

Case study | VACON® NXP Liquid Cooled

Danfoss AC drives keep flooding at bay in the **Noordoostpolder**

In 2019 the Zuiderzeeland District Water Board in the Netherlands invested in new AC drives for three centrifugal pumps in the Buma pumping station in the town of Rutten. Danfoss partner ENGIE Electropoject was awarded the order to replace the drives and associated tasks. Since then, the Danfoss VACON® AC drives have been keeping flooding at bay in the Noordoostpolder.



Buma pumping station

The Buma pumping station was instrumental in draining the Noordoostpolder in 1941–1942, along with the Smeenge pumping station on the east side of the polder. The Vissering pumping station near Urk was constructed later on. Today, the Buma pumping station is still essential to water level management in the polder. The pumping station is equipped with three large vertical centrifugal pumps, each with a maximum flow rate of 750 cubic meters per minute with a head of 5.6 meters. Each pump is driven by an 850 kW three-phase induction motor.

The present pumps and the variable-speed 690 V motors from the Spanish manufacturer Alconza have been in service since 2006. One of the AC drives began to suffer from an increasing number of malfunctions, while spare parts were difficult or even impossible to obtain. To ensure the ongoing availability of the pumps, the District Water Board decided in 2018 to replace the existing AC drives.

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Photos: Worcflow

The Zuiderzeeland District Water Board is responsible for water management in the province of Flevoland and limited parts of Friesland and Overijssel. In this region, the water board looks after all dikes, waterways, pumping stations and water treatment plants to guarantee safety as well as an adequate supply of clean water. It has seven polder pumping stations (including three for the Noordoostpolder), five wastewater treatment plants, fifteen sewage pumping stations, and thousands of small dams, pumps, and everything else required to maintain the desired water level in Flevoland.

VACON® AC drives

Danfoss VACON® AC drives were the preferred choice of the water board's electrical engineers.

Sandro Posno, Senior Project Manager Electrical Engineering, prepared detailed specifications that included these AC drives. Given the scope of the investment, a public tender was not necessary.

Posno:

"For this project I approached three companies that I knew would be able to handle the job. One of the reasons for inviting ENGIE Electropoject to tender was that they have a lot of experience in the water sector. They were awarded the order because they had the most complete and attractive bid."

Sales Engineer Bas Verhoog from ENGIE Electropoject explains: "We design, execute and manage complete projects, and we handle upgrades along with any repairs to AC drives. We provide 24/7 service and have all required parts in stock. In an emergency, we can draw on the Danfoss stock in Gorinchem. Danfoss maintains an inventory of AC drives with a rated power of up to at least 1000 kW. For this project, we had to replace AC drives from a different brand. Our aim was to keep the existing cabling, including supply cables as well as signal and motor cables, as much as possible. We labeled and disconnected all existing connections, lifted the old panel out and installed the new one. We adapted the panels to the location, so we could connect all cables to the same points at the same height and screw them tight. That guarantees the highest reliability and is the least time-consuming option. Afterwards, all we had to do was adapt the water cooling."

Danfoss collaborates closely with companies like ENGIE Electropoject.

Danfoss Account Manager Ruud Versluis:

"Over the years Danfoss has supplied tens of thousands of AC drives – big and small – to the water sector. While the format installed in the Buma pumping station is less common, large numbers of small and medium-sized AC drives have been delivered for sewage pumping stations, aerators, stirrers in wastewater tanks, and so on. We do not execute projects ourselves, but we know what matters and what the requirements are."





Operation

The water board already has VACON® AC drives of the same type in operation elsewhere, so there was little need to instruct the operating staff and maintenance department.

Posno: "The speed does not vary much in this type of large-scale pumping station. Due to the extensive inertia, it's best to keep the pumps running at the same speed as much as possible. The AC drives are controlled by a central PLC. ENGIE Electropoject took care of configuring

and adjusting the AC drives to the right speed. We basically don't have to touch the AC drives. If there's a problem, we scroll through the menus; there's no need to complete a seven-day training course just to do that.

We can run one, two or three pumps, depending on how much water we need to shift. All three at the same time is unusual, and only happens when the water is very high. That would be an unwelcome situation, because

then the water levels in the rivers and the IJsselmeer would generally be higher as well. In October 1998 we had nearly 100 mm of rain in 24 hours, causing temporary flooding in large parts of the Noordoostpolder. We simply couldn't get rid of the water. After that we built an additional large pumping station (IJsvogel in Tollebeek) to keep that part of the polder from flooding in extreme situations.





Liquid cooling

The AC drives and motors are cooled with water. The cooling water flows through a heat exchanger in a closed circuit. The heat exchanger is cooled by the discharge water from the pump, flowing via a second closed circuit. In both circuits the water is circulated using variable-speed pumps. Liquid cooling is quieter than air cooling, which is an advantage in populated areas, especially in the summer with higher ambient temperatures.

Noise level

After a pleasant conversation, we took a tour through the pumping station, during which one of the motor and pump sets was started. The 28-pole motors run at approximately 23 Hz, which corresponds to 98 rpm. They are started with no load. When the pressure in the pump reaches a specific level, the outlet valve is opened and the station starts to discharge water. Thanks to the speed control and the sturdy design of the pump and motor, the noise level is surprisingly low, even in full operation. It's possible to conduct a normal conversation next to the motor, which is higher than an average person's head. This is pleasant, as are the AC drives installed in the cabinets, which are also quiet.



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