

Significant weight and cost savings through the use of "engineering polymers"

Automotive engineering: reducing weight and costs

Metal prices are rising, while at the same time the content of high performance engineering polymers in automobiles is continuing to increase. But the rationale behind metal replacement is not simply cost. It is also about the performance and light weight of the polymers. Every gram counts when it comes to cutting fuel consumption and CO₂ emissions.

Experts predict that in the short term it would be feasible to trim 50 kg off a medium-sized vehicle through systematic use of lightweight construction. In the medium term, weight savings of up to 300 kg could be possible by substituting polymers for metal and employing suitable composite or hybrid solutions. There is sufficient potential to achieve this in the average 900 kg of steel and other metal products contained in a vehicle today.

Reversing the weight spiral

It is true that despite all the advantages that polymers have to offer, automakers cannot entirely dispense with metals. But against a background of spiraling fuel prices, increasing vehicle weight and the CO₂ problem, there is a need for action. Over the last 15 years, vehicles have not become lighter but are actually some 30 percent heavier. While the VW Golf weighed 800 kg at its launch in 1974, the Golf V tops 1200 kg. Polymers help reduce excess weight without compromising the safety and comfort features that are mainly responsible for the upward weight spiral.

Replacement of metal by polymers or fiber reinforced composites pays off, because in addition to weight, total costs can also be reduced by about 15 percent. Countless small solutions are already helping to achieve weight savings. Examples include:

- Crankshaft flange seals, where Fortron® PPS is replacing conventional aluminum to obtain a 32 percent weight reduction from 250 to 170 g.
- The weight of charge-air pipes for turbochargers can even be cut by 43 percent. Instead of the 870 g for the aluminum

pipe, the same part produced from Fortron® PPS weighs only 500 g.

- Door modules produced from Celstran® PP instead of steel weigh some eight kg less, reducing fuel consumption by four percent.

Innovative lightweight structures: learning from aircraft construction

The outstanding performance and durability of composites based on Fortron® PPS have already persuaded aircraft manufacturers like Airbus and Boeing to use them. In both large profile sections and small interior applications on the A380, the manufacturer achieves weight savings of up to 50 percent in some cases by using long fiber reinforced composites with a PPS matrix.

Composites are also finding application in automotive engineering today. For example, Volkswagen uses Celstran®+ long fiber reinforced thermoplastic (LFRT) to produce the generously designed dashboard support for the Golf Plus, because it offers the required high quality in terms of rigidity and toughness. The material also makes it possible to reduce the number of individual manufacturing steps by allowing important components, like the passenger airbag, to be fully integrated into structural elements.

Prefabricated: lightweight takes on new form

Celstran® LFRT is creating new opportunities for cost-efficient lightweight construction leading to reduced fuel consumption and CO₂ emissions. The specially developed thermoplastic composites produced from this long fiber reinforced material weigh less than thermosets and light metal alloys, while allowing more efficient, eco-friendly processing.

