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The Effect of Honeycomb Cavity: Acoustic Performance of a Double-leaf Micro Perforated Panel

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ABSTRACT

A micro perforated panel (MPP) is a device consisting of a thin plate and submillimeter perforations for reducing low frequency noise. MPPs have many advantages compared to traditional sound absorption materials, such as durability and designability, and they can be used in a variety of places such as room interior designs, passenger and crew compartments of aircrafts and combustion engines. The models in this study were designed and fabricated with the latest 3-D printing technology. The transmission loss and sound absorption coefficient of the 3-D printed double-leaf MPPs with honeycomb cavities were studied. According to the established theory, MPPs work well with the help of a backing and a cavity. Earlier experimental and theoretical developments have suggested that the acoustic performance of the MPPs can be improved by partitioning the backing cavity. A Brüel & Kjær type 4206 impedance tube was used for the experiments and the one-load method was implemented for calculating the absorption and transmission coefficients of the MPPs. A honeycomb structure was chosen to be placed in the cavity because it can provide the required partitions between perforated panels so that the overall transmission loss was expected to be higher than those without the cavity partitioning. Measured results indicated that use of the honeycomb structure in the cavity have improved the acoustic performance of the MPPs. The sound absorption coefficient of a double-leaf MPP was similar to that of a single-leaf MPP if the cavity was long enough. Future studies should involve an investigation of the acoustic performance of the MPPs at oblique angles of incidence because the current study only provides the pertinent information at normal incidence since the standing wave tubes were used in the experiments.

KEYWORDS

Acoustics, micro perforated panels, transmission loss, honeycomb, noise control