A sustainable method of ventilating education facilities

There are a multitude of energy efficient ventilation options for building service engineers for both retrofit projects and new eco-friendly builds and natural ventilation is one method that has many sustainable and cost effective benefits, particularly in schools says **Laura Henderson**

Combined natural ventilation and roof light a John Leggot College

IT IS FUNDAMENTAL that all buildings, new or refurbished, comply with the relevant building standards. Building Regulations Part F (Means of Ventilation) and Part L (Conservation of Fuel and Power) to ensure the adequate provision of ventilation in buildings, good air quality and the avoidance of overheating. The Building Research Establishment's BREEAM scheme is an environmental assessment that ensures the optimum environmental performance of buildings, and produces an overall rating according to the efficiency and effectiveness of all aspects of a building's design, including its services.

It is suggested by the Chartered Institute of Building Services Engineers (CIBSE) that in all occupied areas, eight litres of fresh air per second per person (l/s/p) should be provided to prevent pockets of stagnant air and address air temperature gains produced by humans, solar radiation and machines. In all other areas, such as corridors and halls, 3l/s/p should be provided. In summer, it may be necessary to provide more than the recommended level to remove unwanted heat gains, and additional ventilation is required where fumes or dust accumulate, such as in kitchens. Poor ventilation leads to damp conditions, a build-up of dust and dirt and the possibility of an unhealthy environment. A controlled ventilation rate is absolutely essential within a school environment as the occupancy levels vary in each classroom, assembly halls, gymnasiums and sports halls throughout the day. Ventilation demand also varies depending on the season. Natural ventilation systems maintain a controlled seasonal ventilation rate allowing for a comfortable environment with the correct air temperature and velocity, whilst maintaining the security of the buildings when there are are no open windows.

The concept of the natural ventilation system is to create a stack effect through the space often via Penthouse roof mounted turrets and wall units with modulating dampers that control the incoming air temperature and CO2 levels.

Harnessing natural wind and solar power as well as temperature buoyancy to ventilate buildings significantly reduces energy consumption that would have been used to operate a more traditional mechanical arrangement. Incorporating CO2 sensors within a natural ventilation system will prevent wastage of energy in buildings where occupancy varies throughout the day.

Carbon dioxide levels are often measured to ascertain indoor air quality. It indicates the number of occupants and if levels of C02 are high, adequate ventilation is not

Energy efficient ventilation

GDL has designed a range of natural ventilation products called the Intelivent range. These have been designed to provide a sustainable and cost effective method of providing energy efficient ventilation and lighting throughout all building types.

GDL recently worked alongside a clients to design and supply a natural ventilation and natural daylight solution throughout an educational facility in Auchinleck, Scotland (pictured above).

The design team created a bespoke system that utilised both wind and solar power and also provided natural lighting throughout the building significantly reducing energy consumption and the expensive operational costs of a wired mechanical arrangement. The company manufactures six product types that comprise the full range. This particular project incorporated its standard Penthouse Turrets, its Solarpipe and Solarstore products.

The Intelivent Solarpipe diffuses natural light into the building whilst also providing a controlled ventilation rate. GDL's solar cell driven Intelivent Solarstore allows increased ventilation in summer and at times of high occupancy and also improves the effectiveness of night time cooling.

being provided. Exposure to high levels of CO2 is not dangerous, but may affect performance – some studies have shown it can lead to a lack of concentration and symptoms of sick building syndrome.

CIBSE recommends a CO2 concentration of no more than 900 parts per million (ppm) in occupied spaces to control odours and create a comfortable environment.

By incorporating CO2 monitoring throughout a school classroom, the ventilation rate can be designed in each area to be dependent on the occupancy within the room again significantly contributing to energy conservation.

Temperature and CO2 sensors maintain a controlled seasonal ventilation rate.

In summer, ventilation rates will be controlled by temperature sensors, once the temperature peaks, the dampers will crack open to allow fresh air to enter.

Lower winter ventilation rates will be controlled by CO2 sensors. This limits the fresh air entering the building in order to maintain the internal temperature.

A heating coil can then be used as a front line heating source for re-circulating air. There are numerous options to allow for the most effective airflow throughout the building.

// The author is the marketing manager for GDL //

Spa commits to renewables

A Shrewsbury-based health, fitness and tennis club has demonstrated its commitment to slashing carbon emissions with a large-scale switch to renewable energy.

The Shrewsbury Club has invested around £350,000 in the construction of a new, renewable energy centre which is significantly reducing its reliance on fossil fuels, whilst dramatically lowering its annual energy expenditure.

Core to the club's new system – which has been designed and built by the Shropshire-based renewable energy specialist Edge Renewables – is the construction of a purpose-made energy centre, which houses two 199kW biomass boilers that produce all of the site's heating and hot water requirements from the company's locally-produced wood chip fuel.

Replacing the existing natural-gas-fired boilers, the new biomass-fuelled system includes two, 5,000-litre insulated heat storage tanks that will help the system's efficiency when supplying large demands for heating and hot water during the coldest months of the year.

In addition to the biomass boiler system, 960 square metres of solar photo voltaic (PV) panels have been installed onto the club's roof, which will generate some 120,000 kWh of electricity every year – all of which will be consumed at the site – to further offset the use of fossil fuels and largely eliminate the purchase of grid-supplied energy.

Steve Taylor, director with Mosaic Spa and Health Clubs, the owner of The Shrewsbury Club, commented: "With the club's move towards renewable energy from traditional fossil-fuel-supplied alternatives, we expect to annually save the emission of around 215,000kg of carbon – which is the equivalent to taking around 90 average family cars off the road."

"Furthermore, there's a strong economic case for shifting to renewable energy. With the savings that we'll be making on our energy bills, the return on investment should be impressive.

The biomass boiler system qualifies for the Government's non-domestic Renewable Heat Incentive (RHI) scheme – which pays system owners to generate heating and hot water from renewable sources such as biomass wood chip fuel. Simon Lloyd-Jones, MD of Edge Renewables, added: "Having a large swimming pool, health spa, gym and tennis courts the club has a steady demand for heat, which lends itself to biomass boilers. Couple this with the Solar PV panels on the roof and the carbon savings really start to mount up."

"The boilers will annually recover the energy from around 300 tonnes of woodchip fuel – which is produced by us in the former Lea Quarry site at Wenlock Edge, so the whole process is very much in the spirit of local sustainability."

The fully-automated energy centre incorporates an electrically-powered sliding roof so that wood chip fuel can be delivered to site and offloaded straight into the integral storage fuel hoppers, – keeping the area clean and tidy.

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