CASE STUDY

NATIONAL SPORTS CENTRE DRIVES DOWN POWER CONSUMPTION

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It has taken just a year for the Isle of Man's National Sports Centre to recoup the £41000 cost of fitting Trend NX variable speed drives on 20 of its pump and fan motors, an action which has cut the site's electricity usage by 17%. Supplied and installed by Manx Control Systems Ltd, the VSDs have reduced the motors' annual power consumption by a higher than expected 436,200 kWh – a fall of 43%. There have been maintenance savings too and an improvement in comfort conditions for centre users and staff.

The National Sports Centre was opened in 1998 and is run by the Isle of Man Government's Department of Leisure and Tourism. Its facilities include leisure and championship swimming pools, two sports halls, squash courts, a bowls hall and a gym. Controlling and monitoring its heating, ventilation and lighting is a Trend building management system that was supplied and engineered by Manx Control Systems. The NX drives have been connected directly to the system's Ethernet network, which as well as simplifying their installation has allowed them to be centrally managed and monitored through the BMS.

Six of the 20 variable speed drives have been fitted on 11 and 15kW pool water circulating pumps, while the others are on air handling unit supply and extract fans with power ratings from 2.2 to 16.3kW. To accommodate the different motor sizes, six different models have been used from the Trend NX range. Previously, all the pumps and fans were run at full speed. Though some of the larger fans did have two-speed motors, it was not normal practice to switch to the lower speed – which had to be done manually.

Some of the biggest energy savings have come from lowering the speed of the pumps, which operate 24hrs/day. Because these units were oversized it had been necessary to fit valves to reduce the flow to a level that delivered the desired pool water turnover rate. The valves have now been fully opened and the VSDs operate the pumps at a permanently reduced speed, though because of the need to maintain water quality a relatively high flow rate must be maintained. Thus, during centre opening hours, the pumps serving the championship pool are run at 90% of maximum and the set for the other pool at 95%. However, owing to the cube law relationship between motor speed and power consumption, these figures equate to energy savings of 27% and 14% respectively. Moreover, at night the pump speed is ramped down by 25%, which is equivalent to a 58% cut in electrical usage.

The speed of the AHU fans is controlled in accordance with environmental

conditions, which in the pool hall area means both temperature and humidity. The main pool is served by two identical air handlers whose 12 and 8.2kW supply and extract fan motors have each been equipped with an NX drive. So have those on the leisure pool AHU, though these were installed prior to this recent project. If conditions within the pool hall are satisfied, the fans are ramped down to a pre-set minimum speed. If dehumidification is necessary – in order to prevent condensation and protect the building fabric - fan speed is increased to draw in more fresh air, the same being done in the summer months when there is demand for cooling. When there is heating demand, the AHUs' heating coil valves are opened up and again the fans are ramped up. During the day, the space temperature setpoint for the pool hall is 29°C – just above that of the water in the main pool – and at night is reduced to 28°C.

The other NX drives are on the air handlers for the sports halls, bowls hall, changing area and the building's atrium. Whenever the space temperature setpoint is satisfied in an area, the speed of its AHU fans is reduced and at night they are switched off completely, and only brought on again if heating is required for frost protection.

The facility to automatically regulate fan speed in line with demand has not only saved energy. It has also resulted in more stable control of conditions, particularly in the pool hall and changing areas, thus producing a more pleasant environment for visitors. All 20 drives installed at the centre have brought the additional bonus of lower wear and tear on motor bearings, drive-shafts and belts – a direct consequence of the fans and pumps no longer running flat out all the time.

Fan speed is varied on the basis of signals transmitted to the NX drives by IQ3xcite controllers that form part of the BMS and regulate all elements of the AHUs' operation. Communication is via the system's Ethernet TCP/IP network, to which each drive connects through a standard, plug-in interface board. (The latter can be fitted in any of the 20 models that make up the Trend NX range.) Because the drives connect to the network, the operational data they are collecting can be viewed through the BMS's '963' supervisors, the operator interfaces that provide system access.

One of the '963s' is in the office of David Haynes, the site's maintenance manager and the man behind the VSD project and other energy saving initiatives at the centre: "Using the supervisor I can 'run' round the building every day from my desk. As well as looking at environmental conditions in the pool hall and other areas, I can now also monitor the operation of the fan and pump motors. I hardly ever have to go and check on them in-situ. Should a motor fail I would be alerted automatically via the system."

The NXIP interface board allows monitoring of some 30 operational variables, including motor status, speed, power, current, torque and hours run. Furthermore, it is able to store 80 sequential values of a particular variable.

The National Sports Centre has also recently made significant savings on its gas consumption by using waste heat from a nearby power station. Here again the Trend BMS plays an important role. Heat from the power plant's gas turbines is used to provide piped hot water to the centre; this passes through a heat exchanger connected to the building's heating circuits. The BMS controls the system's circulating pumps and control valves to maintain the desired flow temperature. When necessary it brings on the centre's gas boilers in place of the waste heat circuits. The waste heat recovery scheme has cut the site's gas consumption by 71% - an annual saving of £95,000. It was implemented by the NSC's maintenance team, with specialist assistance from Manx Control Systems.

For his work on this and the VSD project, David Haynes received an energy saving award from the Isle of Man government.

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