News Release

The Chemical Company

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Load simulation right on the monitor

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- First high load torque rod supports made of plastic
- ContiTech Vibration Control and BASF employ Ultramid CR and Integrative Simulation for Opel

Together with the renowned system supplier ContiTech Vibration Control, a business division of Continental AG, BASF has developed the first engine torque rod support made of plastic that can withstand high mechanical load. This component serves to secure the vehicle engine and transmission assembly as well as to dampen vibrations and to insulate structure-borne noise. Up to now, highly loaded components such as engine mounts, gear mounts and torque rod supports have been made exclusively of aluminum or steel. For the development BASF employed its new special polyamide Ultramid® A3WG10 CR together with the distinctly expanded instrument of Integrative Simulation. The part weighs 35% less than its predecessor made of aluminum and has gone into serial production for the Opel Vectra and Saab 9-3. The engine mount system is the primary connection member between the engine/transmission unit and the car body. In addition to high loads, these systems are exposed to temperatures ranging from -30°C to 120°C [-22°F to 248°F] as well as to contamination by oils and other chemicals.

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New: engine mount system made of special plastic

Although car manufacturers are constantly striving towards lightweight constructions, they are still using steel and aluminum for load-bearing structural elements in vehicles – and thus also for engine mount systems. So far, it was felt to be impossible to use thermoplastics for parts that are subject to such high mechanical loads. The prerequisites for a precise dimensioning of highly loaded components include high-quality material models, powerful simulation tools like the Integrative Simulation and, above all, specially developed materials such as Ultramid® A3WG10 CR. In the family of Ultramid CR materials, the dependence of the material properties on the fiber orientation and strain rate has been determined very precisely. Furthermore, the performance level of these plastics is higher and the standard deviation of the mechanical properties is smaller than with commercially available polyamides. The feedstocks are accurately selected and the production conditions are strictly controlled so that components made of these plastics offer a constant quality level and the calculations of their properties match the experiments very well.

Now: strength prediction with Integrative Simulation

The most important part of the development – the comprehensive calculations and simulation – was based on BASF's instrument of Integrative Simulation. In the quest to reliably predict the strength of such a highly loaded engine mount, BASF once again enhanced this tool. In the method for part dimensioning that is widely used in the industry today, a strength calculation is carried out independently of the process simulation using only averaged characteristic material properties. In order to better utilize the capabilities of fiber-reinforced polyamides, however, there is a need to correctly take into account the fiber orientation at various places in the part since the mechanical properties differ quite substantially as a function of the fiber alignment. This is where Integrative Simulation comes in: it links the results of the

filling simulation with a finite element analysis in which the fiber orientation throughout the part is taken into account. These findings, along with the influence of the temperature and the load rate, are all used for dimensioning the component and the mold. The complex life cycle tests as well as the final vehicle testing of Adam Opel AG have shown that Integrative Simulation yields a very reliable component design.

Additional information about BASF's Ultramid® (PA) materials is available from the e-mail address Ultraplaste.infopoint@basf.com or by calling phone no.: [+49] (0) 621 60 78780.

A press photograph can be found at www.basf.de/pressphotos under the keyword "Plastics" or under the search term "Ultramid". In the near future, this text and the photo will be available in the press release archive of BASF Plastics at www.basf.de/plastics/pressreleases.