steel, aluminum, or injection molded thermoplastics. In this housing concept for the passenger-side airbag, the long side walls are made of molded TEPEX dynalite 102 RG600 from Bond-Laminates. This nylon composite sheet of polyamide 6, reinforced with 47 percent continuous glass fibers by volume, is over-molded and reinforced with Durethan DP BKV 240 H2.0, an impact-modified polyamide 6 copolymer from LANXESS. The design using PA 6 composite sheet technology enables the wall thickness of the side walls to be reduced from 4 mm to less than 1 mm, resulting in a considerable cost savings.

When the airbag is triggered in an accident, the base and walls of the housing must be able to withstand the explosion and the pressure during inflation of the airbag. Although the side walls are quite thin, they can withstand the sudden pressure because of the high strength and stiffness of the PA 6 composite sheet. Composite sheet technology is generally suitable for all plastic automotive parts where high stiffness and strength need to be combined with low weight.

LANXESS is able to accurately simulate all process steps in the manufacture of PA 6 composite sheet parts – including the highly complex processes involved in forming the material. For the airbag housing, LANXESS was able to calculate the variation in glass fiber alignment in shaped nylon composite sheets in order to account for their anisotropic behavior. This expertise is part of the HiAnt brand, in which the High Performance Materials business unit has pooled the know-how it has developed in materials, design, simulation and process technology to deliver tailored customer service and solutions.

GREEN MOBILITY™
ENERGIZED BY LANXESS

The ability to save weight in vehicles by using plastics such as Durethan®, Pocan® and TEPEX® makes an important contribution to saving fuel and, linked to this, reducing CO_2 emissions.
