Acoustic properties of innovative material from date palm fibre

Abstract

Problem statement: An organic material is one of the major requirements to improve living environment and the invention of materials need to consider for the best solution. This study presents an experimental investigation on pure porous from Date Palm Fibre (DPF). The effectiveness of sound absorbers depends on structural architecture of this material. This study was conducted to examine the potential of using date palm fibre as sound absorber. The effects of porous layer thicknesses, densities and compression on Acoustic Absorption Coefficient (AAC) of sound absorber using date palm fibre were studied. Approach: Rigid frame Johnson-Allard Model for various sample thicknesses was used in this study. The measurements were conducted in impedance tube on normal incidence acoustic absorption. The date palm fibre was mixed with latex which used for physical treatment on this material. Acoustic absorption behaviour of a porous material with different thicknesses was studied as well as samples with same thickness but different densities. In addition, samples with same properties but different period of compression time were inspected. The tests were in accordance to ISO 10534-2 and ASTM E1050-98 international standards for Acoustic Absorption Coefficient (AAC). Results: The experimental data indicates that two peak values of AAC is 0.93 at 1356Hz for sample with 50 mm thickness, also the AAC at high frequency for same thickness is 0.99 at 4200-4353 Hz that means able to improve acoustic absorption coefficient at low and high frequencies with significant increasing. Meanwhile, another experimental results were acquired for AAC of date palm fibre, with samples thicknesses of 35 mm at different densities.The results show that denser sample (11 Kg m -3) has higher AAC value of 0.83 at 1934-2250 Hz as compared to less dense sample (9.92 Kg m -3) with AAC value 0.84 at 2443-2587 Hz. Conclusion: Acoustic absorption coefficient AAC of date palm fibre was increased at all frequencies when the thickness of sample was increased, particularly at low frequencies less than 1200 Hz. The introduction of latex on the samples adds stiffness, so that sound can be dissipated significantly as it travels through material. Results from the experimental tests show that date palm fibre has good acoustic properties at low and high frequencies and can be used as an alternative replacement to conventional product. Increasing density of the samples, increase the AAC as well. The innovative acoustic absorption panel has a good potential because they are cheaper and lighter in comparison to asbestos and rock wool industrial materials.