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Abstract

The aim of this paper is to investigate the technical, energy and financial convenience of Controlled Mechanical Ventilation (CMV) systems in residential units. With reference to a residential unit belonging to an apartment block, a mechanical ventilation system is first conceived according to different possible configurations (constant or hygro-adjustable flow, single or double flow). All the proposed configurations are suitable to provide fresh outdoor air and dilute indoor pollutants; this preliminary analysis allows to evaluate the overall costs for installation.

Then, the paper determines the energy consumption for the operation of all the proposed configurations, both in terms of electricity to feed the blower fan and of fuel to preheat the cold air stream up to the indoor air temperature. Finally, these results are compared to the energy needs for a building without CMV systems, where air renewal is left to the occupants, who open and close windows at will. This analysis is proposed for three different sites in Italy, that show different climatic conditions.

The results suggest that the adoption of controlled mechanical ventilation in residential units is a convenient practice under several points of view. Indeed, they undeniably allow to save primary energy, and the financial payback time is fairly low, particularly in cold climates.

Keywords: Controlled mechanical ventilation, residential buildings, indoor air quality, primary energy, costs.

Nomenclature

Variables

A surface area (m^2)

ACH air change rate (h^{-1})

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