290 TRIPLE LAYER FIRE AND ACOUSTIC HOOD

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Lithe Audio Ltd has created a loudspeaker fire and acoustic hood engineered to provide up to 90 minutes of protection against fire spreading between floors in both residential and commercial buildings. As part of our commitment to innovation and quality assurance, the acoustic insertion loss of a new loudspeaker hood, referred to as Lithe Audio 290 (Triple Layer), has been thoroughly evaluated.

TESTING METHODOLOGY:

The acoustic performance evaluation was conducted in accordance with ISO 11546-1: 1996 standards. This methodology involves measuring the sound pressure level in a free-field over a reflecting plane both with, and without the loudspeaker hood in place. The difference in sound pressure levels, denoted as Dp, represents the insertion loss or sound insulation performance.

TESTING ENVIRONMENT:

The tests were performed in a hemi-anechoic chamber meeting the requirements of ISO 11201: 2010. The chambers free-field radius is 1.5 meters, providing acoustic conditions suitable for accurate measurements. Background noise levels exceeded 30 dB signal-to-noise ratio in all frequency bands, ensuring reliable testing conditions.

TESTING SYSTEM:

A standard Gyproc plasterboard sheet served as the test surface, with the loudspeaker hood securely installed using provided metal pins. A Genelec 6010A active 2-way loudspeaker generated the test frequencies, positioned in an up-firing orientation on a rubber isolation pad to prevent structural vibrations. A calibrated sound level meter meeting Class 1 requirements of IEC 61672-1: 2013 was used for sound pressure level measurements.

RESULTS:

The insertion loss performance of Lithe Audio 290 (Triple Layer) is presented in one-third octave frequency bands, demonstrating varying levels of sound attenuation across different frequencies. Additionally, a weighted single number value, Dp,w, was derived in accordance with ISO 717-1: 2020, providing a comprehensive assessment of overall acoustic insulation performance versus Lithe Audio Standard 270 hood.

ANALYSIS:

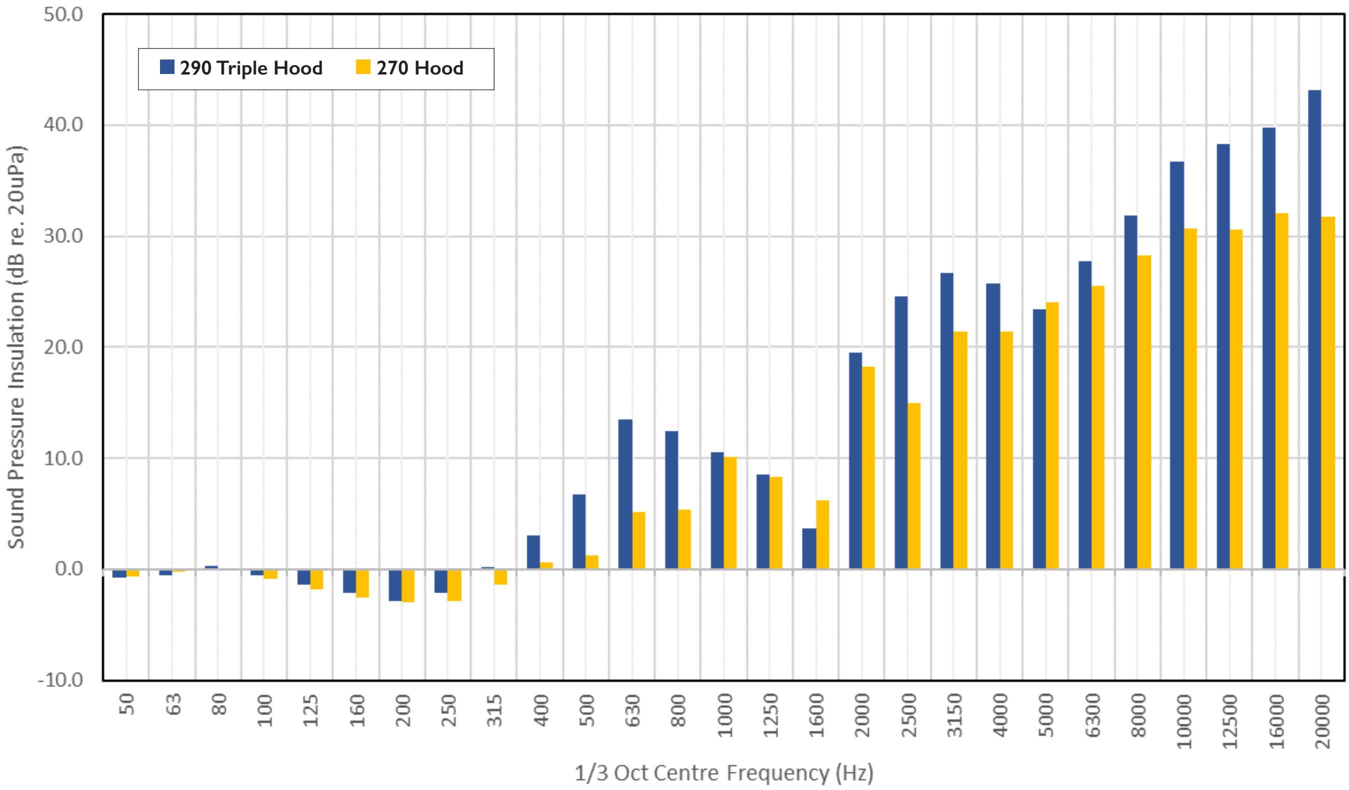
The analysis of the acoustic performance of the Lithe Audio 290 (Triple Layer) loudspeaker hood provides valuable insights into its effectiveness in attenuating sound transmission across different frequency bands. Here, we delve deeper into several key aspects:

Frequency Response:

The frequency response curve illustrates the variation in insertion loss across different frequencies. While the overall trend indicates an increase in sound insulation performance with frequency, there are notable deviations, particularly in the 1600 Hz frequency band. This deviation suggests the presence of Helmholtz resonance, which is a phenomenon commonly observed in enclosures and can impact sound transmission characteristics.

