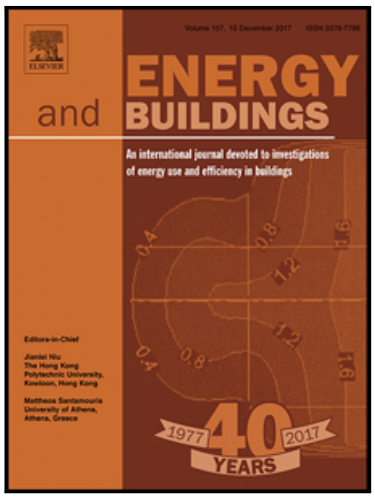

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Impact of demand controlled ventilation on system performance and energy use

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Abstract

Demand-controlled-ventilation (DCV) refers to a ventilation system with controlled air flow rate based on indoor air quality. DCV operates at reduced air flow rates during most of the operation time. Therefore, less energy is required for fan operation, compared to a constant-air-volume (CAV) ventilation system.

Typically, DCV has a two-layer control with variable-air-volume (VAV) valves, and a fan speed control to maintain a constant-static-pressure in the duct system based on a pressure set point.

However, this nominal design based fan pressure setpoint is higher than required when all VAV-valves are closed to a certain extent. Therefore, advanced pressure-reset (PR) control - resetting the pressure set point - potentially reduces fan energy use even further.

This paper assesses the impact of fan control on both fan energy use and ventilation performance in DCV system of a densely occupied office. Results of a simulation model and realistic measurement setup are compared. The PR control, using air flow rate and VAV-valve position measurements as feedback, causes significantly reduction on fan energy use. These reductions compared to conventional DCV and CAV respectively, are approximately 10% and 72% in case of high occupancy and 50% and 93% in case of low occupancy. Largely, DCV with PR control