

## عنوان مقاله:

Optimum Design of Multi-layered Micro-perforated Panel Sound Absorbers in Combination with Porous Materials in an Arbitrary Frequency Range

## محل انتشار:

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## خلاصه مقاله:

Optimum design of sound absorbers with optimum thickness and maximum sound absorption has always been an important issue to noise control. The purpose of this paper is an achievement of optimum design for micro-perforated panel (MPP) and its combination with a porous material and air gap to obtain maximum sound absorption with maximum overall thickness up to about 10 cm in the frequency range of (20-500 Hz), (500-2000 Hz) and (2000-10000 Hz). For this purpose, the genetic algorithm is proposed as an effective technique to solve the optimization problem. By using the precise theoretical models (i.e. simplified Allard's model and Atalla et al.'s model) to calculate the acoustic characteristics of each layer consisting of MPP, porous material, and airgap, we obtained more precise optimized structures. The transfer matrix method has been used to investigate the sound absorption of structures. To verify the operation of the programmed genetic algorithm, the results obtained from the optimization of the MPP absorber are compared with others that show the accuracy and efficiency of this method. After ensuring the accuracy of the proposed programmed genetic algorithm with more precise theoretical models to achieve the characteristics of each layer, new structures were obtained that have a much better sound absorption coefficient in the desired frequency range than the previous structures. The results show that the sound absorption coefficient can be reached to 0.67, 0.96, and 0.96 in the mentioned first, second, and third frequency range, respectively by optimum design parameter choosing of a composite structure.

## کلمات کلیدی:

Sound Absorption Coefficient, Micro-perforated panel absorber, Optimized composite absorber, Transfer matrix method, Genetic Algorithm

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