News Release

Housing made of DuPont™ Zytel® HTN PPA facilitates the precise management of car air suspension systems

Photo: DuPont

DuPont™ Zytel® HTN polyphthalamide (PPA) with 35 wt. % glass fibres meets the high requirements for the housing of a pneumatic switchover unit used in car air suspension systems, which is exposed to internal pressures of 16 bar. The unit was developed by Woco for Continental Automotive Systems. It is directly connected to the compressor unit and manages air supply to the suspension system. Electronic air suspension systems allow the bodywork to be raised during journeys on uneven ground, for example, to ensure greater chassis clearance.

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Stevenage, June 2008. DuPont™ Zytel® HTN was the material of choice for Woco Industrietechnik GmbH during the development of a pneumatic switchover unit which is exposed to high internal pressures. It is used in air suspension systems from Continental Automotive Systems. The polyphthalamide (PPA) with 35 wt. % glass fibres meets high requirements in terms of strength, dimensional stability – even at high temperatures, chemical and hydrolysis resistance as well as suitability for injection moulding. The manufacturing costs are considerably lower than those associated with the diecast-magnesium housings traditionally used for such units. This is mainly due to the fact that no further refinishing work is required, such as deburring, and that the complex-shaped parts can be produced in a single manufacturing stage.

The switchover unit, with the housing made of Zytel® HTN, contains coils, electro- and pneumatic valves as well as several check valves. It is connected directly to the compressor unit and manages the air supply to the suspension system. Depending on the vehicle make, it is installed either under the front bumper, in the vicinity of the exhaust or in the car's interior, e.g. in the spare wheel cavity. Thus the housing is exposed to aggressive media such as cleaning and brake fluids, oils, lubricants and contaminants such as dust, sand, etc. during its entire lifetime. Working temperatures range from -40 °C to 80 °C. Short-term temperature peaks can reach 120 °C at a maximum operating pressure of 16 bars. In its new condition, the housing is required to withstand a burst pressure of 35 bars.

"We chose Zytel® HTN PPA 51G35 due to the positive experience we have had with the material to date," says Peter Henninger, development engineer at Woco. "It meets all our requirements in terms of mechanical strength and is highly-suited to this application. Moreover, the material maintains its very high dimensional stability and accuracy even at very high temperatures. This helps ensure that an air-tight seal is created between the switchover unit and the compressor unit for its entire lifetime, which is in turn critical for the reliable operation of the air suspension system."

The complex-shaped housing – measuring 133 mm long, 83 mm wide and 70 mm high – is produced using precision injection moulding. The high flowability of the Zytel® HTN grade used, and its very low tendency to warp, enable production within tolerances of +/- 0.05 mm. Moreover, because refinishing work such as deburring or machining is not required, in contrast to comparable housings made of diecast magnesium, the housing can be processed for assembly as soon as it leaves the tool – saving both time and cost.

Background: Air suspension systems

Electronic Air Suspension Systems (EAS) have been used in the commercial vehicle sector for many years to keep a vehicle at a specified level regardless of load status. With regard to passenger vehicles, they are principally used today in high-end models (e.g. Mercedes S and E Class, Audi A8) as well as Sports Utility Vehicles, (e.g. Mercedes M-Class, Audi Q7, VW Touareg) for a more comfortable and quieter ride. Benefits include driver-adjusted suspension settings for a sportier or more comfortable drive, the automatic lowering of the bodywork for reduced consumption when travelling at high speed, as well as several different height settings, e.g. for more chassis clearance when driving off-road.

An air suspension system consists of four air spring struts and integrated dampers, each with continuously adjustable characteristics and switchable, additional air volume. In addition there is a sensor system with travel and body acceleration sensors. The system is rounded off by the pressure supply unit with switchover unit and pressure reservoir, as well as a valve block with pressure sensors. The control unit uses signals from the travel sensors to calculate the current height of the chassis, which it then manages by inflating or deflating the air springs. In addition, it prevents the car from bouncing up-and-down when travelling on uneven roads – indeed the car position is so quiet and even, it is as though it is anchored in the sky (the so-called Skyhook-Principle).

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