CASE STUDY

MAKING AND DEMONSTRATING SAVINGS

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Designed as a model of energy efficiency that can be widely and cost-effectively replicated, the new student services and administration centre at the University of Southampton has quickly achieved its ambitious savings target. Opened in 2006, it has been using just over half the energy consumed by a conventional building of its type. Trend IQ building controls – which are installed throughout the university campus – have played a key part in both realising and demonstrating these savings.

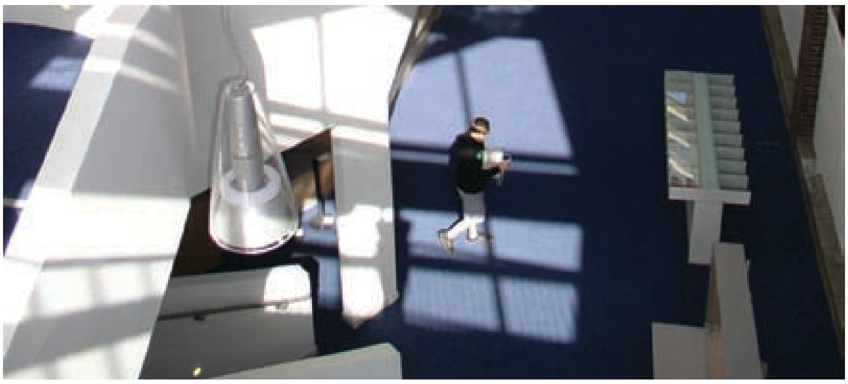
The University of Southampton building is one of several sites across Europe that have been part of a recently completed European Commission project (SARA) to construct and demonstrate highly sustainable and replicable public-access 'eco-buildings'. All have been designed with the aim of minimising their environmental impact.

The three-storey student service and admin centre has a floor area of 2600m^2 and an atrium that links it directly to an older office building. Its impressive energy performance stems from a combination of design features, including high use of natural lighting, ground linked ventilation, automatically opening atrium roof vents for natural ventilation, windows with interstitial blinds for solar gain control, a 14kWp photovoltaic array and exposed concrete wall and floor slabs to moderate temperature variations. And, of course, there are the Trend IQ controls.

Three IQ2 series units control and monitor the building's heating and ventilation, while to meet the SARA project's monitoring requirements two IQ3xcites were installed. The latter units – which link to the university's intranet - were the ideal choice for this application owing to their TCP/IP connectivity and built in web server. This has meant that the European partner organisations involved in the SARA initiative have been able to access real-time energy consumption values or other current data, such the electricity being generated by the PV system, directly from the controllers via the internet, using a standard web browser.

They have also had internet access to all historic readings through an iMAT monitoring system operated by Trend's Energy and Support Solutions Team. Locally there is an interactive display through which anyone can look at building performance data.

The new building's heating and hot water needs are met by the university's CHP-based district heating scheme. There are three variable temperature circuits, two serving radiators in the offices and the other providing underfloor heating in the atrium. There is no mechanical cooling, though the office area and atrium each has a small ventilation plant. Outside air is brought into the atrium through an underground pipe, which provides a measure of free cooling.

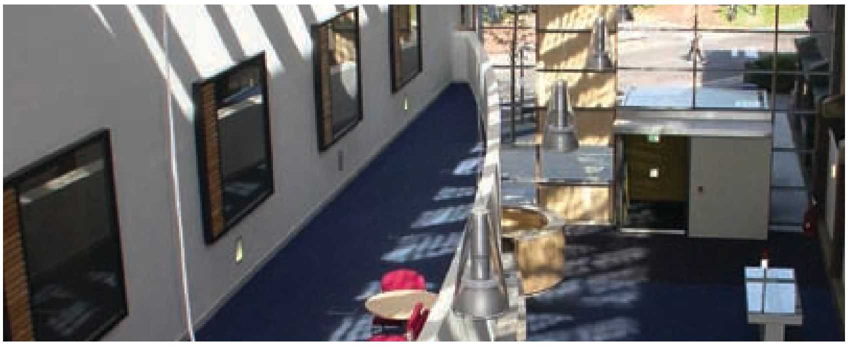


Automatic opening of the smoke vents in the atrium roof induces natural ventilation and cooling. The IQ controlling the vents must take into account not only the conditions in the atrium but also those in the adjoining building, some of whose windows open into the atrium. It also looks at wind speed/direction and rain measurements taken by a roof-mounted weather station and if necessary will inhibit opening of the vents. Air movement between the atrium and new offices is via manually operated trickle ventilators; occupants are also able to edge open externally facing windows.

Another element of the SARA project at the University of Southampton has been the testing of a recently devised adaptive control algorithm. This was applied to one of the heating circuits in the adjacent building, where the H&V services are also Trend controlled. Recently, it has also gone into use on the new offices' two heating circuits. Unlike the weather compensation routine it replaces – which adjusted circuit flow temperature on the basis of outside air temperature – the new algorithm modulates the space temperature setpoint.

It has been developed in the wake of research showing that the temperature which people find comfortable varies with season and climate, and can change from day to day. Thus the algorithm calculates the space setpoint – or comfort temperature - using a running mean value based on the daily average of hourly outside temperature readings. When outside air temperature is less than 10ºC the setpoint remains fixed, as studies have indicated that the comfort temperature tends not to vary below this level. The IQ controllers that implement the algorithm have been easy to adapt to perform the new routine, a consequence of their flexible firmware and the advanced engineering tool that Trend has developed for strategy configuration.

In the year from March 2007 to Feb 2008, the energy consumption of the student service and administration centre was $149kWh/m^2$. This compares with a figure of 278kWh/m2 for a typical building of this type (with active cooling), a saving of 46%. Subsequent changes to the controls following analysis of performance data – including optimising the operation of the ventilation plants – should have cut consumption further.



The University of Southampton was the first ever user of the original Trend intelligent controller, the IQ150, a number of which were installed in 1983. The present Trend BMS comprises some 650 controllers and covers the whole of the main campus, as well encompassing halls of residence and the Winchester School of Art. It incorporates every generation of Trend IQ, including a number of IQ151s that have been in continuous service for over twenty years.

The IQ3xcite controllers in the SARA building were supplied and engineered by Dalkia, a Trend Technology Centre.

For details of the SARA programme go to: **www.sara-project.net**

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