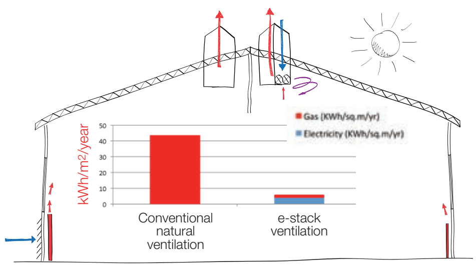
Breathing Buildings

Modelling Ventilation in IES – The e-stack difference

We are often asked what IES shows for natural ventilation and alternative ventilation strategies. The short answer is the e-stack system provides significant energy savings. But don't take our word for it let us help you to model your classroom with different ventilation strategies using IES.

Graph 1: Comparison of e-stack ventilation vs natural ventilation in a Good Practice U-value classroom



Most natural ventilation systems incorporate a low-level louvre with heater and high-level exhaust. How does the annual energy usage compare to e-stack ventilation in a typical, Good Practice, Manchester classroom, modelled in IES?

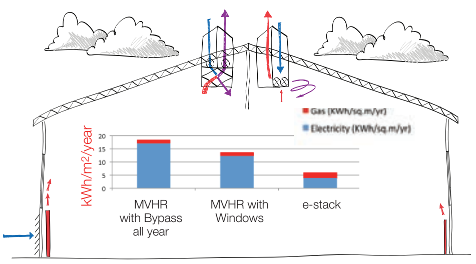
As you can see e-stack uses far less energy than conventional natural ventilation.

The main reasons for this are:

- We use the heat gains in a space rather than wastefully pre-heating the incoming air with radiators or heating elements
- By not adding to the overheating problem in mild winters we operate for longer at minimum ventilation

You can download the IES files from our web-site to see that this applies to your building too.

Graph 2: Comparison of e-stack ventilation vs MVHR with bypass vs MVHR with windows in a Good Practice U-value classroom

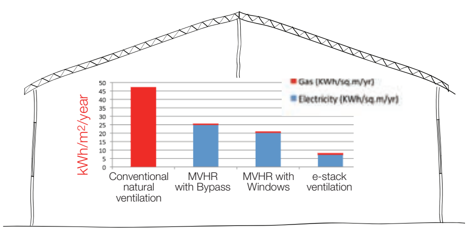


The excessive heating bills associated with conventional upflow displacement natural ventilation has led to many in the industry using Mechanical Ventilation with Heat Recovery (MVHR) as an alternative to natural ventilation. However IES shows you that e-stack once more saves you energy.

The graph on the left shows our Manchester classroom compared to MVHR:

- MVHR causes the room to overheat in winter, requiring increased ventilation and fan power
- Even when MVHR is combined with opening windows the fan power used by MVHR in winter means e-stack is the lowest energy scheme

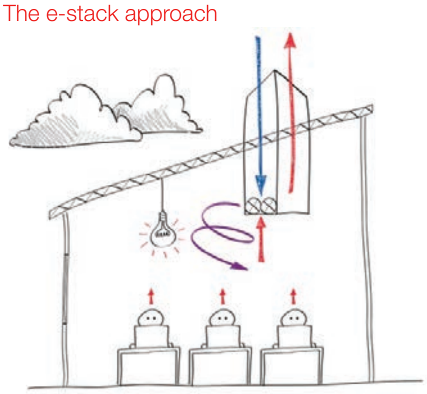
Graph 3: Comparison of ventilation strategies for a building built to Passivhaus standards



You will not be surprised to find that when you use Passivhaus building standards the e-stack system saves energy compared to the alternatives.

This is because e-stack exploits even more excess internal heat gains in winter and provides natural ventilation for free in summer.

The e-stack approach



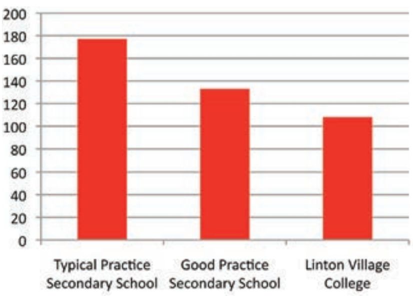
Summary of Ventilation Strategies

The modelling in detail	Ext T<16degC	Ext T>16degC
e-stack	Minimum ventilation of 5l/s/p. Boost Vent when Int T>25degC	Opening windows with e-stack
Conventional Natural Ventilation	Minimum ventilation of 5l/s/p. Boost Vent when Int T>25degC Preheat incoming air to 16degC	Opening windows with stack
MVHR with Bypass	Minimum ventilation of 5l/s/p. Boost Vent when Int T>25degC	Minimum ventilation of 5l/s/p. Boost Vent when Int T>25degC
MVHR with Windows	Minimum ventilation of 5l/s/p. Boost Vent when Int T>25degC	Opening windows provide 220l/s Boost Vent when Int T>25degC

Natural ventilation delivered – The e-stack difference

Modelling is one thing, delivering low energy buildings is quite another. We work with our clients throughout a project to ensure that their energy bills are as low as possible, including going back to monitor a project where appropriate. This can also be valuable for BREEAM as post occupancy evaluations are an important aspect of the assessment. The information gained from the monitoring provides us with a wealth of information and shows that not only do we design low-energy buildings we also deliver them!

Total energy use (kWh/sq.m/yr)



Case study: Linton Village College

We provided an e-stack ventilation scheme for a new science block at Linton Village College, a Secondary School near Cambridge. This involved ten S1200 e-stack units split over three floors.

The increased height available in multi-storey buildings offers the potential for enhanced natural ventilation flow in summer. However, this often involves installing shafts through the building which can restrict the usable space on the upper floors. We worked closely with the architect to design the shafts so that they had the benefits of a stack-based system whilst maintaining the design of the classroom spaces.

Heating in the classrooms was provided by radiant heating panels. We provided a link from these panels to our system to minimise energy consumption whilst maintaining comfortable conditions within the classrooms.

We monitored two classrooms over the winter and summer of 2010. The results show the building performed significantly better than CIBSE Good Practice guidelines and B101 summer over-heating criteria. We also monitored the temperature of air delivered to the space to prove that the e-stack mixing system was effective at mitigating cold draughts.

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