Standard Deviation Analysis:

The standard deviation of repeated sound pressure level measurements offers important information regarding the consistency and repeatability of the testing process. By comparing the standard deviations with and without the loudspeaker hood in place, we can assess the influence of mounting conditions and the sealing integrity of the hood. In this analysis, minor variations observed in certain frequency bands, particularly in the range of 3150 – 16,000 Hz, indicate potential challenges in maintaining consistent acoustic seals with the plasterboard ceiling. This underscores the importance of ensuring proper installation and mounting techniques to optimise the hood's performance.



Impact on Single Number Rating:
The single number rating, Dp,w, provides a concise summary of the overall acoustic insulation performance of the loudspeaker hood. By deriving this weighted value according to ISO 717-1: 2020, we gain a comprehensive understanding of the products effectiveness in attenuating sound transmission across a wide frequency range. However, it's important to note that variations in performance, particularly in specific frequency bands, can influence the final rating. For instance, improvements in performance in critical frequency bands, such as the 1000 Hz, 1250 Hz, and 1600 Hz bands, can significantly enhance the overall rating of the product.

Potential for Improvement:
The analysis highlights areas where further optimization and refinement may be beneficial. For instance, addressing the Helmholtz resonance effect in the 1600 Hz frequency band through design modifications or acoustic treatments could lead to improvements in overall sound insulation performance. Additionally, efforts to enhance the consistency of mounting and sealing conditions could reduce variability in performance across different frequency bands, resulting in a more reliable and predictable acoustic outcome.

To understand the practical implications of this reduction in noise transmission, consider the following:

Effect on Speech and Conversation/Background Noise:
A reduction of 9 dB can make a noticeable difference in reducing the clarity and intensity of speech and conversation. While speech may still be audible, it would be quieter and less intrusive, making it easier for occupants in the rooms above to concentrate or engage in conversations without being disturbed by the sound from the loudspeaker.

Enhanced Privacy:
The reduction in noise transmission can enhance privacy for occupants in the rooms above, as conversations or activities occurring in the space with the loudspeaker are less likely to be heard clearly. This can be particularly beneficial in residential settings where privacy is valued.

Improved Acoustic Comfort:
Overall, the reduction in noise transmission provided by the hood can contribute to improved acoustic comfort in the rooms above, creating a more enjoyable and conducive environment for various activities, such as relaxation, work, or sleep.

It's important to note that while a 9 dB reduction represents a significant improvement in noise reduction, the effectiveness of the hood may vary depending on factors such as the construction of the building, the presence of other soundproofing measures, and the specific characteristics of the loudspeaker and surrounding environment.

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CONCLUSION:

The thorough analysis of the acoustic performance of the Lithe Audio 290 (Triple Layer) loudspeaker hood reveals valuable insights into its effectiveness in attenuating sound transmission across various frequency bands. While the overall trend indicates a commendable increase in sound insulation performance with frequency, notable deviations, particularly in the 1600 Hz frequency band, suggest the presence of Helmholtz resonance, warranting attention for further optimization.

Furthermore, the examination of standard deviations highlights the importance of consistent mounting and sealing conditions to ensure reliable performance across different frequency bands. These findings underscore the significance of meticulous installation practices and potential areas for refinement to enhance the hood's overall acoustic performance.

In real life, this statement means that the Lithe Audio 290 (Triple Layer) loudspeaker hood has been found to provide a sound insulation performance of Dp,w 9 dB. This indicates that the hood is effective in reducing the transmission of sound from the loudspeaker to its surroundings. Essentially, it means that when the loudspeaker is operating within the hood, the sound level outside of the hood is reduced by approximately 9 decibels compared to when the hood is not in place. This reduction in sound transmission can contribute to creating quieter and more comfortable environments in both residential and commercial spaces, improving overall acoustic privacy and comfort.

In terms of volume, a sound insulation performance of Dp,w 9 dB means that the loudspeaker hood reduces the volume of sound transmitted outside of the hood by approximately 9 decibels compared to when the hood is not installed. Decibels (dB) are a logarithmic unit used to measure the intensity or volume of sound.

To put this into context, every 10 dB reduction in sound level is perceived as roughly half the volume by human ears. Therefore, a reduction of 9 dB would correspond to a noticeable decrease in volume, but it may not necessarily halve the perceived loudness.

For example, if the sound level of the loudspeaker without the hood is measured at 80 dB, installing the hood would reduce the sound level to approximately 71 dB. This reduction in volume can contribute to creating quieter environments and improving acoustic comfort in residential and commercial spaces.

In conclusion, the comprehensive analysis presented in this study serves as a valuable foundation for ongoing refinement efforts and underscores our commitment to delivering innovative and effective solutions for sound insulation in building environments..

REFERENCES:

IEC 61672-1: 2013. Electroacoustics - Sound level meters - Part 1: Specifications

ISO 11546-1: 1996. Acoustics — Determination of sound insulation performances of enclosures - Part 1: Measurements under laboratory conditions (for declaration purposes).

ISO 717-1: 2020. Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation

ISO 26101: 2021. Acoustics — Test methods for the qualification of the acoustic environment — Part 1: Qualification of free-field environment

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