

## K-Flex USA Acoustic Insulation Applications

Insulation is used to improve the acoustics of various types of applications. The applications can generally be categorized into two types: sound absorption and sound barriers.

Sound absorption applications would include: air handling equipment, duct lining, equipment rooms and room interiors where the goal is to reduce sound reflection and transfer by converting sound energy into heat. The sound waves are absorbed by the acoustic material and not reflected back into the room or area. This property is quantified by the Noise Reduction Coefficient as measured according to ASTM C423 (Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method). The test method covers the measurement of sound absorption in a reverberation room by measuring noise decay rate for the twelve one-third octave bands from 125 through 4000 Hz, inclusive. There are two values that are commonly reported for comparison with other materials: NRC (Noise Reduction Coefficient) and SAA (Sound Absorption Average). They differ slightly in that the NRC is an average (rounded to the nearest 0.05) of four frequencies (250, 500, 1000 and 2000 Hz) which have been rounded to the nearest 0.01 before averaging. The SAA is the average of all twelve frequencies rounded to the nearest 0.01. The coefficients approximate the percentage of sound absorbed. For example, a material such as K-Flex Duct<sup>®</sup> Liner Gray with an NRC = 0.55 would absorb 55% of the noise in the room.

Materials with excellent noise reduction properties are usually open cell type materials, allowing the noise to be captured in the cell structure. With open cell materials, as the material thickness increases, the noise reduction qualities usually improve as well. When using closed cell materials, such as K-Flex Duct<sup>®</sup> Liner Gray, increasing the thickness above 1" does not dramatically improve the sound absorption of the material. However, closed cell materials can also provide some barrier capabilities. K-Flex Duct Liner Gray has an STC rating of 12 at 1" thickness and 27 at 1" thickness when applied to 22gauge sheet metal.

K-Fonik<sup>®</sup> AB is an open cell, flexible elastomeric acoustic and thermal insulation material that has an NRC = .75 at 1" thickness and 0.85 at 2" thickness. It is not ASTM E84 25/50 rated for flame and smoke (K-Flex Duct Liner Gray is E84 25/50 rated up to 2" thickness), so product selection should be based on system requirements.

Sound barrier applications would include: room / building partitions, equipment / engine rooms, duct covering, and process / drain piping where the goal is to act as a barrier to the sound, not allowing it to exit or pass through the area being acoustically treated. Noise barriers reduce structure-borne noise generated by a vibrating surface and airborne noise when placed between a sound source and its receiver.

This property is quantified by the Sound Transmission Loss of the material as measured according to ASTM E90 (Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements). This test method covers the laboratory measurement of airborne sound transmission loss of building partitions, such as walls of all kinds, windows, roofs, ceiling panels, other space dividing elements and insulation materials

applied to equipment, pipes and wall curtains. Transmission loss is defined as the difference in decibels between the average sound pressure levels in the source and receiving rooms. The value stated is generally given as a single value (average decibel loss over the one-third-octave bands with mid-band frequencies from 100 to 5000 Hz) called STL (sound transmission loss) values. Single frequency values are generally not considered as these can be very sensitive to the shape of the spectrum in the source room and to the details of the transmission loss characteristics of the test panel. Sound barrier properties are generally related to the mass of the material, with the higher the mass (lb/sq ft), the higher (better) the STL value. The STL value essentially represents the dB reduction that can be expected when the barrier material is positioned between the source and the receiver.

Sound barrier materials are often referred to as mass loaded products and are specified or sold designated by their mass. K-Flex<sup>®</sup> Insul-Sheet closed cell foam at 1" thickness has a mass of .35 lbs/sq ft and an STL of 17 dB (STC = 13). K-Fonik<sup>™</sup> GK, which is considered to be a high mass material, at .75 lbs/sq ft has an STL of 22 dB (STC = 25), whereas K-Fonik<sup>™</sup> GK at 1.5 lb/sq ft has an STL of 26 dB (STC = 29). The effect of higher mass on the STL is easily seen.

In some applications, it is beneficial to use a combination of sound absorbing and sound barrier materials for the greatest effect. An insulation material can provide both thermal insulation and acoustical properties. The acoustical properties of a material can be affected by temperature, so the placement of the materials in the composite layer may be critical to the performance of the system. An application must be viewed from a complete systems approach.

It should be noted that data obtained in a controlled environment laboratory may be difficult to correlate to real world applications. It is best used as a comparison of the properties of various materials.

For more information on acoustic properties of specific K-Flex USA products, see the appropriate data sheet or contact a K-Flex USA representative.