

Case story | VACON® common DC bus modules

Advanced winch technology for extracting oil deep under the sea

Vacon is the market leader in Norway in supplying drive systems for electric active heave-compensated (AHC) winches. AHC winch systems are increasingly being deployed for lowering and lifting equipment to and from the seabed at depths down to 3,000 meters. By compensating for any undulations or heavy sea movements that cause sudden slack or pull on cables, they especially meet the need when extracting oil from wells deep under the sea in extreme, harsh conditions, including high seas.

The oil age has reached its peak - the maximum rate of petroleum extraction - and oil reserves on land and under shallow water are running out. To an increasing extent, oil is being extracted from reserves buried deep under the sea, which requires advanced technology.

Norway is a leading country in high tech R&D for the subsea oil industry, where the equipment must work at sea depths down to 3,000 meters. One of its areas of special expertise is winches fitted with active heave

compensation (AHC) technology, which is used on lifting equipment to reduce the influence of waves by actively compensating for any movement relative to the seabed. AHC winch systems compensate for any undulations or heavy sea movements that cause sudden slack or pull on cables, resulting in safe and controlled deployment and retrieval of loads, increased safety and reduced weather-related down times. The trend is for AHC winch systems to become larger in size and to be electrically operated.



The most important features of electric AHC winches include:

- High dynamic speed control (providing precise load handling)
- Full speed reverse in 3-6 seconds
- Very low mechanical inertia in total system
- Induction motors max 200 kW due to inertia
- Permanent magnet (PM) motors in the 200-400 rpm range are most suitable
- No alarm systems: the winch does not stop for anything!

Right products, application and attitude for demanding needs. Vacon AS based in Holmestrand, Norway, has a proven track record of supplying AC drive systems to several major electric AHC winch manufacturers.

"Our customers include about 10 major system integrators, who use VACON® AC drives to control their AHC winches. Vacon is the market leader in supplying drive systems for electric AHC winches in Norway," says Per Halvor Rønningen, Managing Director, Vacon AS.

"Our success is largely based on our products, our extensive software library, our expertise, and our way of working, which is to be open and share our knowhow. We deliver VACON® common DC bus modules in standardized enclosed solutions and provide advanced support to our customers at their sites – however demanding the environment may be."

Vacon provides AHC winch manufacturers with:

- VACON® Active Front-End modules, which enable regenerative braking, are compliant with requirements of major classification societies, and are also available in 690 V AC

- Compact VACON® common DC bus switchgear solutions
- The advanced VACON® Marine application, which is very suitable for AHC winches, PM motors, and multi-motor systems with load sharing requirements
- High competence in winches and capability to give customer training in AHC drives

Precise, robust and reliable

Active heave compensation causes the winch to adapt to varying load and operating conditions, maintaining safe and efficient compensation without overloading. A motion reference unit (MRU) is used to measure the pitch, roll and heave of the vessel with very high accuracy. AHC increases the vessel's operational time window and minimizes weather related downtime.

The winch operator has precise control of the load, even when operating in rough sea conditions. There are no alarms in the system to make the AHC winch stop; only the operator can stop the winch. This is a cost issue. "If the AHC winch stopped, the costs would be huge. This is why the AHC winch never ever stops," explains Per Halvor Rønningen. "If plan A does not work, there is always a plan B, C, D etc. to use. The goal for AHC winch systems is to be sufficiently robust and reliable so that they can operate continuously."

This case story was originally released before the merger of Vacon and Danfoss Power Electronics was fully completed on 15 May 2015. As a result, Vacon as a company brand no longer exists and contact persons mentioned in the story may have changed. Future case stories on VACON® products will be released on behalf of the new organization – Danfoss Drives – which is part of the Danfoss Group.



VACON® Active Front-End/common DC bus units being installed in switchgear. Vacon's Active Front-End technology complies with the most stringent harmonic distortion requirements, set by the Norwegian classification body Det Norske Veritas. If required, it also enables the energy generated by winch braking to be fed back into the vessel's electrical network.



Active heave compensation (AHC) systems are increasingly being deployed to complement deep water installation applications. Active heave compensated winches are designed to enable equipment to be safely lowered to and lifted from the sea bed during high seas. Advanced fiber and carbon ropes are being used instead of heavy steel cables.

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