ENGINEERING TOMORROW



Case story

Animal welfare and energy savings go hand in hand at Randers Rainforest

Randers Rainforest, an indoor tropical zoo park in Randers, Denmark, goes to great lengths to consider realistic, energy-efficient solutions when establishing enclosures for its tropical animals and plants. VLT® HVAC Drive frequency converters thus play an important role in the park's water treatment, and contribute to a safer and more effective management of the park's pumps.

The air humidity is high in the technical room directly under the South American dome in Randers Rainforest. Above, visitors walk around in a perfect tropical rain forest climate as they look at the wildlife of the rain forest. The three domes, which make up the attraction's tropical exhibit, house more than 250 different species of wildlife, including sea cows, piranhas, monkeys, and an army of leafcutter ants, who tirelessly carry small parts of leaves along a tree trunk on their way to their home in the cliff behind the waterfall. The temperature remains a constant 22-30 degrees Celsius all year round, and the air humidity in the dome often comes close to 100%. The floor is constantly damp and the air is thick with smell of moist earth: perfect conditions for the many tropical animals and plants, which most people know only from nature programmes on TV, and which tourists from across the entire world visit annually in order to see up close.

Not so perfect are the conditions for the equipment that ensures the water in the aquarium is kept clean.

Manual control takes time

Two VLT[®] 6000 and two VLT[®] HVAC Drive FC 102 frequency converters are hanging in the technical room. Round the clock, they automatically control the pumps to the dome's two waterfalls, together with those pumps that ensure water is sent from the basins for cleaning in



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Technical manager Peter B. Jensen does not have to expend much energy to control the park's Danfoss frequency converters. There is never any problems with them, he says.

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I would think that it would cost one man-year to service all the valves in our three domes manually. Now we can just leave them alone, and leave it to the frequency converters to control the speed of the pumps. It's all controlled by one PLC, and we save a huge amount of both time and manpower, while also benefitting from a cost-effective solution.

Peter B. Jensen, Technical Manager, Randers Rainforest



the sand filters and then returned. However, motor control has not always been so automatic.

The tropical zoo park opened in 1996, and consisted at that time of two domes: the African and the Asian. At that time, the treatment process was dependent on manual labour, recalls technical manager Peter B. Jensen. "For the first few years, rinsing out the filter system was managed with the aid of ball valves. This meant that we had to open and close the valves manually in order to ensure the correct pressure and flow for the water to be properly cleaned. The process was extremely time-consuming, as we had to do it every day."

Increased automation

In 2003, Randers Rainforest was expanded to include a third dome, this time to house South American species of animals and plants. In the new dome, it was decided to increase automation, amongst other by installing Danfoss VLT® 6000 frequency converters to control the pumps. It did not take long for the drives to prove their worth both as a time-saving device and financially.

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Avoid expensive human error

The automatic control of the pumps also has the advantage of preventing mistakes in servicing. It is precisely this kind of human error that can, in the worst cases, be of critical consequence to the animals' welfare. If an alarm is tripped, Peter Jensen automatically receives an SMS, which makes it faster to rectify any error that may occur.

"It's a real hassle if the water cleaning unit stands still every other day. It's bad for animals as well as plants, which risk a lot of damage. And it's not like you can simply go get yourself another sea cow".

Replacements and upgrades

In 2012, a pair of the old VLT 6000 units were replaced with the latest VLT[®] HVAC Drive FC 102 drives. While there were signs that the older drives were starting to fail, there was also a natural explanation: "We needed extra storage space for plants, and moved them down into the technical room. This meant that air humidity rose to almost 100%, which was more than the old drives could handle, so they slowly stopped working. They simply weren't built for that," recalls Peter Jensen. The new FC 102 drive is supplied with IP 55 protective casing and a printed circuit board with a special coated surface. This gives the drive optimal protection against the installation environment.

Jan Roetink, Key Account Manager from Danfoss explains: "The old machines were simply not wellsuited for this tough environment, and definitely not when the plants were moved in. The new drives are fitted with IP 55 protective casing, which is perfect for humid environments. This too is why the printed circuit boards have also been supplied with casing that enables them to live up to the requirements for C3C protection. Water is the ultimate enemy of electronics, but the special protective casing means that the risk of short circuiting and breakdowns due to humidity is minimised."

The installation of the new frequency converters went according to plan, but when outside help was needed one day, Peter B. Jensen contacted Danfoss. "It's a great benefit to us that Danfoss has service engineers so close at hand. When I called, they were here in the space of a few hours to get the whole thing up-and-running again," he recalls.

Saving energy not the highest priority

With a strong profile in environmental protection, Randers Rainforest has a clear ambition of being an environmentally-friendly attraction. Among other things, the domes' design means that heating is as optimal as possible. Heating consumption in Randers Rainforest is around 2,000 MWh annually, but calculated in consumption per cubic metre, the figure is less than that for an average detached home.

With 300,000 visitors every year, Peter B. Jensen is most concerned that animals and plants are doing well, and that all the visitors can therefore have a great experience. It is however important that the processes don't use more energy than is necessary: and here it's clear that the drive control of the many pumps has helped reduce electricity consumption, which is down to 850 MWh annually for the whole of Randers Rainforest.

"The big saving we achieve is in terms of time. It would probably cost around € 40,000 a year to have a man employed to open and close ball valves all day long. We avoid that with the frequency converters. They also play an important role in ensuring the water our animals live in is clean and will not make them ill. The fact that we can also keep our energy consumption down as an extra, and welcomed, bonus," concludes Peter B. Jensen.

Products installed

- 1 VLT[®] HVAC Drive FC 102, 1.5 kW, IP 55 controls the pump to the park's small waterfall
- 1 VLT[®] HVAC Drive FC 102, 11 kW, IP 55 controls the large waterfall
- 2 VLT[®] 6000 control the basins for the piranhas and the crocodile enclosure respectively.





Peter B. Jensen in front of the VLT drive-controlled waterfall in Randers Forest's South American dome.



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Danfoss

What VLT[®] is all about

Danfoss VLT Drives is the world leader among dedicated drives providers – and still gaining market share.

Environmentally responsible

VLT[®] products are manufactured with respect for the safety and well-being of people and the environment.

All frequency converter factories are certified according to ISO 14001 and ISO 9001 standards.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place with a minimum of noise, smoke or other pollution and environmentally safe disposal of the products is pre-prepared.

UN Global Compact

Danfoss has signed the UN Global Compact on social and environmental responsibility and our companies act responsibly towards local societies.

Impact on energy savings

One year's energy savings from our annual production of VLT[®] drives will save the energy equivalent to the energy production from a major power plant. Better process control at the same time improves product quality and reduces waste and wear on equipment.

Dedicated to drives

Dedication has been a key word since 1968, when Danfoss introduced the world's first mass produced variable speed drive for AC motors – and named it VLT[®].

Twenty five hundred employees develop, manufacture, sell and service drives and soft starters in more than one hundred countries, focused only on drives and soft starters.

Intelligent and innovative

Developers at Danfoss VLT Drives have fully adopted modular principles in development as well as design, production and configuration.

Tomorrow's features are developed in parallel using dedicated technology platforms. This allows the development of all elements to take place in parallel, at the same time reducing time to market and ensuring that customers always enjoy the benefits of the latest features.

Rely on the experts

We take responsibility for every element of our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee of reliable products.

Local backup – globally

VLT[®] motor controllers are operating in applications all over the world and Danfoss VLT Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

Danfoss VLT Drives experts don't stop until the customer's drive challenges are solved.



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