

Thermodynamic Analysis of Ventilated Façades under Operating Conditions in Southern Spain

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Abstract : In this work we study the thermodynamic behavior of some ventilated facades under summer operating conditions in Southern Spain. Under these climatic conditions, indoor comfort implies a high energetic demand due to high temperatures that usually are reached in this season in the considered geographical area. The aim of this work is to determine if during summer operating conditions in Southern Spain, ventilated façades provide some energy saving compared to the non-ventilated façades and to deduce their behavior patterns in terms of energy efficiency. The modeling of the air flow in the channel has been performed by using Navier-Stokes equations for thermodynamic flows. Numerical simulations have been carried out with a 2D Finite Element approach. This way, we analyze the behavior of ventilated façades under different weather conditions as variable wind, variable temperature and different levels of solar irradiation. CFD computations show that the combined effect of the shading of the external wall and the ventilation by the natural convection into the air gap achieve a reduction of the heat load during the summer period. This reduction has been evaluated by comparing the thermodynamic performances of two ventilated and two unventilated façades with the same geometry and thermophysical characteristics.

Keywords : passive cooling, ventilated façades, energy-efficient building, CFD, FEM

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