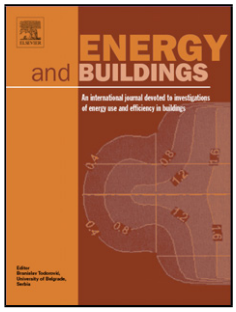

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Analysis of Operational Performance of a Mechanical Ventilation Cooling System with Latent Thermal Energy Storage

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Highlights

- Operational performance analysis of an active LTES provides thermal comfort
- Comfort is maintained within adaptive thermal comfort limits
- Energy consumption for cooling is very small
- Control system charging periods and set-point temperatures influence performance.

Abstract

Latent Thermal Energy Storage (LTES) is a promising solution to reduce cooling energy consumption in buildings. Laboratory and computational studies have demonstrated its capabilities while commercial passive and active systems are available. This paper presents data and analysis of the performance of an active LTES ventilation system in two case-studies, a seminar room and an open plan office in the UK. Analysis using environmental data from the system's control as well as additional space monitoring indicates that (a) internal temperature is maintained within adaptive thermal comfort limits, (b) acceptable Indoor Air Quality is also maintained (using metabolic CO_2 as indicator) and (c) energy costs are low compared to air-conditioned buildings. Thermal and CFD computational studies indicate that purging and charging duration and associated set-points for room temperature as well as air flow rate are the important parameters for optimised performance for a given LTES design. These parameters should be optimised according to the use of the space and prevailing external conditions to maintain internal thermal comfort within upper (usually in the afternoon) and lower (usually in the morning) limits.

Keywords: Active LTES, operational performance, cooling, ventilation