



Making a big noise

NVH materials are becoming more important as comfort moves up the design agenda. Lou Reade reports

You'd think that the development of quieter engines – such as those seen in hybrid or electric vehicles – would make life easier for the acoustic engineer. If anything, the opposite is true, because suddenly drivers can hear a new range of annoying squeaks, rattles and vibrations.

“Many of these noises were previously hidden by the noise of the engine,” says Ivan Mini, global market manager for automotive interiors and safety components at Dow Corning. “On the one hand, we’re trying to damp vibrations from the engine. But we’re also looking to identify sources of noise in the car interior.”

The ever increasing need for comfort, especially on high-range cars, means these noises must be eliminated. There are many reasons for interior noise, he points out, with one of the main culprits being when two different materials rub together. A variety of plastics – including some

recycled materials – are finding more and more use in car interiors. If they are in contact with a different material, whether it is a metal or another plastic, this can set up ‘micro vibrations’ – causing unwanted squeaks. More annoyingly, noises like this can be amplified by other components, such as door panels.

The noises can be prevented in a number of ways: elastomeric materials – for use as gaskets or as adhesives – allow parts to flex and absorb vibrations; and various additives and dry lubricants can ensure that parts rub together, without generating noise.

Dow Corning can run tests on components to see whether two materials will make a noise when rubbed together. These tests can be repeated with different materials formulations, such as with and without a lubricant additive. The test helps to match materials, ensuring that those with the correct mechanical properties, for example,

will not generate unwanted noise.

While most car design teams can call on acoustic specialists, Mini feels that NVH issues do not merit as much attention as mechanical or aesthetic design, but thinks this is beginning to change. “Designers are getting more conscious of it, because of the importance of comfort in the car,” he states.

Attention to NVH can also deliver design flexibility, he says: for example, if the sliding mechanism for a seat uses a dry lubricant, rather than grease, there is no need to have a cover over it – saving one component. The company is also considering extending the concept of its ‘NVH kit’, which contains seven products in a ‘briefcase’. The products, such as sealant and various dry lubricants, have been used by designers to develop prototype parts for car interiors.

“We’re now planning something similar for other areas of the car, such as the engine and



Sophisticated electronics, complimentary materials and semi anechoic chambers are tools in the NVH challenge



transmission,” he adds. The proposed new kit would probably include some elastomeric materials and heavy-duty lubricants. Reducing weight is critical for all parts of the car: with new European penalties ready to be introduced next year, punishing cars with higher emissions, any weight reduction will automatically lead to a cost reduction. In fact, Rieter Automotive says that each 1kg saved would equate to a E4.2 saving in penalties.

Immediate savings

“Each kilo weight saving with lightweight products will mean immediate savings of penalties for the whole vehicle fleet, which has an enormous value for the OEMs,” comments Maurizio Mantovani, head of comfort functions at Rieter’s European acoustics business group.

He says there is a strong push to reduce the weight of NVH materials, in order to save fuel and cut emissions. An example is its Ultralight family of products, which are used for carpet systems, inner dashes, parcel shelves and trunk trim. Rieter claims that it can cut the weight of an NVH system by 40%. In the Mini Countryman, a complete thermo-acoustic engine encapsulation system has lowered emissions and cut fuel consumption.

One way in which Rieter plans to

develop optimised designs of NVH components is by using an in-house finite element analysis (FEA) program. The damping simulation procedure, called Silver, was presented at the recent Society of Automotive Engineers congress and is fully integrated in Nastran. “The procedure makes it possible to design the optimal damping layout, with respect to panel mobility targets, while taking into account the presence of the insulation part on body panels,” says the company.

All change

For Alain Guillaume, engineering manager at Trelleborg Automotive, NVH materials will have to work “even harder” as cars become better insulated against noise and vibration. “Third-order frequencies, or parasitic noise, become more evident to the driver and passenger,” he says.

“Electric vehicles should push this demand further, leading to an increasing use of active solutions – noise cancellation and not just damping,” is his contention.

Guillaume says that NVH components are becoming smaller and lighter for a number of reasons. One is the need for increased fuel efficiency, meaning that more NVH components are using plastics and composites: higher performance vehicles are increasingly using fibre-

reinforced rubber, for example, which helps to enhance strength and durability. At the same time, the trend towards smaller cars means that dampers must fit into a smaller space. Designers are having to react to new types of car as well.

“Hybrid technologies require mounting solutions that can switch between two states – an engine undergoing combustion (high vibration) and electric power mode (low vibration),” he points out.

Farther ahead, other emerging technologies are likely to pose new design headaches. “The development of fuel cell technologies creates new challenges,” concludes Guillaume. “The component’s lighter structure means increased vibration, as NVH switches focus to chassis, rather than powertrain, solutions.”

So, as cars get quieter and lighter, designers are faced with a new set of challenges. When electric or fuel cell-driven cars become mainstream, the cockpit will be almost devoid of engine noise. This means that designers of car interiors – and developers of NVH materials – will have to change their focus, if they are to banish unwanted noise from the cockpit.

The only alternative, it seems, would be to turn the radio up that bit louder.