Heat recovery and the cause of energy efficiency

What has heat recovery done for the cause of energy efficiency? If some manufacturers of heat recovery equipment are to be believed, the savings in ventilation costs are "quite staggering".

Heat recovery ventilation systems, which enable fresh air ventilation to be integrated with a VRV air conditioning system or split air conditioning, are claimed to reduce ventilation energy consumption by as much as 60% and to enable overall energy consumption reduction in a building by around 23%.

Some 17% of this reduction stems from the lower energy losses associated with heat recovery, the rest being achieved through integrating and operating ventilation in combination with the air conditioning. In the case of the Daikin HRV, the heart of the system is the VAM heat exchanger, in which sensible and latent heat are removed from the return air prior to its exhaust to atmosphere and excess hum idity is removed from the incoming fresh air.

Payback periods for HRV systems vary from around three years, if used for stand-alone fresh air ventilation, less (maybe two years), if retrofitted to an existing air conditioning system, resulting in reductions in ongoing cooling load.

Further benefits in reduced capital and ventilation costs are enabled as a result of its integration with VRV air conditioning.The system has recently been extensively upgraded. Improvements include the facility to supply ventilation independently during the intermediate season, when neither cooling nor heating is necessary.The airflow rate, previously governed by the HRV remote controller, can now be modulated via the indoor fan coil unit remote controller, while new pre-cool and pre-heat facilities, which delay ventilation start-up during air conditioning, have been introduced in order to maximise energy savings.

In smaller commercial premises particularly, powered ventilation is seen as the low energy route to the creation of better environments, specially where heat recovery is a principal component of the system design.

Until recently, popular perception of this approach saw these recovery techniques applying only to large industrial and commercial applications, where energy savings could offset additional capital costs. Heat reclaim in smaller commercial ventilation systems was regarded as uneconomic.

This attitude has changed dramatically with the advent of compact and more affordable air-to-air heat exchangers, which manufacturers say are now plugging the gap which automatic controls could not. With these units, it is now possible to recover up to 70% of the heat which controlled ventilation methods removed. In the new concept, through-the-wall heat recovery ventilation units exhaust stale air, while introducing warmed fresh air from outside.

David James, of Daikin, says, "Fresh air ventilation can be handled in several ways: at source, for example, or by adding it to the cooling/heating load of an air conditioning system, if there is one. The former method is preferable, since it enables overall control of the building to be achieved, particularly in rooms with intermittent occupancy levels."

He goes on, "Air contains two types of energy - latent heat, in the form of water vapour and sensible heat, in the form of dry air - and a normally occupied, sedentary adult requires at least 0.47litres/sec of fresh air to cope with his oxygen requirements and compensate for his CO2 output. The energy consumption needed to supply one litre/sec of fresh air to a building (at an ambient of 10°C db) and temper it to 21°C without heat recovery is 32kWh/annum (say 270 days at 8hours/day), at a cost of some £1.60/litre/sec per person of fresh air, so clearly, ventilation can be a very costly business."

Adding an extra dimension to energy efficiency within the smaller commercial premises environment is the provision of extraction fans with super-efficient. long-life motors, capable of reducing electrical power consumption by up to 80%. For example, Vent-Axia's LoWatt fan range achieves energy efficiency through a new generation of electronically-controlled DC stepped motor driven fans, which consume just 2.3Watts, compared to 15-20 Watts for conventional designs.

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