CASE STUDY

# FOCUS ON CONTROL BRINGS SAVINGS IN THE CITY

First published: March 2010

Actions taken following an energy audit in the Cass Business School at City University London have significantly reduced the building's energy consumption and resulted in much improved comfort conditions.

Cass Business School is one of the university's newest buildings. Opened in 2003 it contains a 200 seat lecture theatre, classrooms, a resource centre, café, restaurant, and office accommodation. Though designed to accommodate up to 1,750 students and 250 members of staff, these numbers were soon exceeded, reaching 2,804 students plus 290 staff.

In 2007, the university carried out an energy survey in the building to assess performance and highlight areas where improvements could be made to bring down energy consumption and provide better conditions for occupants. This resulted in adjustments being made to the building's Trend BMS, which had been set to operate the HVAC services from 4:00am to 10:00pm seven days a week. These times were reduced significantly and, together with changes made to a number of setpoints, led to energy consumption cuts of around 8% for electricity and almost 50% for gas.

However, the adjustments highlighted a number of operational issues that had previously been disguised by the long operating hours and it was decided to bring in Trend Control Systems to undertake an energy audit of the building and its BMS. This was carried out in November 2007.

The building is heated in a number of ways depending on the area. Most heating is provided by tempered air from seven air handling units (AHUs). There are also perimeter heating on each floor and a mixture of wet and electric radiators in the stairwells, lift lobbies and basement corridors. Some classrooms have fan convectors. The main entrance foyer has underfloor heating and cooling.

The low loss header from the boilers feeds five secondary heating circuits, three being constant temperature (CT) and two variable temperature (VT). The CT circuits are for the basement and rooftop AHUs and the domestic hot water service, whilst the VT circuits


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are for the perimeter heating, radiators and underfloor heating.

The report by Trend recommended various opportunities for energy savings. It noted that several floors were always too hot and there was constant adjustment of on/off times and setpoints in an attempt to overcome this issue.

Trend examined the system settings (on/off times and setpoints) and recommended that they be reset to a base setting of standard opening times and 21ºC. Then, if specific areas were revealed as being too hot or cold, further tests should be carried out.

It was also observed that there was no significant 'dead band' between heating and cooling. When an AHU operated close to the required supply air setpoint there was significant temperature fluctuation as the heating and cooling cycled on and off. Trend's report pointed out that it was not necessary to have close control of supply temperature with this type of system. Its recommended solution was to provide a fairly wide dead band between heating and cooling.

Other recommendations included:

- Provision of BMS monitoring of the AHUs' thermal wheels with fault indication shown on graphics.
- Operation of the thermal wheels to take priority over use of the heater batteries in order to maximise heat recovery.
- Optimization of AHU operation, which would help prevent problems in some areas which failed to reach set temperatures by the desired occupation time.
- Stop controlling the AHUs to achieve a fixed (user adjustable) supply air temperature setpoint. This to be amended to schedule the supply air setpoint against outside air temperature to assist the VAV system when dealing with extreme weather conditions and to help the plant to control space conditions more efficiently.
- Introduction of a 'night purge' routine where overheating of floors was an issue; this would allow fresh air to be drawn into the building when the correct conditions were met, to achieve 'free cooling' in the relevant area and reduce the cooling load on the building during normal hours.

The proposed changes were among many improvements subsequently made by Trend and the university's own personnel, the work being completed in January 2009. The resultant reduction in electricity consumption averaged 8.2% (281,000 kWh annual), with savings of 18.5 – 19.8% respectively in the critical months of January and February. The reduction in gas consumption averaged 10.3% (143,000 kWh annual) with the greatest savings being achieved in July (59.3%) and August (48.3%).

The averaged annual savings in energy costs due to the university's adjustments totalled £81,812 and the savings attributable to Trend have so far reached £60,839 (adjusted to delivered energy costs in November 2009).

"We have been delighted by the results of implementing these measures," said Stephen McKinnell, Energy and Environmental Manager in City University London's Property and Facilities Department. "It shows that bringing in experts to look at operating strategies, rather than continuously adjusting setpoints, can result in huge improvements. The investments have paid for themselves in a matter of months and the number of complaints has greatly reduced."

The university has recently been trialling a new control regime for some of the dampers that serve a mixture of classrooms and common areas; the aim is to achieve better temperatures and to zone the building more effectively. This is expected to provide additional savings and, if successful, will be rolled out throughout the building.

The energy saving initiatives carried out at the Cass Business School have involved both Trend Field Services and the company's Energy and Support Solutions team. Trend partners ST Controls and Energy Efficient Controls have also worked closely with the university, having installed Trend controls in a number of other buildings on the campus.

Trend can be contacted on (0) 1403 211888