

Part L Compliance

The CO₂ emissions for the whole office space including the lighting were reduced by 26% for the Mixed Mode system compared to the Heat Recovery system. The modelled building received a non-domestic EPC asset rating of 24 for Mixed Mode and 33 for Heat Recovery system. This means that the Mixed Mode system achieved an A rated EPC and actually exceeded the draft 2010 Part L2 CO₂ emissions target of 55%. The Heat Recovery system achieved a B rated EPC.

(Thermal Model: ADL 2006 minimum standard building fabric, Lighting 10W/m² - no natural daylighting control, A/C COP Summer 3.0, A/C COP Winter 3.4, Occupation as for open plan office from the notional calculation method results, Heat Recovery temperature exchange efficiency of 79% Electricity cost 10p/kWh).

Further information

Contact Passivent for further information on the design of natural ventilation and mixed mode systems.

References

1. Best Practice Programme, Energy Consumption Guide 19 - Energy Use in Offices (2000)
2. ADL Draft consultation document (April 2008)



Mixed Mode Cooling Systems

A comparative study of Mixed Mode Vs Heat Recovery



Capital costs
Payback periods
Carbon emission levels
Part L compliance



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Carbon Emissions

Human production of greenhouse gases, primarily CO₂ is changing the world's climate. 50% of CO₂ emissions in the UK derive from energy consumption in buildings. Heating and cooling can account for more than 50% of this energy requirement. A well controlled and energy efficient ventilation system, is therefore a prerequisite for low energy consumption and a substantial reduction in CO₂ emissions. With Energy Performance Certificates being rolled out across commercial buildings and targets set in Part L of the Building Regulations to reduce CO₂ emissions, the need for effective low energy ventilation has never been so great.

What is Mixed Mode

Mixed Mode is the term used to describe the combination of natural ventilation and air conditioning. Natural Ventilation is the preferred low energy strategy option for commercial buildings.

Air conditioning can provide the close climate control desired in the period of peak hot or cold weather. The Mixed Mode system combines these two elements, providing the benefits of both—energy efficiency and improved comfort.

The Mixed Mode strategy relies on well designed natural ventilation most of the time. Mechanical air conditioning is employed only when and where necessary to deliver the required levels of comfort.

Mixed Mode Benefits

A mixed mode cooling system can provide a more energy efficient solution, with less running costs and reduced maintenance costs compared to a traditional air conditioning system. It can also future proof buildings against climate change. A building that can adapt to a wide range of requirements is more likely to provide enduring value to its owner and occupiers and reduce environmental impact. Mixed Mode can provide improved indoor air quality, resulting in few incidents of sick building syndrome. Occupants are also provided with their own local control, increasing perceived comfort levels.

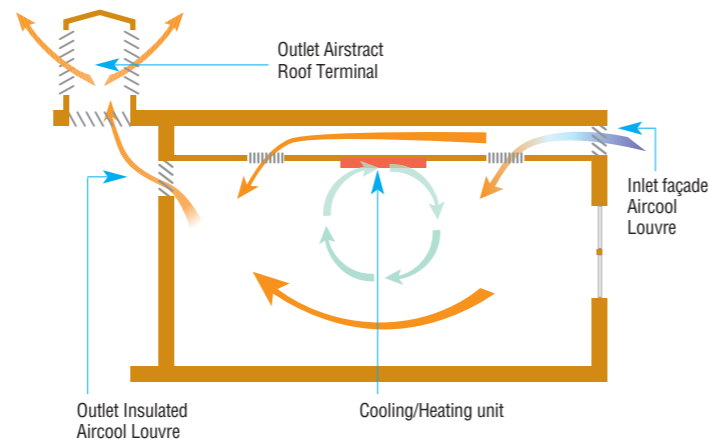
Thermal Modelling

A thermal modelling study conducted by EDSL covering energy, maintenance, capital costs, payback periods and carbon emission levels was undertaken comparing Mixed Mode and Heat Recovery in the ground floor of an office totalling 850m². The data was produced using TAS (thermal modelling software). The study compared two environmental ventilation systems within the same building:

1. Mixed Mode environmental system consisting; VRF Air conditioning system and natural ventilation.
2. Heat Recovery environmental system consisting; VRF Air conditioning system and heat recovery ventilation. Identical Air sourced VRF air conditioning systems were used in both modelling calculations.

