

# CASE STUDY CAMBRIDGE UNIVERSITY GIVES LESSON IN ENERGY MANAGEMENT

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Cambridge University has developed and adopted an award-winning model for applying building energy management systems in the higher education sector. The initiative involves massively increasing access to BEMS-monitored data using the university's campus wide IT network, which will enable many more of its staff to play a key role in energy saving and carbon reduction. To help facilitate this strategy it has standardised on a single make of BEMS; in all new buildings and for its rolling programme of control upgrades it now only installs Trend systems.

Cambridge University, which last year celebrated its 800th anniversary, is currently undergoing the biggest building programme in its history. Its world renowned teaching and research facilities are spread across some 360 buildings, of which 25 have been constructed in just the last decade. With plans for a major new campus in the north west of the city, this ancient seat of learning is set to continue its expansion well into the future.

Over the last twenty years the university has installed five different makes of BEMS to control and monitor the building services across much of its large estate. Each came with its own 'supervisor' (main operator interface), through which the estates

management department could access and manage the system. Data communication was by autodial modem – but on the Trend system this is no longer the case.

Though five years ago the Trend BEMS was only in three buildings, today it regulates and monitors the heating, ventilation and air conditioning in over 60% of the university (by floor area). Crucially, it now uses the university's IT network for systems communication and its '963' supervisor software runs on a network server. As a consequence, system monitored data – which is set to include many more energy meter readings - can be viewed by authorised users from any PC on campus, using just a web browser. This means that the data will no longer be available to just a relatively small number of estates management personnel, but will also be accessible to academics and others in all Trend-controlled buildings.

According to Garry van Geete, the university's Project Manager for the BEMS development: "By moving to a common standard we are beginning to get a clearer picture of what is happening across our estate of properties, which will allow us to

better understand the operation of the building services. With at least one person per building looking at the BEMS-collected data there is a far greater chance that we will spot causes of energy waste. Also, once the necessary sub-metering is in place and connected to the system, the different departments will be able to easily see how their buildings are performing – which is a pre-requisite if we are to bring in energy saving incentive schemes."

Cambridge recently received a Green Gown Award for Carbon Reduction in recognition of its work to widen BEMS access. Significantly, the judges considered it to be a model that could be easily replicated across the HE sector, to reduce building related carbon emissions. The prestigious Green Gown Awards are given only to exceptional environmental and sustainability initiatives undertaken by universities and the learning and skills sector.

The BEMS upgrade programme has in itself produced impressive savings owing to the much improved control that has resulted. The programme began in earnest in March 2007 and over the next 20 months the old BEMS in over 30 buildings were replaced





Sainsbury Laboratory, an 11,000m<sup>2</sup> plant science research facility due to open this year.

While some of the buildings controlled by the BEMS have simple heating systems, others are heavily serviced, particularly those with laboratories and clean room environments. Some also have non-standard plant, such as the Kavli Institute, which uses ground source heat pumps to reduce its dependence on non-renewable energy.

Most of the Trend controllers are IQ3xcites, whose Ethernet/TCP/IP connectivity has allowed them to be directly connected to the university intranet, obviating the need for a separate communications network. IQLs, which are LonWorks-based air conditioning terminal unit controllers have also been installed, while the very earliest part of the BEMS comprises IQ2 series models – most of them in the Chemistry building. The IQ2s run on dedicated LANs. The latter and the LonWorks busses that support the IQLs have been interfaced directly with the intranet, thus allowing all of the Trend system to be accessed using the '963' supervisor software – which effectively means from any PC.

Monitored data – such as environmental conditions within the buildings and the operational status of HVAC plant – are viewable on easy to understand graphics pages. Both live and historic values can be displayed. Password protection of the supervisor database prevents unauthorised adjustment of the controls.

with Trend IQ controllers. In the main they took over control of boiler heating systems with variable and constant temperature circuits. The result was a 4406 MWh reduction in gas consumption (degree day corrected) - equivalent to a 16% saving in annual usage and a cost saving of £104,000, giving an average payback of 3.5 years. The buildings' occupants have also benefited from more comfortable conditions, as evidenced by a sharp fall in complaints.

The upgrading work has subsequently moved onto other buildings, adding to the savings total. Trend controls have also gone into many of the university's newer premises and for the last two years have been specified for all new build work. On the West Cambridge science and technology campus they have been fitted in the Centre for the Physics of Medicine, which opened in 2008, as well as the Kavli Institute for Cosmology and the new home of the Institute for Manufacturing, both of which were completed last year. Other buildings in which they will soon be installed include the

The BEMS also provides access to electricity and gas meter readings from a number of buildings. This part of its role will develop substantially as the university implements plans to install many more electricity sub-meters. Eventually every department will be able to access a BEMS generated web page through which it can view its current energy consumption and review historical trends.

Explaining Cambridge University's decision to standardise on Trend controls, Garry van Geete points to a number of key factors: "With Trend we are always provided with copies of the controller software. This means we have control over our own destiny and have the freedom to choose whoever we want to supply and engineer additions to the system. There is also a wide choice of authorised controls contractors that we can pick from. Furthermore, we have had close support from Trend's R&D division, which has been mutually beneficial. The energy savings that accrued when we started the controls upgrade was of course another factor."

The controls contractors that have been used by the university to supply and engineer the Trend BEMS have included Imtech Aqua Controls, ECS Power & Control, Berkeley Environmental Services and DMS Controls – all of which have gained approval as Trend Technology Centres.

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