

# Composite damper bodies

...Roman Bielak, technology development manager at **BWI Group**, discusses the trials and triumphs of developing a composite damper body

» The use of materials other than steel and aluminium in the design and manufacture of automotive suspension parts has become common practice for both suppliers and auto manufacturers, bringing weight benefits in terms of lighter materials and slimmed-down components. With components made from alternative materials such as composites already being used in chassis applications, the question is not whether they can be used, but what more can be done.

BWI Group specialises in finding alternative materials to replace steel and aluminium in shock absorbers, and a number of its lightweight solutions have already been successfully implemented by customers. Roman Bielak, technology development manager at BWI Group, discusses the way forward for lighter suspension components.

## WHAT ARE THE PROS AND CONS OF USING COMPOSITES IN DYNAMICS COMPONENTS?

Composite materials have been tempting suspension designers for some time, as they have great potential to deliver weight savings. Composite suspension components can be easily manufactured in high volume and in many different forms, but there are offsetting factors: performance over temperature and performance over time, which must be taken into account at the design stage.

Bearing in mind the potential that composite materials bring, along with their constraints, several years ago BWI Group pioneered the application of composite strut-spring-seats by introducing a part with no steel reinforcement into the market. This very demanding application, with the spring seat holding the weight of the vehicle corner, is responsible for transferring substantial static and dynamic loads, and is linked with safety. It took several years to develop these parts, analysing parts with FEM, advancing moulding technology and testing physical parts, while accounting for the special properties of composite materials. The result was that the composite spring seat offered a 50% reduction in mass, compared to the equivalent steel component.



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ABOVE: Better dynamic suspension performance and improved vehicle fuel efficiency are possible with BWI Group's innovative composite damper body

## WHAT OTHER APPLICATIONS ARE THERE FOR COMPOSITES?

Motivated and inspired by the benefits of composites, damper design engineers have been evaluating other potential applications, leading to the desire to create a damper body fully comprised of composite materials. The target became a shock absorber body, with possible extension to coil-overs. However, for the time being, the suspension strut has been ruled out due to concerns over stiffness and knuckle-clamping challenges related to the rheological properties of the favoured composite material.

Another interesting challenge is that composite materials are heat isolators, which goes against one of the primary functions of dampers: transferring damping forces into heat, and dissipating that heat into the surrounding environment. A solution has been found by increasing the surface area of the composite damper body through the addition of moulded ribs, offsetting the slower heat conductivity of the composite material by having more surface area.

A further challenge is that integrating a composite damper body with a steel inner tube into a twin-tube shock absorber design makes damper closure design more difficult. Given the different heat-expansion properties of the materials used, additional features must be implemented to secure the internal preload on the inner tube over the damper's entire operational temperature range.

## HAVE THESE CHALLENGES BEEN OVERCOME?

Bench testing has been completed, and the damper is now ready for serial production. BWI Group's composite damper body is an effective tool with which automotive designers can reduce vehicle weight, yielding reduced emissions, improvements to electric vehicle range, and improved vehicle agility and suspension system responsiveness. 

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