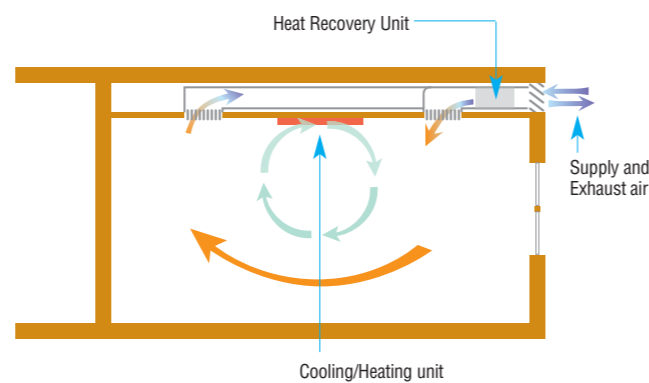
Mixed Mode System

On the outside of the building controllable insulated Passivent Aircool natural ventilation units, were installed to supply the fresh air via the ceiling void to temper the incoming air in winter and provide acoustic attenuation. The air that moved across the office and meeting room spaces was exhausted via the stairwells through two roof mounted Passivent Airtract terminals. Ceiling mounted VRF air conditioning units provided heating and cooling for the space.



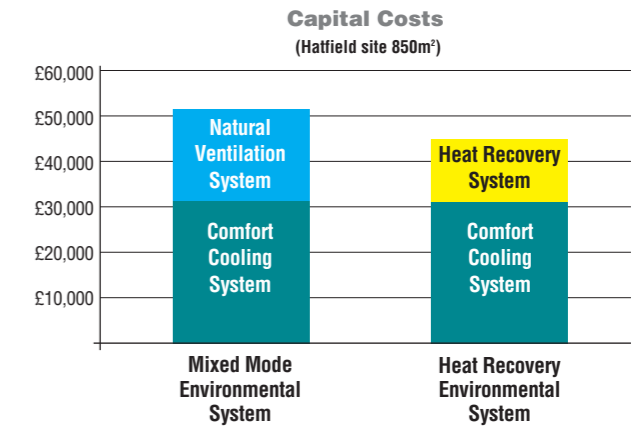
Heat Recovery System

Identical air conditioning units were used in this strategy, but the natural ventilation system was replaced by three ceiling mounted recovery units, with a temperature exchange efficiency of 79%. The units were designed to provide the same levels of ventilation as the natural ventilation system. The air is delivered and exhausted through façade louvres mounted above the ceiling level, opening to the outside.



Capital Costs

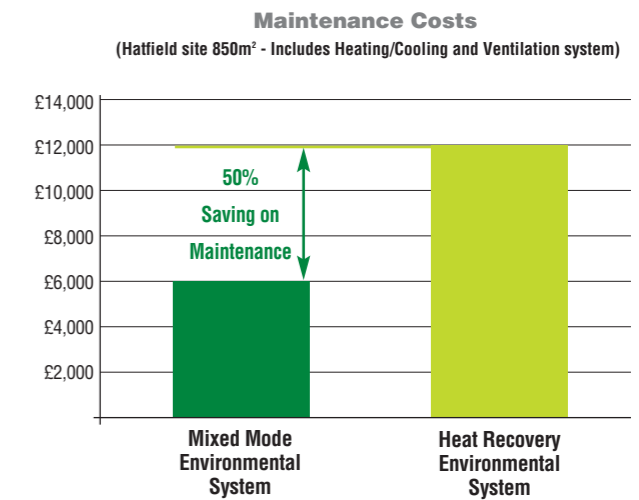
The capital costs for the Mixed Mode system were 15% more than for a Heat Recovery system designed to deliver the same levels of ventilation. The additional cost in this study were recovered within 11 months through savings in running and maintenance costs. The costs were based on a system delivering ventilation for 75 occupants and a design cooling load of 125W/m². The Mixed Mode capital costs could be reduced below those of the heat recovery system, if the free day and night time cooling features had been included in a thermal modelling calculation, by reducing cooling load. (The controller costs have been excluded from these sums as this portion is assumed to be within the BEMS package).



Maintenance Costs

Research into maintenance costs shows a 50% cost reduction for a mixed mode environmental system compared to a heat recovery environmental system. This is due to the limited use of mechanical cooling as the air conditioning element of a mixed mode system operates only as and when required. The natural ventilation element of the system requires 83% less maintenance than a full air conditioning system.

(Source: Prof. Martin Liddament of Veetech Limited, based on BSRIA ECON 19).



Running Costs and Energy Savings

With the Mixed Mode system running costs, energy consumption and CO₂ emissions are reduced by 49% per annum when compared to the heat recovery system. A saving of 6,205 kg CO₂ per annum were realised with the modest 850m² office space. The running costs are reduced because fresh air is supplied into the indoor environment by the natural ventilation system without mechanical ventilation power consumption. The natural ventilation system also provides the building with day and night time free cooling, reducing the systems cooling loads.

