TESTING MULTIPLE LAYERED SOUND-ABSORBING PANELS IN OUDOOR ENVIRONMENT

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Abstract

This paper describes the thorough research concerning sound-absorbing panels and noise absorption phenomenon by means of studying the panel aesthetics and finding new recipes and mixtures of sound-absorbing materials that should materialize by means of design and fabrication of various installations, in order to determine the mechanical characteristics and the flexibility of these materials. The purpose of the experimental tests performed on gypsum and modeling plaster based building materials with thermal and sound-absorbing properties, was to determine their elasticity as well as other parameters not mentioned by technical norms specific to these trials for materials. To this purpose, the Matlab software was used to design the measurement and data acquisitions programs. The acquisition program is written in the Visual C ++ language, using functions in the functions library of the acquisition board. The results deriving from the use of a double or triple layered sound-absorbing panel stand are shown, and the results prove that continuous noise attenuation over the entire frequency range used was recorded.

Key words: sound-absorbing panels, manufacture, mold, noise

INTRODUCTION

The experimental tests were applied to gypsum and modeling plaster construction materials with thermal and sound-absorbing properties, with the purpose of determining their elasticity as well as other parameters not mentioned by the technical norms pertaining to these various tests performed on the materials.

For this purpose, three installations were built and tested designed to determine the elasticity, absorption coefficient and the study of the behavior of the sound-absorbing panels in outdoor environments, all of which are described in below (Ungur, 2010).

MATERIAL AND METHODS

Figure 1 shows the data acquisition system used at the University of Oradea, Faculty of Management and Technological Engineering. The acquisition is performed by using the system shown in fig. 1. The acquisition program is written in the Visual C ++ language using functions in the function library of the acquisition board.

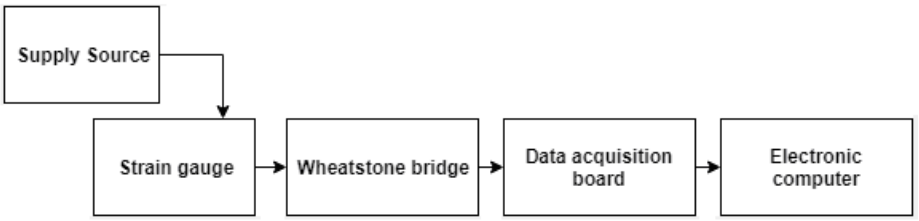

Fig. 1 Data acquisition system with strain gauges.

Measurements were made concurrently with the computer data recording, respectively in CENTER332 (Data Loger Sound Level Meter) from Taiwan fig.2.

Fig. 2 Measurement of sound-absorbing panels using the test and additional noise recording system in CENTER 332 provided with Digital Sonometer

The installation for studying the behavior of sound-absorbing panels in outdoor environment generally uses the same data generation and acquisition system used to determine the absorption coefficient.

RESULTS AND DISCUSSION

The tests were performed by using a 6 sound-absorbing panel stand and two computers: one for signal generation and the other for acquisitions and interpretation of the noise passing through these panels. (Ungur, 2009) However, several layers of sound-absorbing panels were used (1 to 3 layers), and the noise source was maintained at 0.5 m from the test stand. The results of the test can be seen in Figure 3, respectively Figure 4.

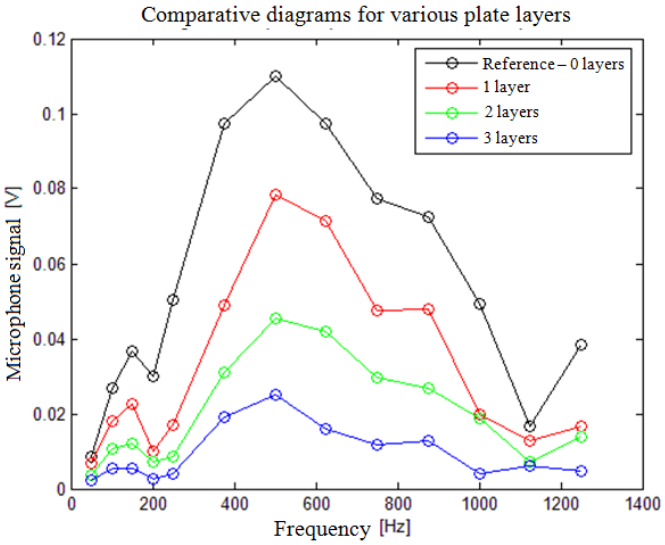

Fig. 3. Measurement diagrams for sound-absorbing panels with layer variation, using the system and interpretation of results by means of computer and by using the "zgomote0a3" program, rendered in volts.

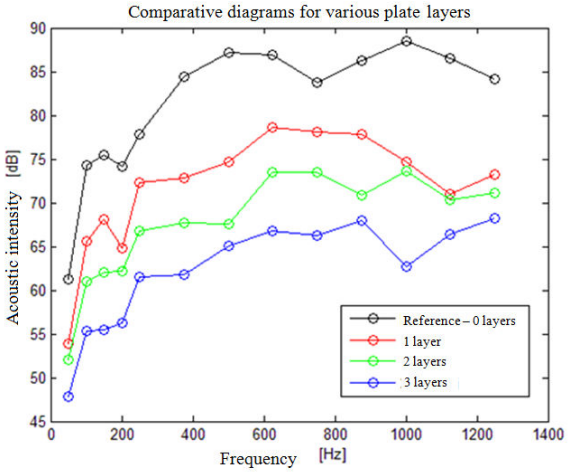

Fig.4. Measurement diagrams for sound-absorbing panels with layer variation by using the installation and interpretation of results by using the CENTER 332 Sonometer, rendered in dB

CONCLUSIONS

The measurements presented in this paper were performed by having a source positioned at 0.5m from the stand consisting of 2 and 3 layers of

sound-absorbing panels. The results of the measurements are illustrated in Figure 3 and Figure 4. Following the usage of a double or triple layered sound-absorbing panel stand, continuous noise attenuation for the entire frequency range was recorded. Thus:

- For a 2 layered sound-absorbing panel stand, the attenuation was recorded to be between -7.1dB and -18.6dB, with an average of -13.5dB and the best result at 500Hz and 1125Hz.
- For a 3 layered sound-absorbing panel stand, the recorded attenuation ranged between -13.4dB and -25.4dB, with an average of -19.1dB and the best result at 1000Hz.

Both tests have highlighted the quality of sound-absorbing panels in outdoor tests, the only problem being panels' low endurance under humid conditions.

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