ProAir

HEAT RECOVERY VENTILATION SYSTEMS

Put on the Pressure, Pay the Price

In times of tight budgets, upcoming climate change problems and looming peak-oil, savings are imperative but especially in the area of energy conservation.

Central to this problem is the energy that is used in our buildings and particularly in our houses. The best approach to energy use in this situation is to use no energy at all if possible, or to put it another way, conserve what we've got. The key to energy conservation in buildings is to insulate and draught proof them thoroughly and to compliment this with energy efficient ventilation. The most tried and tested form of this type of ventilation is **H**eat **R**ecovery **V**entilation (HRV), which can now achieve thermal efficiencies of over 90%.

Until very recently, there were many arguments from so-called experts, that this technology is not viable in the maritime UK and Irish climate and that the fans consume more energy than can be recovered. There may have been justification for this argument a few years ago due to the following

- A slow adaptation of the new high efficiency electronically commutated (EC) fan motors.
- A residual supply of the now out of date cross-flow plate exchanger units mainly imported from the Far East.
- An appalling standard of both design and installation of systems.
- Inappropriate ducting systems and other infrastructure.
- Inferior knowledge of the thermo-fluid dynamics and psychrometry involved in these so-called 'simple systems'.
- Absence of an EN standard in the area of installation of such systems.

Absolutely!, an out of date inefficient HRV unit, under-sized, with a badly designed and poorly installed ducting system, will result in **more** electrical energy being consumed than heat energy recovered.

Moving on to 2013, most HRV units on the market possess highly efficient counter-flow plastic heat exchangers and low energy EC fan motors. Most units, being sold in the Ireland and the UK are tested under the exact same conditions in an independent laboratory such as the Building Research Establishment (BRE) in Watford and are given energy ratings which are published on Appendix Q of the SAP. Nowadays, most units tested have thermal efficiencies of between 85% and 95%. Electrical efficiency varies considerably across the different makes, but one common denominator is that, best results are always achieved at the lower fan speeds. Generally, at higher speeds these fan motors are less efficient and at full speed will be less efficient than the old AC induction motors of a few years ago which always performed best at their rated speeds. This is good, as ventilation fans spend most of their time operating at low speed and are only occasionally asked to work at their maximum.

In order to move the required amount of air using the least amount of energy two things are important

a) The unit must be adequately sized for the project in hand.

b) The fans are not under pressure from the ducting system and other components of the installation.

By having the unit sized such that regulation airflows can be achieved while running the fans at or below 50% of their maximum capacity will ensure that a low energy system can be operated. The level at which the fans can be run will depend on the pressure developed in the ducting system. The lower the pressure in the system, the more the fans can be turned down.

In early 2013 ProAir worked on an installation in a standard 2 storey 5 bedroom house in the UK West Midlands region, with a floor area of 207 m^2

It was ducted using the radial plenum box distribution system (manifold system) with each area served by a separate duct. These ducts were of two sizes the D&J 10 series and the D&J 15 series. These are ovalised solid ducts with cross sectional areas equivalent to 89 mm and 107 mm respectively. The average velocity of 1.5 m/second was calculated at normal running speed. Static duct pressure in the supply was measured at 18 Pa, with 20 Pa in the extract line, at an air-flow of 55 l/second in both directions. This represents a slightly higher ventilation rate than that required by regulation.

The wattage of the system under these conditions was measured at **18.8 watts**. This represents a specific fan power (SFP) for the overall system of 0.36 ws/l despite using a HRV unit listed with a higher SFP rating on SAP Appendix Q.

The heating system, in the case of this new-build, had been running for a few weeks and the overall internal temperature was at 20^{0}C. The outside temperature on the day, (08/02/13) at 10.00am was 3^{0}C. The average supply air temperature was 18.8^{0}C. From this we calculated that **1011 watts** was being recovered at this airflow. Indoor average RH was presumed to be at 50%.

Taking these as typical average UK winter conditions, this example shows that a properly designed, installed and commissioned system such as this will recover over fifty times more energy than it consumes during the heating season.