



Sound Attenuation – Diesel Powered Equipment

Diesel-powered equipment, with its many advantages, does have the drawback of being somewhat noisy. When placed in a room / enclosure with poor sound-absorption characteristics, this noise can be deafening and quite disturbing to those who find themselves in its environs.

As a manufacturer of removable insulation blankets, we are often called upon to provide sound attenuation as well. While standard removable insulation blankets do offer some sound attenuation properties, the correct solution is often a combination of removable blankets, composite foam barrier materials, insulation boards, and barrier curtains. The right choice depends on a number of factors particular to each situation.

Background: What is Sound?

Sound is a change in atmospheric pressure that is interpreted by the ear. The sound pressure level heard by a person in a room is determined both by the sound power radiated by the source of the sound and the acoustic characteristics of the room.

The most common way of measuring sound is in Decibels [dB] which measure both sound power and sound pressure levels and are expressed in logarithmic terms. **Tolerable noise is accepted as 85dBs.** (OSHA standard 29 CFR 1910.95).

To identify the root cause of a noise problem, sound has to be further analyzed into frequency levels [Hz Hertz], which for convenience are separated into 8 or 9 octaves on a frequency scale.

In order to engineer sound attenuation solutions, ideally, both the dB ratings and Octave band Frequency Analysis report are needed. This enables an Acoustics Engineer to address the complete situation within the practical limitations of the available materials and constraints of the individual case.

Sound Attenuation Solutions – Materials

Insulation solutions are based on using combinations of materials to absorb sound, to offer barriers to sound, and to close up places where there is sound leakage.

1. Some materials, such as Fiberglass and Mineral wool, are particularly good in absorbing higher frequency sound in the 1000 to 4000 Hz ranges.
2. Low frequency sounds are difficult to absorb because of their long wavelengths. In general, the absorption of low frequency sound increases with the thickness of the absorber or barrier.
3. Sound will leak through openings where no sound insulation is in place.



In order to give some perspective to the effect of Sound barrier materials and their effectiveness over a full Octave band we show data for some typical materials used.

Comparative Charts of three typical absorber materials showing Sound Absorption and NRC [Noise Reduction Coefficients]

<i>Frequency [Hz]</i>							
	125	250	500	1000	2000	4000	NRC
Material							
Fibrous Glass 4lb/cu.ft							
<i>Sound Absorption Coefficients</i>							
1" thick	.07	.23	.48	.83	.88	.80	.60
2" thick	.2	.55	.89	.97	.83	.79	.81
Fibrous Glass 11lb/cu.ft							
1" thick		.29	.86	.95	.92	.95	.75
Polyurethane Foam							
[Open Cell]							
1" thick	.14	.30	.63	.91	.98	.91	.70
2" thick	.35	.51	.82	.98	.97	.95	.82

Chart showing Transmission Loss and STC [Standard Transmission Loss Coefficient] for a Composite Absorber/Barrier used for lining Engine Rooms and Containers

<i>Frequency [Hz]</i>								
	80	125	250	500	1000	2000	4000	STC
Material								
<i>Transmission Loss [dB]</i>								
BTMM14C	22	22	22	32	44	50	56	34



Typical Solutions – Panels, Absorbers, Blankets

Typical solutions for Engine Generator sets in engine rooms or containers are to insulate the walls with absorption materials made from fibrous glass/mineral wools or open cell foam panels butted tightly against each other. However this concentrates mainly on the upper Hz range and not the lower Hz range, so often composites such as [Firwin BTMM14C](#) are used which offer better attenuation over the full octave spectrum. Composites include absorption materials and barrier materials together with a decoupler layer to separate the barrier from the room/container wall.

Where space considerations limit the use of wall/ enclosure insulation, Removable Insulation Blankets can be used for the manifold, turbo, exhaust piping, silencers, etc. contained inside the room/enclosure. These blankets contain composites to bridge the full frequency band. In some situations, both wall insulated and engine and exhaust blanketed approaches together achieve the best solution. These blankets have both heat and sound insulation properties with a side benefit of energy conservation.

Factors to Consider for Proper Sound Attenuation

1. Thickness of the materials used will affect the attenuation.
2. All panels must be butted up to each other to assure that there is no sound leakage.
3. Engines and other equipment must be mounted on vibration isolation mounts or pads to stop vibration and sound transmission.
4. Baffle chambers and good Silencers are also important.
5. Where space is at premium and enclosures cannot be used, Removable Insulation blankets with built in barriers are an answer. Because the Sound Insulation package is installed directly on the equipment the attenuation is usually limited to no more than 8 to 10dB [provided the installation is done with care and diligence]
6. Very often space and economic limitations will mean that the ultimate practical possible solution is not attainable.

Each project should be regarded as a separate case due to the multiplicity of variants from application to application.