Performance potential of mechanical ventilation systems with minimized pressure loss - DTU Orbit (08/12/2018)

Performance potential of mechanical ventilation systems with minimized pressure loss

In many locations mechanical ventilation has been the most widely used principle of ventilation over the last 50 years but the conventional system design must be revised to comply with future energy requirements. This paper examines the options and describes a concept for the design of mechanical ventilation systems with minimal pressure loss and minimal energy use. This can provide comfort ventilation and avoid overheating through increased ventilation and night cooling.

Based on this concept, a test system was designed for a fictive office building and its performance was documented using building simulations that quantify fan power consumption, heating demand and indoor environmental conditions. The system was designed with minimal pressure loss in the duct system and heat exchanger. Also, it uses state-of-the-art components such as electrostatic precipitators, diffuse ceiling inlets and demand-control ventilation with static pressure set-point reset. All the equipment has been designed to minimize pressure losses and thereby the fan power needed to operate the system. The total pressure loss is 30-75 Pa depending on the operating conditions. The annual average specific fan power is 330 J/m³ of airflow rate. This corresponds to 10-15% of the power consumption for conventional mechanical ventilation systems thus enabling the system to fulfil future energy requirements in buildings.

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