A match made in rubber & metal

Vehicle chassis are becoming increasingly complex, with more importance being placed on rubber metal components. To improve the steering performance and driving stability, the rubber metal components are used as a flexible joint between the chassis and the body. They include control arms, stabiliser links, engine and gearbox mountings, and strut top mountings.

Rubber metal parts have to firmly fix their respective components in position, absorb vibrations and drive torque, whilst making a significant contribution to increasing driving comfort and noise insulation. They also improve steering and vehicle stability when the road surface is uneven and during braking and evasive manoeuvres. The elastomeric materials used in the production of rubber-metal parts are matched precisely to the technical requirements and loads of their specific fitting position.

Fig 1. A hydro-mount without the outer metal sleeve

Construction and function of the hydro-mount

Despite all this, passive rubber metal components cannot absorb all the vibrations in the chassis. As a result, hydraulically damping elastomeric bearings (hydro-mounts) were developed. These enable the isolation and dampening of vibrations. A hydro-mount consists of a tubular metal inner part which is connected to a specially shaped rubber body by vulcanisation, and a metal outer sleeve. The specially shaped rubber material has embedded fluid chambers and flow channels (see fig. 1). With the additional damping characteristics of the fluid which occur in addition to the rubber core, it is even possible to achieve optimum reduction of vibrations in higher frequency ranges with smaller amplitudes. If parts with a solid rubber core are used instead of hydro-mounts, with only durability in mind, they do not absorb the vibration completely, but rather transfer it to surrounding chassis components, resulting in noises becoming more audible and vibrations noticeable.

Elastokinematics

In addition to these vibroacoustic properties, rubber metal parts are resilient and excellent for use as connection points between the individual chassis components. In a complex chassis, it is possible to achieve a specific increase in driving safety and responsiveness, because the stiffness of the elastomeric materials can be matched precisely to the suspension kinematics. These elastokinematics enable the wheels to adopt the optimum position in different driving situations, having a significant effect on comfort and safety. For example, when you apply the brakes, the wheel rotation is retarded and most of the vehicle weight transfers to the front wheels. The majority of the braking load is transferred via the lower control arm to the chassis. Most of this load is taken by hydro-mounts where fitted. So while the brakes stop the wheels, it is these control arms and their mounts that help to achieve the desired stabilisation on braking, while bringing the vehicle to a stop. If a rigid mount is fitted instead of a hydro-mount, the effect desired by the manufacturer, e.g. a change in the toe-in on braking, is significantly reduced. Although the parts may last longer, they may increase the likelihood of an accident, as the desired control is reduced.

Fitting instructions

Depending on the driving conditions, the fluid flows through the flow channels of the hydro-mount, offering the best possible potential for absorption. It is important that extra attention is paid to the correct fitting position with hydro-mounts, due to the alignment of the flow channels. In the Mercedes C class for example, the mount must be positioned in such a way that marking "a" must be pointing downwards, and the marking "b" pointing to the spherical head when the control arm is in the fitted position.

Caution must also be exercised when it comes to rubber metal parts, as they can appear outwardly identical, however a cross section reveals that the similarities are only skin deep. Some suppliers rely on a solid rubber core which does not, however, have the precise vibration and noise reducing or elastokinematic potential of hydro-mounts (see Fig. 2). Only an OE specification engineered hydro-mount fulfils the performance and comfort requirements of the vehicle. Specific high quality grade of rubber and engineered metal components, vulcanised in the correct way, is the only way to maintain the vibration absorption and acoustic characteristics of the vehicle. The cheapest is not always the best choice.

Further information may be obtained at www.bilsteingroup.com.

Fig 2. Comparison between hydro mounts and solid rubber mounts