Acoustic Performance of K-Flex Duct® Liner Gray in Duct Lining Applications

K-Flex Duct Liner Gray is a closed cell, flexible elastomeric duct lining material used to provide thermal insulation and to improve the acoustic performance of air handling systems (ducts). Acoustic performance can generally be categorized into two functions: noise reduction (absorption) and sound barrier. For acoustic duct lining applications, the primary goal of the insulation is to achieve noise reduction through the absorption of sound waves and the subsequent conversion of sound energy into heat. The insulation absorbs the noise from the air handler (fan) as well as airborne room noise and prevents it from traveling down the duct and exiting at the vent openings. The metal duct itself acts as a sound barrier, preventing noise inside the duct from traveling through the duct itself and radiating into the space through which the duct passes. This is referred to as "controlling breakout noise".

Noise reduction is quantified by the Noise Reduction Coefficient (NRC) as measured according to ASTM C423, which measures sound absorption in a reverberation room by determining noise decay rate. The NRC approximates the percentage of sound absorbed and is an average of four frequencies (250, 500, 1000, and 2000Hz). For example, K-Flex Duct® Liner Gray with an NRC = 0.55 would absorb 55% of the noise in the room. Products with excellent noise reduction properties are usually open cell, low density materials, allowing the noise to be captured in the cell structure, and flexible rather than rigid, allowing them to dissipate the energy associated with the noise.

Sound barrier materials reduce the amount of noise that will pass through the area being acoustically treated by reflecting the sound waves back to its source. This property is quantified by the Sound Transmission Loss (STL) of the material as measured according to ASTM E90, which describes the method of measuring an insulation material's ability to prevent noise transmission when applied to equipment, pipes and wall curtains. STL values are defined as the difference in decibels (dB) between the average sound pressure levels in the source and receiving rooms before and after acoustic treatment which are then used to determine the Sound Transmission Class (STC) of the product. Sound barrier properties are generally related to the mass of the material in that the higher the mass, the higher (better) the STC value. In the case of metal air ducts, the metal duct itself can be a good barrier material if it is heavy and rigid enough, and open cell insulation is not a major contributor as a sound barrier. When STC values are given for duct lining materials, they are often tested as a composite (insulation and metal together) as this provides a more accurate measure of the STL of the application and if the insulation were tested by itself, it would not provide a very high value. It should be noted however, that insulation, when adhered to the duct will reduce noise created by vibration from the duct.

Based on these property characteristics, insulation materials with a good STC normally have a relatively poor NRC value, and vice versa. As a result, elastomeric insulation (in either semi-open / crushed or a standard closed cell structure) can provide a high NRC (0.50 – 0.60), noise absorption performance <u>but a relatively low STC</u> value 12 – 17 dB.   Insulation products used as duct lining that indicate a high (25 dB) STC value are supplying results based on testing as a composite (insulation / metal duct).   The K-Flex Duct® Liner Gray data sheet indicates the STC for the material both plain insulation (STC = 12 at 1" thickness) and as a composite of insulation and 22 gauge metal duct (STC = 27)) for an accurate representation of both the material itself and as it is typically used.

Refer to Technical Bulleting TA 66 for additional information, or contact a K-Flex USA representative.