

Case story | VLT® HVAC Drive FC 102

Sustainability benchmark

- the luxury hotel of tomorrow, **driven by drives**

Designed for sustainability, Crowne Plaza Copenhagen Towers is truly engineering tomorrow, with 77% lower electricity consumption than comparable hotels operating conventional energy technology, in 2015. Deploying the best environmental and energy technology, the hotel comes close to achieving carbon neutrality.

Copenhagen's luxury business hotel, the elegant Crowne Plaza Copenhagen Towers in the Ørestad district, has been designed from the ground up with sustainability in mind.

Its electricity and water consumption for 2015 were respectively 77% and 25% lower than comparable properties in the Crowne Plaza chain, internationally. These results reinforce the hotel's global benchmark status.

The enviably lean power and water consumption are achieved on a solid base of innovative technology and

best practice operation, demonstrated by ISO 14001 environmental certification and international recognition with a Sustainable Tourism (SKÅL) award, for the most environmentally friendly hotel in the world.

Innovative ground water cooling system

In order for energy consumption and CO₂ emissions to be as low as possible, the hotel insisted on state-of-the-art energy technology throughout. One of its most significant features is an innovative ground water cooling system. This supplies the heating and air conditioning for 366 guest rooms,

conference rooms, kitchen, restaurant and offices in an adjoining wing.

Equipped with 2,500 m² solar cell panels

Copenhagen Towers is also equipped with 2,500 m² specially adapted solar cell panels mounted on three of the hotel's four facades, where they provide part of the building's electricity requirements throughout the year. The installation constitutes Denmark's largest array of solar cells which are architecturally integrated into a building, producing 200 MWh per year – equivalent to the electricity consumption of 65 average-sized



77%

lower electricity consumption than comparable hotels run on conventional technology

UN Global Compact

Crowne Plaza Copenhagen Towers fulfils the requirements of the EU GreenBuilding Programme. It is also the first hotel in Denmark to register under the UN Global Compact.

The hotel has been built to the Danish building regulations' Low Energy Standard, Class 2, which stipulate conusumption of no more than 42.6 kWh of energy per square metre annually.



Two AC drives in the form of 355 kW VLT® HVAC Drive FC 102 IP54 control the screw compressors which enable the two GEA Grenco heat pumps with a combined performance of 2,400 kW to adjust the heat capacity continuously from low to full performance, with the same efficiency.

detached houses. Both the ground water heating and cooling system and the solar cells are part of the foundation on which the hotel's 'green' profile rests. To optimize energy efficiency and cost effectiveness, the systems are equipped with AC drives in the form of VLT® HVAC Drive, and Danfoss solar inverters.

Ground water cooling and heat pumps save energy

The ground water cooling system required two stages of drilling to a depth of 110 metres at two locations near the hotel. In the summer, cool water from the ground, at 7- 9°C, is pumped via one set of wells to the hotel's cellars where it is sent through a heat exchanger and back down to a heat reservoir where the heat accumulates and is stored during the warmer months. The cooled water from the heat exchanger is circulated in the building to cool rooms to the desired temperature. No active refrigeration is required. The COP (coefficient of performance) can be as high as 40, which means that the cooling power is 40 times the electricity consumed by the installation.

In winter, water from the reservoir, which has accumulated heat during the summer period, is pumped through the heat exchanger and back down to the wells. Heat from the heat



The cooled water from the heat exchanger is circulated in the building to cool rooms to the desired temperature. No active refrigeration is required.

exchanger is sent through two heat pumps which raise the temperature to 55°C. This is then used to heat hotel rooms and offices.

"The combination of ground water cooling and heat pumps is an innovative solution. It allows us to recycle heat from the summer months and use it during the cold winter months," explains Peter Andersen, Copenhagen Towers' Property Director. The installation represents Denmark's first ground-water based cooling and heating system and saves up to 90% of the hotel's air conditioning energy consumption.

High efficiency due to VLT® drives

The two GEA Grenco heat pumps have a combined heat pump performance of 2,400 kW and are fitted with VLT® HVAC Drive FC 102 controlled screw compressors which enable the pumps to adjust the heat capacity continuously from low to full performance, with the same efficiency. Heat pumps do not always run at full capacity and it is therefore important for energy consumption that efficiency is high, irrespective of whether the system is working at full or half capacity. All ground water pumps are controlled by AC drives in the form of VLT® HVAC Drive FC 102, and speed

control of the pumps that propel heat around the hotel's internal heating and air conditioning systems is also performed by the same AC drives. These help to ensure good capacity control and afford superlative energy savings for the pump system.

Facades covered in solar cells

Each of the Crowne Plaza's south-facing facades is covered with ultra-thin, high-tech solar cells. Together, these generate around 200 MWh per year, roughly 10% of the electricity consumption of the hotel.

The hotel buys the remaining 90% in the form of green energy produced by wind turbines from Energi Danmark A/S.

Electronically controlled air volume

Several other initiatives have been used to reduce CO₂ emissions as far as possible and to ensure that the hotel achieves its aim of sustainability. For example, VAV (Variable Air Volume) ventilation has been installed in all the hotel rooms. "This means that we can control air volumes electronically in each room, according to need and to occupancy. We also have intelligent lighting in all hotel corridors and low-energy lights in general. There are LED reading lamps in guest rooms," says Andersen.

Another measure is water-saving equipment, including energy and water-efficient dishwashers. Unnecessary products and packaging have also been cut back. Guest rooms have LED flat-screen televisions which at the time of purchase were the most energy-efficient.

Computer-controlled equipment

All electronic equipment is computer-controlled from reception so that consumption is kept to a minimum when the room is not in use. Fridge temperatures are changed according to the time of day. All components of the hotel's IT infrastructure - not least PCs and laptops - are selected for their energy characteristics and recyclability.

The hotel has even decided to forego the customary hotel information folder. All the information a hotel guest might need is available in electronic and interactive format via the television, presented in a familiar 'Internet page' format.

"Our basic principle is to attain sustainability without compromising quality and visitor comfort. I believe we have managed to achieve both," says Andersen.



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Peter Andersen, Copenhagen Towers' Property Director with Danfoss TripleLynx solar inverters