

CASE STUDY

WINE SOCIETY CUTS BACK ON ITS CONSUMPTION

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Despite hugely increasing the storage capacity of its wine warehousing facility, the Hertfordshire-based Wine Society has seen a 19% reduction in its energy consumption - and is more than likely to see it fall further. With the installation of a Trend building energy management system (BEMS) the operation of the site's air conditioning and central plant is now much more in tune with demand, resulting in gas and electricity savings that are so far worth £55,000 a year. The system, which comprises Trend IQ intelligent controls and variable speed drives, was supplied and engineered by ECS Power & Control Ltd.

A non-profit making organisation owned entirely by its membership, the Wine Society aims to provide its 100,000 members with the highest possible quality of wines at the best possible prices. It stocks 1500 different wines and can now hold some 600,000 cases - equivalent to over seven million bottles - at its recently expanded Stevenage base. The site's four large temperature controlled warehouses have a combined storage capacity of 123,800 m³, around 40% of it provided by warehouse no 4 - which opened in late 2008 and at 17m high is twice the height of the other three. Designed with low energy use very much in mind, it is particularly

notable for its hemp-based (Hemcrete) wall cladding, a material with excellent insulation properties.

A total of 18 air handling units supply tempered air into the four warehouses. Warehouse 1, which is divided into two sections, has three units serving one area and four the other. In warehouse 2 there are three units supplying the main floor and two doing a downstairs area. The third warehouse has four AHUs and in number 4 there are two, though it also has separate destratification fans. Most of the units feature direct expansion cooling, the rest having chilled water cooling coils. Air heating is either by gas burners or low temperature hot water coils.

Prior to the installation of the Trend controls the supply fans on all the AHUs operated continuously. Also, apart from in the newest warehouse (no 4) none had variable speed drives on their motors - as all now do - and they thus ran flat out. Moreover, whenever there was demand for heating or cooling the previous controls would immediately switch on all of the gas-fired heater burners or every stage of DX cooling, whereas they are now sequenced on the basis of demand.

Crucially, the Trend BEMS measures the warehouse temperature at both high and low levels. It then calculates not only the average of these values - which it uses as the basis for modulating the AHUs' heating and cooling output - but also the difference between them. Should this temperature gradient exceed a specified amount it then brings on the fans to provide thermal destratification. Thus, an even temperature distribution is ensured without running the plant 24/7. Prior to installing the system, ECS spent several weeks monitoring conditions within the warehouses, which enabled them to match the control strategies to the buildings' thermal responses and the characteristics of the plant.





The most obvious change produced by the BEMS and the strategies programmed into it by ECS, is that most of the air handling plant is now switched off for much of the time. According to Steve Levet, the Wine Society's Facilities Manager: "There is generally only one AHU running in each warehouse or warehouse area at any one time, yet we are still able to maintain the required temperature conditions. It is only during very hot weather that more need to be operated."

One AHU is always kept running to maintain a degree of air circulation, though if the temperature setpoints are satisfied its Trend controller signals the VSD to reduce the fan speed. In warehouses 1, 2 and 3 the setback speed is currently 75% of maximum, while in warehouse 4 it is 40%. When there is demand for heating/cooling or destratification, fan speed is increased to 95% (it is not ramped up 100% as the fan motors are slightly oversized).

The Trend controllers and VSDs were

installed in the three older warehouses towards the end of 2008. The controls in warehouse 4, which replaced another manufacturer's control system that was fitted when the building was opened, have only been operational since November 2009. Even though the warehouse's two AHUs had VSDs, the Trend controls have still had a marked impact. As well as holding one unit off for most of the time, they only operate the nine destrat fans when there is demand, whereas previously these ran virtually continuously.

In all four warehouses the space temperature is maintained between 12° and 16°C. This range meets the requirements of the wine, the temperature of which should not exceed the upper limit, and provides a satisfactory working environment. The destratification setpoint – viz, the maximum allowable temperature difference between the high and low level sensors – is currently set at 4°C in the older warehouses and 1.8°C in the new one. One reason for the latter's lower setpoint is that the building has no distribution ductwork, the destrat fans being the only means of forcing down hot air from high level.

The Trend system monitors not only the air temperature but also that of the wine, via an immersion sensor in a bottle in each warehouse. Current and live readings both from these and the space sensors can be viewed by the Facilities Manager through the system's main operator interface (a '963' supervisor), along with other monitored data such as the status of the plant. Data is displayed on a series of graphics pages, one of which is a

site overview that gives an instant picture of the air and wine temperature in each warehouse and the hi/lo temperature differential values.

As well as controlling the warehouse air handlers the BEMS sequences the site's four boilers and enables its chillers in line with heating and cooling demand. Trend VSDs have also been fitted on a number of hot and chilled water pumps.

In its first year of operation in warehouses 1, 2 and 3, the system cut their combined gas and electricity consumption from 2,624,115 kWh to 1,684,478 kWh, bringing it down from 35 to 22 kWh/m³ and more than offsetting the energy used in warehouse 4. Owing to the latter's low energy design its initial usage was just 10.7 kWh/m³, though this should fall even further once the impact of its Trend controls are reflected in the annual figures. There may also be scope to make additional savings in all four warehouses by reducing the setback speed of the AHU fans, possibly switching them off altogether at certain times. But even without adding to the £55,000 worth of confirmed annual savings, the BEMS would still pay for itself in just two and a half years.

The ECS-supplied Trend system comprises 17 network-linked IQ controllers and 24 variable speed drives of five different sizes. These control pump and fan motors ranging 0.37 to 7.5kW.

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