System Design for Demand Controlled Ventilation in Multi-Family Dwellings

This paper presents an investigation into solutions for the system design of a centralized DCV system in multi-family dwellings. The design focused on simple and inexpensive solutions. A cost benefit estimate showed that the initial cost of implementing DCV in a system with an efficient heat exchanger should not exceed 3400 DKK per dwelling in regions with weather conditions similar to the Danish climate. A design expected to fulfill this requirement was investigated in detail with regard to its electricity consumption by evaluation of different control strategies. Systems with variable airflows are typically controlled by maintaining the static pressure at a fixed level at a selected point in the main duct. However, sustaining the static pressure at a fixed level at part load leads to throttling of all control components and thereby unnecessary energy consumption. Resetting the static pressure at part load condition reduces throttling and energy can be saved. A static pressure reset strategy was applied to a dwelling-specific DCV system where the airflow varied between three fixed rates. The system performance was evaluated for two diffusers. The annual electricity consumption was reduced by 20% to 30% when resetting the static pressure at part load condition compared to a control strategy with fixed static pressure.