

Numerical HVAC analysis of shape-stabilized phase change material plates  
coupling an active building envelope system in a building

蔡博章, 林顯群, 楊位盛

Mechanical Engineering

Engineering

bjtsai@chu.edu.tw

Abstract

Abstract—Effect of shape-stabilized phase change material (SSPCM) plates combined with night ventilation in summer is investigated numerically. A building in Hsinchu, Taiwan without active air-conditioning is considered for analysis, which includes SSPCM plates as inner linings of walls, the ceiling and floor, and an active building envelope the Hybrid system. Unsteady simulation is performed using a verified enthalpy model, with time period covering the summer season. In the present study, a kind of floor with SSPCM is put forward which can absorb the solar radiation energy in the daytime or in summer and release the heat at night or in winter. In the present paper, the thermal performance of a room using such floor, wall and ceiling were numerically studied. Results show that the average indoor air temperature of a room with the SSPCM floor was about 2 K to 4 K higher than that of the room without SSPCM floor, and the indoor air temperature swing range was narrowed greatly. This manifests that applying SSPCM in room suitably can increase the thermal comfort degree and save space heating energy in winter.

Keyword : Shape-stabilized phase change material, Active building envelope system, HVAC, Renewable energy