CASE STUDY

FLEXIBLE CONTROL BRINGS WELCOME POWER CUTS

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A Trend control system incorporating variable speed drives has been responsible for virtually all of a 55% fall in building services power consumption at Bristol's Broad Quay House, an 8-storey, multi-tenanted office block. Installed by Trend Services as part of a major refurbishment programme, the system is estimated to have cut up to £25,000 off the building's annual electricity bill, thus allowing a reduction in tenant charges. The savings are largely the result of controlling the speed of air handling unit fans in strict accordance with heating and cooling demand.

Plant controlled and monitored by the Trend system includes the building's boilers, chillers and the three large air handling units that serve the offices' VAV (variable air volume) air conditioning. It basically comprises nine network-linked IQ 'intelligent' controllers, a '962' graphics-based supervisor and seven NX variable speed drives. Six of the latter control the AHUs' supply and extract fan motors, the ratings of which range from 15 to 55kW. The other unit drives a 15kW motor on the cooling tower fan.

Trend was originally called in by the landlord's agent King Sturge and by consultants Property Solutions Building Services Ltd, who were project managing the refurbishment work on behalf of the building's owner Standard Life. They were concerned about the poor performance of the air conditioning, which they had identified as a major source of energy waste. The problem lay in the method of control being used by the building automation system that had been installed in Broad Quay House in the mid 1990s.

This system – which was recently replaced by the Trend control equipment – had maintained a constant air pressure in the supply duct from each AHU by simply opening or closing a throttling damper. Regardless of demand from the VAV terminal units in the office space, the air handlers' supply and extract fans were always run at full speed. Now, the Trend NX drives vary the speed of the fan motors in response to signals from one of the IQ controllers, which constantly monitors static duct pressures on all three AHUs.

Generally the fans now run at 60 – 70% of full speed. Owing to the cube law relationship between motor speed and power consumption this actually equates to electricity usage being cut by roughly 65 – 80%. In fact, speeds are sometimes down to just 40% of maximum, which represents an energy saving of over 90%. Though the potential for making savings was not as great on the cooling tower fan, it has still been possible to reduce consumption by more than 50%. Until the fan's motor was linked to an NX drive, it too had always operated at full speed (control of condenser water temperature being achieved by modulating a by-pass valve).

Three sizes of NX drive have been supplied to match the various ratings of the fan motors. The total cost of installing the seven drives and

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associated equipment came to not much more than the annual level of savings they have made. Payback on investment has therefore been rapid.

The IQ controllers have also contributed to increases in energy efficiency, as well as improving comfort conditions. For instance, under the old system the supply air temperature setpoint for all three AHUs was varied according to measurements from a single room sensor, which led to many areas being heated or cooled unnecessarily. Now the setpoint for each plant is separately controlled and is based on the average reading from several temperature sensors in the zone that it serves. This approach takes account of the effects of solar gain and provides much more uniform temperature conditions. The nine installed controllers comprise two IQ241s (regulating the boilers and chillers) and seven IQ222s.

Through the system's PC-based '962' supervisor, the building manager Steve Rees is able to closely monitor space conditions and air conditioning plant status – including that of the variable speed drives. He is also able to adjust control settings, a facility that he regularly uses to satisfy tenants' changing requirements and maximise energy savings. The main operator interface on the old system was a simple and difficult to read LCD display located in the plant room.

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