Material matters

A new breakthrough innovation is delivering key weight, noise and system cost benefits in oil sump applications

Author: Ralf Ponicki, global marketing manager, Akulon products DSM

The main trends in the automotive industry include system cost optimization and productivity gains, as well as long-term sustainability and reduced environmental impact. Each is driven either by legal regulations – reduced CO₂ emissions and fuel consumption – or by profit considerations within the automotive business chain. Engineering plastics can play a pivotal role, as these materials are designed to deliver the required performance while meeting the overall industry trends for lighter and greener solutions that are also more cost-effective.

In the past, a key development has been the drive to introduce engineering plastics for the production of oil sump subsystems. These parts can be exposed to top temperatures of 160°C and need to operate over long periods at 110°C to 140°C. At these temperature levels, Akulon PA6 offers the ideal combination of mechanical stiffness, impact resistance, and also chemical resistance.

Cylinder head covers have been designed and produced in Akulon PA6 for a long time now, and the requirements for oil sumps in terms of temperature and media resistance are similar, because both operate in more or less the same environment. However, impact resistance has always been an issue for oil sumps because parts had to be able to withstand several mechanical tests, such as the stone impact test.

“The main decision criteria for the selection of Akulon PA6 are weight, NVH, and system cost reduction opportunities”

It is for this reason that DSM Engineering Plastics decided to combine its material knowledge with the extensive application knowledge of leading automotive components suppliers to develop feasibility studies, tests, and suitable applications in Akulon PA6.

The main decision criteria for the selection of Akulon PA6 are weight, NVH, and system cost reduction opportunities in combination with design freedom versus metal, as well as better heat aging resistance and better welding strength compared with PA66.

The development of new applications such as these requires extensive CAE support as well as highly detailed calculations and analyses.
First results indicate that the noise level with PA6 oil sumps is comparable to that of sumps from silent steel, when the design is optimized for plastics. With improved designs it could be possible to contain more oil with the PA6 solution than is possible in today’s metal sumps. Moreover, various other additional functions and features may be integrated in the Akulon PA6 modules.

Akulon PA6 resins have been selected by various OEMs and suppliers for a range of applications and feasibility studies for oil sumps and oil pans. Various engine and road tests are ongoing.

Additional productivity gains are possible by using DSM's Akulon Ultraflow PA6. This high-flow material enables up to 30% lower cycle times in injection molding in combination with an excellent surface appearance. Akulon Ultraflow K-FHG7 and K-FHG6 deliver a major improvements in such areas as flow ability, and this comes without losing strength. Moreover, Ultraflow’s better processing characteristics enable the realization of more complex geometries, which leads to reduced cycle times.

These developments will undoubtedly lead to new engine designs, in which the potential of plastics is more fully realized, eventually leading to more parts integration and smaller engines. In the future we may have engines that consist of a metal core, with tops, bottoms, and peripherals all made out of plastics, leading to weight reductions of up to several kilograms per engine.

In general, weight reduction is in line with DSM Engineering Plastics’ drive for green materials and solutions. In applications such as these, further benefits may be derived from the recent introduction of EcoPaXX, a bio-based, high-performance engineering plastic for high-tech applications, which has been shown to be 100% carbon neutral from cradle to gate.