

CASE STUDY IMMEDIATE, SUBSTANTIAL ENERGY SAVINGS AT CHARING CROSS HOSPITAL

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Charing Cross Hospital, Imperial College Healthcare NHS Trust, has achieved significant annual gas and electricity savings – five million kWh and two million kWh respectively over a 12 month period – by implementing various energy saving initiatives. The savings were accomplished mainly through three strands of action, each providing a rapid payback: improved monitoring and optimization of heating and ventilation using the hospital's building management system (BMS) supplied by Trend Control Systems; installation of variable speed drives (VSDs) with high efficiency motors on 70 air circulation fans; and various actions to reduce electricity used by lighting.

The hospital, part of Imperial College Healthcare NHS Trust, began a major energy-saving initiative during 2006, assisted by the Carbon Trust. Surveys identified numerous opportunities, a programme to tackle them was drawn up without delay and action commenced immediately.

Terry Croydon, Energy Manager with the NHS Trust, routinely prepares detailed reports showing energy trends. These clearly show substantial savings in gas and electricity, beginning with the completion of the first energy saving projects in 2006/7 and increasing cumulatively as more projects were implemented over the following 12 months.

Charing Cross Hospital's Trend BMS, which provides control and monitoring

for the entire heating and ventilation installation, was critical to the whole process: it not only provided direct potential to save energy by optimizing heating, ventilation and cooling, but also the means to monitor and provide data proving the effectiveness of other energy saving initiatives.

"We upgraded the Trend BMS as a priority and in parallel installed energy meters in all the main plant rooms and monitor them via the BMS," explained Ian Svenson, Head of Estates with the NHS Trust. "The resulting data allowed us to identify and eliminate energy wastage in many ways, yet without causing staff and patients to suffer – in fact they do not even notice the changes."

It was important to maximize savings

offered by night set back (NSB), by which ventilation rates are lowered overnight. The energy meters showed where consumption exceeded a tolerance set on the BMS, which initiated alarms to prompt investigation and corrective action.

Charing Cross Hospital operates 24/7, but some areas such as offices are not used overnight. Maximum savings are made by providing heating and ventilation only when they are occupied. "Using the Trend BMS we can see what's running when it should be switched off. We examined all areas of the buildings and were able to match heating times closely with periods of occupation, so saving energy. We revisited all the on/off timetables to ensure they were



still correct: sometimes these didn't match needs, because there had been changes of use or of occupancy."

Installation of variable speed drives with high efficiency motors on circulation fans provided substantial savings. Previously, the fans operated only at their maximum speed, so wasted a huge amount of electricity. Now, the Trend BMS monitors the demand for air circulation in each area and commands VSDs to adjust fan motor speeds accordingly. A VSD does this by varying the supply frequency. When the frequency is reduced, the power consumed drops dramatically, because it operates using a cube law relationship, so a small reduction of air flow results in a large reduction in electrical consumption.

Another way in which the Trend BMS is reducing energy wastage is by controlling the hospital's cooling towers and main chiller plant according to the outside air temperature. "The chillers are switched off when the outside air temperature falls below 15 degrees C," revealed Svenson. "We then make use of 'free cooling' provided by the outside air."

The hospital used to operate four boilers. Two were replaced with higher efficiency units as part of the energy initiative. While the boilers have their own controls, the boiler room overall is monitored remotely

by the Trend BMS. It revealed that the energy savings were such that one of the two remaining original boilers could be decommissioned. Other energy saving initiatives in this area included reducing boiler steam supply pressures, upgrading condensate returns and replacing valves to stop leakage.

Lighting throughout the hospital provided another great opportunity for energy saving. Through these initiatives the hospital expects to make significant savings. Trial areas exhibited up to 70% power reduction compared with the original installation. It standardized on T8 (1inch) fluorescent tubes and retrofitted dimmable high frequency ballasts to switch start fittings and controlled circuits with dimmable light sensors. Further examination found that even greater savings were achievable with intelligent "Smart" fittings fitted with T5 (5/8 inch) lamps and dimmable sensors.

As with heating and ventilation, the hospital aims to match lighting with needs. For example, lighting in many areas switches off automatically when an area is unoccupied, such as overnight. Lighting in some areas is brought on by occupancy sensors when staff enter. Many lamps have been replaced with intelligent light fittings which dim the lamp in response to sunlight and turn the lamp off overnight.

The lighting changes have knock-on benefits as they have increased the power factor and reduced heat produced by the lighting which, in turn, reduces energy used in chilling.

"The best saving you can make is to switch something off when it's unnecessary," stressed Svenson. "This can even extend to ventilation fans in toilets, which can be switched off for three or four hours overnight when they are hardly used, if at all.

"We encourage all hospital staff to join in our energy saving initiatives. They have been encouraged by seeing what we are doing – particularly the more 'visible' actions such as the lighting controls – so do more themselves to save energy by switching things off whenever possible.

"A number of Trend Technology Centres and Trend Systems Integrators – including Ashdown Control Services, Pillinger Controls, PACE Services and Total Control Services – have been involved with the Trend system on the site over many years, although the majority of the energy savings mentioned here were as a result of the hospitals own initiatives."