CASE STUDY

TREND BEMS THE KEY TO WINDOW CONTROL IN COLLEGE'S NEW BUILDING

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A Trend building energy management system engineered and installed by AirTech Controls Ltd has enabled fully coordinated control of the heating and natural ventilation at the new home of Newcastle-under-Lyme College. Though the original plan had been to install a separate system for window control, the use of a Trend BEMS to perform all control functions was quickly seen as a better option. As a single package solution it offered a much simpler, lower cost means of providing integrated control and maximising energy savings – as well as making it easier for the college to monitor and manage conditions.

Newcastle-under-Lyme College moved to its new £60million campus at the beginning of this year. A further education college, it offers a range of academic and vocational qualifications and is attended by some 2,500 full-time and 10,000 part-time students. Built by BAM Construction, the new site comprises a 4-storey main building with extensive external glazing and a floor area of 18,370m^2, plus a large sports centre and construction and engineering block.

Fan-assisted natural ventilation and cooling is provided in 180 classrooms within the main college building. The rooms' windows and extract dampers are all under the close control of the Trend BEMS, as is their heating, which takes the form of radiators or radiant panels. It also enables/disables a small number of VRF air conditioning units that provide supplementary cooling in rooms with particularly high heat gains (eg, from IT equipment). Each room has its own temperature and air quality (CO_2) sensor and is an individual zone of control.

If a room's temperature exceeds setpoint (21ºC), the windows and extract damper – which is generally positioned above the door – are modulated open. This action, and the exhausting of air from the building by large (22kW) roof-mounted fans, induces a cooling flow of air across the room. The speed of the fans is varied to maintain a constant static pressure in the ductwork, thus ensuring that they operate in accordance with demand and energy wastage is avoided. The windows are also opened, by a fixed amount, if the CO_2 level in a room exceeds a pre-set level (currently 1,000ppm) and if necessary the extract damper is opened as well.

Whenever the BEMS brings on the heating (or an air con unit) it minimises energy consumption by ensuring that the windows and extract damper are kept closed. This would have been very difficult to achieve had the windows and heating been controlled by separate systems. Opening of a window is also inhibited if it is raining or – in cold weather – there is an oncoming wind of more than 2.5m/s, though in hot weather it would be opened to enhance the cooling effect. Rain, wind speed and wind direction, plus other climatic conditions, are measured by a weather station that transmits data to the Trend system via a wireless router.

Each room has a keyswitch to allow teaching staff to override the system and manually open or close the windows. For instance, they might wish to close the windows to shut out noise if an exam were in progress.

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At the end of the day control by the BEMS is restored, so any window left open would automatically close.

When appropriate the BEMS implements a night purge routine to cool the classrooms down. If the average temperature of the rooms at the end of occupancy is above a certain level (adjustable between 18 and 22ºC) and the outside air is below 18ºC and above 11ºC, the windows and dampers are opened and the speed of the extract fans is ramped up. For security reasons the windows are only opened 10%.

Areas of the building that do not have automatically operable windows, which include the rooms on its south side, are supplied with tempered fresh air by a total of seven air handling units, all of them Trend controlled. Variable speed control of their fans allows matching of their output with demand. Each unit is also equipped with a thermal wheel to recover heat from the exhaust air.

The Trend BEMS incorporates 59 IQ3xcite networked controllers and has a total of 2,350 input and output points. More than half of the IQs provide the room-by-room control and monitoring of windows, dampers and heating. The rest take care of the extract fans, air handlers and the building's dual-fuel boilers, as well as the heating plant in the sports centre and construction and engineering block. Their duties also include monitoring for faults on a rainwater harvesting system and recording the readings from the main electricity, gas and water meters plus 30 electrical sub-meters.

The room controllers each cover four to five rooms and are mounted in panels above the ceiling. This naturally placed a restriction on panel size, which AirTech was able to limit to 1,000mm wide x 600mm high x 300mm deep. They were helped in this by the small footprint of the IQ3xcite and its use of add-on i/o modules, which further reduces space requirements. AirTech also made significant space savings by using PCB-mounted window control modules. These take a 0-10V output from the IQ controller and produce a 24Vdc reversing output to open and close the windows.

Access to system monitored data and control settings is via a Trend '963' supervisor package. Because the supervisor server is linked to both the Trend system's Ethernet network and to the campus's IT network, authorised personnel can gain access from any PC in the building – or from offsite by logging in through the college website. The college's Facilities Manager uses the supervisor on a daily basis and AirTech has also given operator training to three other members of the NULC estates management team.

AirTech has set up a supervisor graphics page for every room. This displays the current space temperature and CO_2 level, heating plant status, window and damper position, weather conditions and whether the window control has been manually overridden. Setpoints can be adjusted through this same page. Had a separate system been installed to control the windows, the college would have suffered the considerable inconvenience of having two 'front ends'. It would have been necessary to log on to both of these to view the data for a particular room or change a setpoint. The '963' not only provides a single operator interface but, as the college has found, gives instant data retrieval.

Bailey Building Services were the mechanical and electrical contractor on the NULC new campus project and Operon the M&E consultant.

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