

Construct Ireland

Mechanical Whole House Ventilation with Heat Recovery

The performance of Irish buildings has been blighted for too long by failure to deal with our damp climate, combined with massive, avoidable heat loss. Heat recovery ventilation, a technology that has become a standard building application in Scandinavian countries, is rapidly gaining recognition in Ireland as a solution to both problems.

The onus on reducing energy usage in buildings is continuing to grow in Ireland, and is set to impact heavily on the whole country over the next few years, through a variety of legislature changes. This includes the introduction in 2004 of a carbon tax, which is set to penalise CO₂ intensive fuel usage. On top of that there is the EU Directive on the Energy Performance of Buildings, which, as was reported in the last edition of Construct Ireland, will introduce energy certification for buildings as a key factor in sales or rental, sets minimum energy performance standards for new build and major refurbishment, and demands the consideration of energy saving measures for many categories of buildings. When you add to this list the increased thermal performance demands on buildings posed by the changes last January to part L of the Building Regulations, the fact that judgement day regarding the Kyoto protocol is edging ever nearer, and the fact that nearly half of Ireland's CO₂ emissions derive from energy use in buildings, alarm bells start ringing. Clearly, Irish buildings are under immense pressure to improve in terms of energy performance, and it falls to architects, engineers, developers, self builders, home owners, employers and government to consider ways to improve energy efficiency, reduce emissions and in so doing lower the running costs of buildings.

According to Kirk Shanks, a research engineer with the Energy Research Group, who is actively researching developments in ventilation, "between a third and half of an Irish building's heat loss typically occurs through cold air exchange". However, ventilation plays a key role in the health of occupants and the structure of a building, and there are consequently minimum requirements set out in part F1 of the Building Regulations. An apparent dilemma exists here, as buildings are required to both retain heat, and circulate air. How can modern buildings fulfil their energy requirements and provide adequate air circulation at the same time when each function seems to undermine the other?

Heat Recovery Ventilation is a technology that, whilst having been in existence for some time, is now rapidly gaining recognition in Ireland as an extremely efficient, health-beneficial, cost effective solution to saving energy. Scandinavian in origin, the Heat Recovery Ventilation System (HRV), follows the unique approach to environmentally harmonised living the Scandinavians are renowned for. The basic function of a Heat Recovery Ventilation System is to provide a continuous supply of clean, fresh air throughout the building while at the same time dispensing heat for cold periods. Technically, a HRV operates as follows:

Firstly, a single set of ducts accumulates moist, stale air from the wet areas of the building such as the kitchen, laundry and bathrooms. This stale contaminated air travels through the HRV unit and is released outdoors; another ducting system then takes in fresh clean air from outside. As the two air-streams bypass within the centre of a non-energy consuming heat transfer exchanger, heat is displaced (without the air-streams intersecting) from the emitted stale air to warm the fresh incoming air. As the two air-streams remain separate, no contamination occurs. Finally, the HRV unit succeeds in retaining up to 95% of the energy from the exhausted warm, stale air. This allows clean, filtered air to be distributed throughout the building – where and when needed. The majority of Heat Recovery Ventilation systems are also supplied with automatic humidity sensors that are able to augment the rate of ventilation when required, such as when a shower or bath is in use.

As well as entire building systems, Heat Recovery Ventilation systems also come as room units. Such units provide similar rates of air exchange to conventional fans, making them an attractive alternative as a result of their ability to provide extract and supply. The systems are most suitably installed in areas of high humidity, such as kitchens or bathrooms.

In contrast to conventional ventilation systems, a HRV is well advanced to offer year round comfort in the building, as while also drawing fresh air in it serves the dual purpose of keeping the living areas at a warm, constant temperature. More than 35% of heat loss in today's homes can be attributed to ventilation, as where high-quality conventional systems are well equipped to handle the procedure of air exchange they tend to create an uncomfortably cold living environment in the process. This ultimately means that energy that might have been wasted in re-heating a naturally ventilated building can be saved with a HRV.

An advanced Heat Recovery Ventilation System may be in constant operation for as long as six months of the year (or more) and run at a lower annual cost than a natural ventilation system. It will also be capable of converting all the air in an average sized building over a three-hour period. Present Building Research Establishment (BRE) standards in the UK advocate an ideal ventilation rate of between 0.5 and 1.5 air changes per hour. Countries such as Sweden, with extensive expertise in the area of controlled ventilation lean towards a level at the lower end of the range - The Swedish standard stipulates 0.5 air changes per hour, as do the Canadian and German (DIN) standards.

From a structural perspective, a lack of quality ventilation can be extremely destructive. The most obvious sign of poor ventilation is condensation, which is most commonly visible on cold surfaces such as windows. However, condensation can also occur in other vital constituents of a building, such as masonry or timber. Here moisture is easily absorbed, and with continued accumulation problems such as rot, mould, and deterioration of decoration are likely to result. A HRV will combat this problem by completely drying out the actual framing, insulation and interior cladding of the structure. The system will also dry out damp furniture, curtains and carpets.

As a result of a HRV's ability to keep a building dry and air filtrated, the inhabitants can also be kept healthy. A Heat Recovery Ventilation system will alleviate the symptoms of asthma, cold, hay-fever and other allergy sufferers by removing airborne pollution and irritants such as chemical gases that leech from building materials used in construction, paint odours, dust, dust-mites, and pet hair. A HRV will also extract smoke and cooking odours.

Recent surveys by the DETR (Department of the Environment, Transport and the Regions) and The Building Research Establishment in Britain have discovered that 1 in 10 homes have CO (carbon monoxide) levels above World Health Organisation guidelines. Carbon monoxide is a highly toxic gas, which if left undetected can lead to death or serious illness. As has recently been document in the press, carbon monoxide poses a great risk in Ireland, and the gas, which leaks from faulty central heating systems, boilers, and other gas fuelled appliances is a danger that must be addressed. Due to a HRV's ability to remove gases from buildings, the potential for CO poisoning to the occupants will be greatly reduced upon installation.

Installing a Heat Recovery Ventilation System will also lead to improved security and noise reduction, as well as aesthetic enhancement. There will no longer be a need to relentlessly open windows, nor will there be a requirement for distasteful grills and fans on the internal and external walls.

The installation of a HRV is easy and involves minimum maintenance. Upon selecting a system it is advised that the volume of the building be estimated, as this will establish the amount of air to be ventilated and consequently the size of system that is needed; the type of property must then be considered. A typical two storey Irish home may need to be visited by a specialist, whereas a single storey structure will be simple to ascertain. In the case of new build, specialists can be consulted by architects to decide the best option.

Today, as market interest increases and technology advances, the quality of HRV's is constantly improving. Where old systems operated at an approximate 65% efficiency, new systems are able to function with an efficiency of up to 95%, therefore retaining almost all heat generated inside the building and maintaining a very comfortable indoor environment.

Installing a Heat Recovery Ventilation system will not only save money on electricity bills and improve the health and comfort of a building's occupants, it will also play a vital role in protecting valuable energy resources for generations to come.