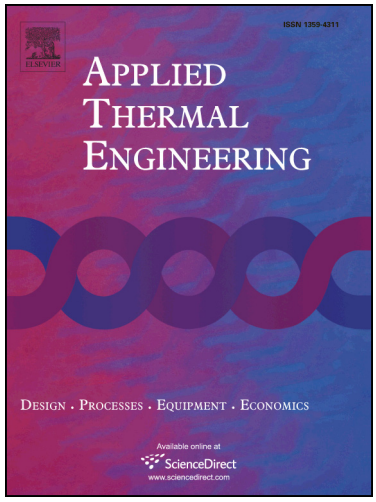

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Enhancement of natural ventilation of a novel roof solar chimney with perforated absorber plate for building energy conservation

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Abstract

A roof solar chimney equipped with perforated absorber plate was proposed to improve the ventilation performance of buildings. The optimized roof solar chimney consist of a glazed panel, a gap, a perforated absorber plate, and an absorber wall. Three-dimensional numerical simulations were conducted to investigate the heat transfer and fluid flow in the roof solar chimney at different gap widths and inclination angles. Mass flow rate, velocity profile, and temperature distribution in the roof solar chimney were presented. In the meantime, the comparisons of ventilation performance between the optimized configuration and the traditional roof solar chimney were performed. The perforated absorber plate, which divided the roof solar chimney into two channel and heat the air in the gap, increase the pressure head and the temperature difference between the ambient and inside air to augment the natural ventilation. The mass flow rate of the proposed optimized roof solar chimney is higher than that of the traditional roof solar chimney. It is also found that the optimization techniques using perforated absorber plate fitted in the air gap is more effective for the roof solar chimney with larger inclination angle and gap width.

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