

Comparative Study of Acoustic Performance in Thermal Flow with the Addition of Natural and Synthetic Materials

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ABSTRACT

This study aims to analyze the comparison of indoor temperature conditions using natural and synthetic insulation materials. The research was conducted by measuring room temperature in a mushalla using an environment meter to observe temperature variations at different distances from the wall.

The collected data were then validated and analyzed through Computational Fluid Dynamics (CFD) simulation using Workbench 2025 R1. The natural insulation material used was coco fiber, while the synthetic material was glass wool, both applied on brick wall layers.

Field measurements showed significant temperature fluctuations both indoors and outdoors. Simulation results indicated that natural and synthetic materials exhibit different performance in thermal resistance, with glass wool having a lower thermal transmittance coefficient (0.040 W/m²K) compared to coco fiber (0.045 W/m²K), affecting indoor temperature distribution. This research highlights the importance of selecting appropriate insulation materials to enhance energy efficiency and indoor thermal comfort in buildings.

Keywords: indoor temperature, thermal insulation, ANSYS, glass wool, coco fiber, CFD.