

SCIENCE OF NOISE

IDENTIFYING AND SOLVING VEHICLE NOISE ISSUES



BOOM MAT THERMAL ACOUSTIC CONTROL

Every car, truck, hot rod or homebuilt vehicle has a unique acoustic signature due to engine type, exhaust, tires, build quality as well as the effects caused by aftermarket accessories. Elements of that signature can create an undesirable environment for the driver and passengers, such that it becomes necessary to address and repair unwanted noise, or at the very least, alter the quality of the noise encountered by utilizing various noise control materials and composites.

In order to accurately identify which noise control material will work to your satisfaction in your vehicle, one needs to first understand some basic Science of Noise as it relates to the material treatments available. Graphically, a given noise source, will typically be illustrated on an x & y axis, x being a given decibel level in dBA, and y being the frequency range from 100Hz to 5000Hz. With proper sound measurement equipment, it is possible to actually see the sine wave of the noise in question such that the loudest frequency level will become the peak frequency. It is in the control of the peak frequency where one can realize the greatest benefit in terms of actual dBA noise reduction. This is also where the term db's for dollars comes into play...the quieter the desired goal, the more it will cost.

However, most automotive enthusiasts that have certain noise issues with their vehicle may have a difficult time identifying their respective peak frequencies without proper sound measurement equipment. Historically, automotive noise is typically concentrated in the lower frequency spectrum, usually in the 500Hz range and

below. Lower frequency issues can also be the toughest to control, but there are a series of steps to take to help you make an educated decision on the best path to follow in achieving your noise reduction target.

Sealing... This part of the exercise will concentrate on identifying the existing structure as it applies to holes or leaks into the operator cabin. Confirm all weather strip is intact and working properly as it applies to its sealing characteristics. Carefully search out any remaining openings in areas such as the dash, firewall, transmission tunnel, mechanical linkages etc. Holes gaps or leaks once identified can be treated with caulk, gasket material. Or removable materials such as Super Seal Foam, for those areas where anticipated service may at some time be required.

Damping... Determine the need for damping. Lower frequency problems and issues can be the result of structure born noise. For example, if you rap your knuckle on the side of a metal file cabinet or washing machine, you'll notice a distinct ring of sorts as a result. Damping products such as Boom Mat or Boom Mat Thick, are designed to remove that ring from the metal. Typically, damping materials are used in vehicle doors in order to acquire the welcome thud sound when a door is closed, imitating the sound of a refrigerator door. Most all vehicle doors are likely candidates for this type of treatment as well as areas such as floors, trunk lids and roofs.

Absorbers...an effective noise control solution, but often times not practical in an automotive environment. In industrial and commercial noise control applications such as in heavy off-road construction equipment, effective noise absorbers that are tuned to peak frequency absorption is typically the most effective and least cost alternative to noise control.

Unfortunately, in most automotive cabins, due to design, there isn't much room to add foam absorbers in a

fashion to be both effective and measurable. However, when considering a major noise source, the engine compartment is a very viable candidate for absorption material such as Under Hood materials. Here, the choice would be for as thick a foam absorber as possible, with 3/4" thickness being the minimum. Strategically placed absorbers in an engine compartment will typically yield a measurable reduction.

Barriers...the most practical and effective noise control solution in most automotive applications. A barrier material such as Under Carpet, can be quite effective in controlling lower frequency noise issues. The additional mass of .5 - 1.0 lbs/sq.ft. is an ideal way to deflect unwanted noise from entering the automobile cabin. Considering the three major noise sources; engine, tires & exhaust, a barrier material can be applied to cover the entire floor pan inside, where by the mass of the barrier creates a blockage in the noise path.

The effectiveness of the barrier can also be enhanced by using a foam decoupler (1/4" thick open cell foam) under the barrier to simulate what is called 'the double wall effect'. This too will help to control the lower frequency noise problem. Another positive aspect of using Under Carpet to control noise in an automotive application is the removeability of the material. Should access to the chassis be required at some point after the initial installation or to return the vehicle to original status, the barrier can easily be removed without damage, and reapplied if necessary.

Changing the quality of the noise... Often times, the net result of a noise control exercise in a given vehicle will be a change in the quality of the noise rather than a significant dBA reduction. Not necessarily an undesirable finish, but more of an enhancement to the cabin environment. This is due to the fact that there are other factors beyond the vehicle itself that can affect the end result such as road surface conditions, wind, and even temperature.

A successful noise control project requires careful evaluation of the noise source as well as the anticipated path. Typically, there is not just one type of generic material used, but a variety of different materials that are designed to tackle specific issues.

