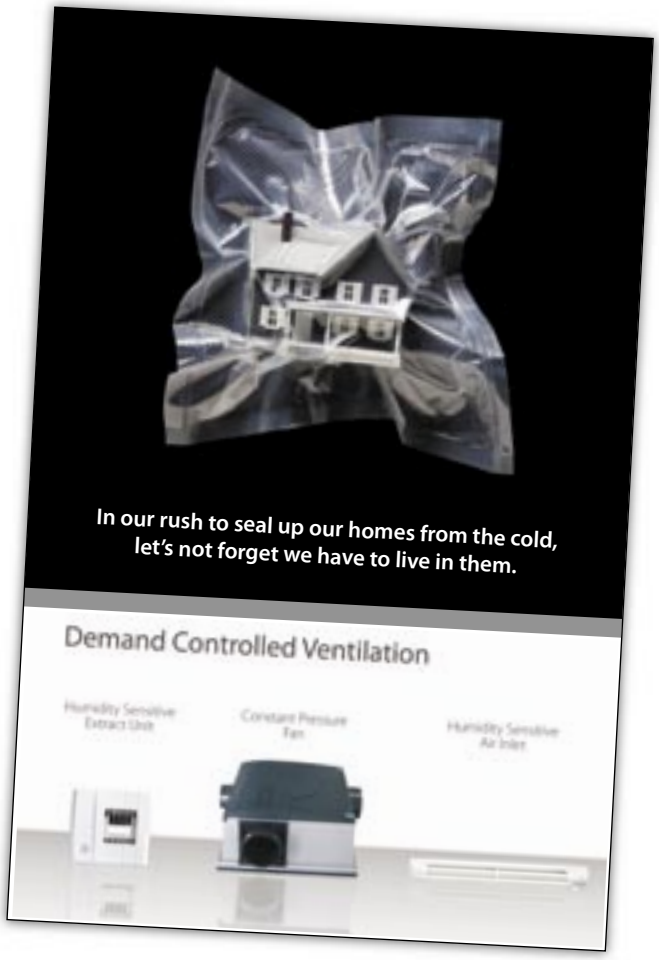
A BREATH OF FRESH AIR FOR NEW AIR TIGHT DWELLINGS

With more than two million homes on the Continent operating safely, energy efficiently and successfully with demand controlled ventilation, is it time for the UK to consider adopting this highly effective system as a standard for both new build and refurbishment?



At a time when both the private and public sectors are looking for improvements in energy efficiency standards for the new generation of air-tight buildings, there is a very real need to install effective ventilation. The recent trend in the UK has been towards embracing mechanical heat recovery ventilation (MHRV).

But is MHRV really the best way to go? There is a school of thought that comes down heavily in favour of demand controlled ventilation (DCV), commonly used on the European continent and Scandinavia in social housing, as a far superior solution for ventilating air tight buildings.

German study show DCV costs are lower

A 2008 study by the Fraunhofer Institut Bauphysik in Germany shows that DCV is a more cost effective and reliable method of delivering the optimum indoor environment. The study published its calculation of primary energy needed for a supply and extract fan with heat recovery in comparison to a demand controlled mechanical extract fan (based on humidity sensors) and comes down heavily in favour of DCV.

In exhaustive tests, the Institut found that a demand controlled MEV system generated only 1070kWh extra consumption per heating period than an 80% heat recovery system and for half the cost. This was equivalent to only €47 or £40 in the conditions of the study which was carried out on a 75m^2 apartment occupied by three persons. (Indoor temperature = 21°C; U-Value = 0.25W/m2.K.)

This represents much less than the cost of the annual filter change, which is compulsory on heat recovery units to maintain their level of performance. In the long run, the initial extra cost of the heat recovery system (supply and fit) in comparison with DCV is never paid back – and that's without taking the required annual filter change into account. This study has also shown that, in real occupation conditions, a DCV system offers a method of staying below 1,200ppm CO_2, which guarantees optimal indoor air quality in the dwelling.

French study focuses on CO2

In France, where DCV is a major player in new build, a large scale monitoring project called Performance spent two years monitoring demand controlled MEV in two large air tight apartment blocks (n50 = 1.51 and 0.94 ACH @ 50Pa). The project, supported by French ADEME, concentrated on two buildings erected in 2007 – one in Paris and one in Lyons – and the efficiency of humidity controlled MEV in general and the DCV system in particular.

A total of 30 occupied dwellings were monitored over two years from November 2007 to measure representative parameters for energy consumption and indoor air quality. Measurements of CO_2 concentrations over that time show indoor air quality is ensured in a low occupied bedroom with one adult present as well as for one with high occupancy (four adults). The peak of CO_2 concentration shifts from 700ppm in the low occupancy bedroom, to 950ppm in the latter, but even there the 1500ppm level was not exceeded for more than just a few hours in the heating season.

The Performance project also tested the impact of DCV on indoor air quality. The fan was stopped for maintenance for one month, and CO_2 concentrations were compared with the other months in the heating season when the fans were on. When the fan was stopped, a strong rise in CO_2 concentrations (above 1900ppm most of the time) could be observed. However, no particular reaction came from the occupants to compensate for the lack of air renewal. This confirms the major role of ventilation on IAQ and demonstrates that occupants are unaware of poor ventilation and don't compensate, for instance, by opening windows.

Thermal loss due to air renewal was also found to be impressive with thermal energy savings evaluated at 30%. However, as the buildings, especially the Paris one, were over occupied, the savings, under normal conditions would have actually been more. When this result was extrapolated to the statistical average French occupancy for each type of dwelling, the result comes in as a 55% energy saving on ventilation heat losses. This statistical airflow reduction does not affect the IAQ; in fact it illustrates a better IAQ in terms of CO_2 and humidity.

To sum up, final results from the Performance project found that the tested DCV systems reached a high level of indoor air quality compared with a fixed ventilation system. It found that condensation risks are negligible; the monitored systems enabled 30% (and more) energy savings in comparison to the regulatory fixed airflow on these over-occupied dwellings. Fan consumption was decreased between 35% and 50% on the two sites.