

Case story | VLT® Solutions

Energy savings up to 78% and optimum conditions for elephants, jaguars and penguins

VLT® drives from Danfoss and a 'demand matched' ventilation strategy has resulted in energy savings of up to 78% being recorded for Chester Zoo in England; 55% of the savings are directly attributable to the drives, which in addition contribute to an unforeseen animal welfare improvement.

JBC Controls, in conjunction with Danfoss Drives, have installed Variable Speed Drives in three of its animal enclosures; Spirit of the Jaguar,

Elephants of the Asian Forest and the penguins. Existing systems were upgraded in order to save energy and increase efficiency. As Glyn Berry, Sales Director of JBC Controls explains "All drives have been retrofitted adjacent to the plant they control as the plant is existing we have had to rewire the fans supplies to comply with the current EMC directive & standards set out by Danfoss. The beauty of the drives being in IP55 enclosures meant there was no need to provide additional protective enclosures".

JBC Controls and Chester Zoo have a longstanding relationship and have been working on projects together for the last five years. This combination of applications is the largest single energy saving project undertaken to date and looks to be the most rewarding according to the statistical data gathered since the addition of the drives, achieving benefits of a financial nature in terms of reduced running costs whilst improving animal welfare.

**78%**

Energy savings
achieved by installing
VLT® HVAC Drives to
the AHU's in the
Elephant house

78% energy saving in the Elephant house

The area where the greatest success has been realised is in the elephant house (one 37 kW drive). Optimisation of controls via the installation in August 2008 of an outside air temperature sensor to the BMS controls enables determination of the modes of operation between the summer and winter setting based on ambient air. This optimisation, the installation of the Danfoss drives and a 'demand matched' ventilation strategy has resulted in energy savings of up to 78% being recorded. 55% of the savings are directly attributable to the drives, which were installed at the end of July 2008. The forecasted cube law savings have been realised in this application i.e. a reduction in speed of 20% has reduced energy consumption in excess of 50%. Service life of the air filters used on the AHU in the Elephant house has increased by around 60% and the ability to control speed has eliminated motor start/stop noise that could potentially disturb the elephants, an unforeseen welfare enhancement benefit for animal management purposes.

VLT® controlled water filtration

The water filtration plant in the penguin enclosure has three 18.5 kW VLT® HVAC drives which control water circulation to the pool area and automatically reduce the flow of water to 70% at night via a time programme. The positive effect was evident immediately after installation of the drives.



In the Penguin exhibit it has been possible to reduce motor speed by up to 40% meaning savings of up to 73% have been achieved.

Payback is clear to see, within 12 months Chester Zoo may profit from a greater return on their investment than projected. Two more unexpected benefits are reduced noise in the plant room, together with improved water quality due to the greater effective use of continuous Ultra Violet light.

The jaguar enclosure has two drives (one 11 kW and one 7.5 kW) controlling the surrounding fresh air in a similar manner to the elephant area, via a BMS control. The ventilation system is enabled by heating or cooling demand from room temperature sen-

sors. In addition, should the system be off and the CO₂ level increase, the system is automatically enabled.

Demand matched speed control

The application of drives has enabled the Zoo to optimise efficiency by adopting a 'demand matching' controls strategy, fundamental to the reduction in energy consumption on the associated HVAC equipment in both the elephant house and the jaguar enclosure. Previously motors had to run 24 hours a day at one speed. Now for the first time the zoo is able to match the speed of the motor (or the pump in the case of the penguins) to the demand of the system, switch the AHU off if heat, cold or a change in air quality is not required for example. Ventilation and seasonal



Before installing VLT® HVAC Drives in the penguins exhibit plant room the system pumps rated at 50 Hz and 14.7 kW ran 24/7 day at 100% duty. The system was re-commissioned, taking out of service the mechanical valves and three 18.5 kW drives were installed (2 duty & 1 standby). The pumps electric motor now runs at 35 Hz during the day and 30 Hz at night. Power consumption has dropped to 4.5 kW at day and 2.9 kW at night.

demands can now be easily met with no adverse effect on environmental conditions.

A contribution to the environment

Ray Morrison, who has been Maintenance Manager at Chester Zoo for 10 years, explains how environmental performance is equally as important as financial performance. "At Chester Zoo we adopt the principle of triple Accounting, our performance is measured by how well we perform financially, environmentally and in terms of corporate social responsibility". Ray goes on to explain how the zoo takes its responsibility for the environment very seriously. "Every £1 saved is £1 that can be re-invested in animal welfare and conservation projects world wide, such as supporting Asian elephants in their natural habitat in the wild."



The purchase and installation of Danfoss drives via JBC Controls is seen by all parties as a major step towards continual global environmental compliance and best practice, with an estimated £3000 reduction in monthly energy costs at Chester Zoo. This long term investment supports the Zoo's proven track record in demonstrating its significant contribution to the protection of animals and reinforces its dedication to sustainability.

The North of England Zoological Society (NEZS) runs Chester Zoo, the UK's number one charity Zoo, with 1.3 million visitors each year, caring for over 7,000 animals, representing over 400 different species; contributing significantly to their protection through a combination of zoo and field based conservation.

Contact:

Tim Keighley; Area Sales Manager (North); Danfoss VLT Drives; tel +44 7702 240559; tim.keighley@danfoss.com
www.danfoss.co.uk/vlt