ENGINEERING TOMORROW

Case story

Energy efficient drives help bring the catch home in **prime condition**

The modern fishing boat is today a very high-tech piece of equipment that has been designed to optimise efficiency and bring home the catch in prime condition. AC drives from Danfoss help the MV Fugløyhav save energy and secure the best price for its catch.

MV Fugløyhav, built at Vaagland's yard in Norway, is typical of the modern fishing boat. At only 34m overall length and displacing 499 tonnes, nevertheless she's packed with modern technology. Variable speed control of the hydraulic pumps that control the main steering gear, the refrigeration system which keeps the catch alive and fresh and the thrusters that positioning the ship perfectly when bringing the valuable catch onboard are all handled by Danfoss VLT® AutomationDrives.

Power control with drives

The main propulsion unit driving the propeller is a diesel engine with a shaft generator supported by an auxiliary diesel generator set. These two generators between them provide the total electrical power throughout the boat, and particularly the many VLT® drives that control the steering, thrusters and refrigeration plant.

Daniel Kvalvik of Elmarin, the contractor in charge of the thruster application, as well as all the electric installation on board says, "For the stern- and bow thruster we have used the Danfoss VLT® AutomationDrive series. Danfoss VLT® drives are easy to program, due to their intuitive and user-friendly Local Control Panel. Danfoss also offered us great support during the project".

The soft-start characteristic of drive motor control is critical on marine applications as this limits the peak loading on the diesel generators. This means that smaller generator sets can be provisioned, a major benefit as there are always space limitations onboard small vessels.

Precision rudder positioning

The Fugløyhav's rudder is positioned using a rotary vane hydraulic steering unit. The dual-redundant reversible hydraulic pumps are each controlled by a 22kW VLT® drive, which enables precise analogue control and highly accurate rudder positioning. Since the rudder only comes into play when the boat is changing course, no energy is used at all while sailing straight ahead.

20%
energy savings

compared to conventional compressor operation by using VLT® control

drives.danfoss.com | VLT®

> Drive control of tunnel thrusters offers much superior control for coming alongside the dock or the net and are much more energy-efficient than the variable pitch propeller alternative. We have delivered this solution for years, with excellent feedback from our customers"
>
> Peter Vaagland,
> Vaagland Shipyard

Superior thruster control aids net unloading

The two largest drives, 355kW units, control the bow and stern tunnel thrusters. These provide lateral control not only when docking, but also out in the fishing fields when the boat has to manoeuver to the net as it is brought in. No longer is the net, huge and very heavy, lifted on board and the fish dumped on the deck.
Instead, the boat comes alongside the net and the fish are sucked out of it alive, with minimal damage, and are pumped to refrigerated storage tanks in the bowels of the boat.

A high degree of control of the boat is critical during the net unloading and drive control of the tunnel thrusters provides this. Again, the soft-start and ramp characteristics are valuable benefits of VSD control of thrusters, along with reduced energy consumption.

As Peter Vaagland of Vaagland Båtbyggeri (Shipyard) explains, "Drive control of tunnel thrusters offers much superior control for coming alongside the dock or the net and are much more energy-efficient than the variable pitch propeller alternative. They require less maintenance as there's a

VLT® drives aboard the MV Fugløyhav

- **Thrusters:**
  2 VLT® AutomationDrive, 355kW
- **Compressor:**
  1 VLT® HVAC Drive, 160kW
- **RSW Pump:**
  2 VLT® HVAC Drive, 22 kW
- **Steering gear:**
  2 VLT® AutomationDrive, 22 kW

good deal less wear and tear and it's a highly compact solution, especially valuable in a boat only 34m long. We have delivered this solutiion for years, with excellent feedback from our customers".

Ensuring catch quality

Catch quality is a critical aspect of the design of MV Fugløyhav as dead fish decay very rapidly, so to allow the boat to remain at sea and still maintain the quality of the catch, the fish are kept alive on-board, in tanks of refrigerated sea water (RSW) kept at -1.5 °C by a highly efficient refrigeration system. At this temperature, the fish enter a sort of suspended animation and maintain this condition for the duration of the voyage until they are unloaded live and fresh as the day they were caught. This is critical for pelagic fish like mackerel which spoil very quickly.

Fugløyhav's refrigeration system comprises a 160kW VLT® drive driven screw compressor and two 22kW VLT® drive driven circulation pumps which constantly circulate the water in the holding tanks from bottom to top. Fresh sea water is added as necessary to keep the fish in prime condition.

VLT® control of the compressors and pumps enable highly accurate control of the storage conditions while saving about 20% energy compared to conventional compressor operation. The soft-start and ramp characteristics are again critical features for these systems, the compressor being ramped up to approx. 1/3 speed while the compressor slide valve increases the loading to 100% and the drive continues to ramp up to full speed - 3600 rpm. Constant pressure is maintained in the RSW by controlling the suction pressure.

Tunnel thruster aboard the MV Fugløyhav

Single system provides operation benefits

Although Danfoss won the orders for the drives for all of these systems from the various equipment manufacturers, the commonality of operation of the drives is a major benefit. There is only one engineer on board and having all the drives from the same manufacturer will make programming and operating the drives much simpler.

Highest number of certifications

Not every variable speed drive manufacturer can meet the specifications of the marine industry. Drives for marine applications have to meet stringent class specifications relating to safety and reliability. Danfoss has the highest number of certifications of any drives manufacturer, including Lloyds Register, DNV and 6 other world renowned authorities, which gives shipbuilders, the owners and the boats' skippers, confidence and peace of mind.

Contact:
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About MV Fugløyhav

- Build no. 143, Vaagland Shipyard, Norway, 2011
- Length: 34 m
- Draught: 4.8m
- Width: 9.5 m
- GT: 499
- Max. speed: 12 knots
- Crew: 10
- Main engine: Mitsubishi S12R diesel, 736 kW at 1,500 rpm
- Auxiliary engine: Scania DI 400, 400kW
- Shaft generator 780 KVa
- Thrusters: 2x Brunvoll 325 hp
- RSW system: Norsk kulde, capacity 515 kW/ 300 m^3

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Danfoss Drives

Danfoss Drives is a world leader in variable speed control of electric motors. We aim to prove to you that a better tomorrow is driven by drives. It is as simple and as ambitious as that.

We offer you unparalleled competitive edge through quality, application-optimized products targeting your needs – and a comprehensive range of product lifecycle services.

You can rely on us to share your goals. Striving for the best possible performance in your applications is our focus. We achieve this by providing the innovative products and application know-how required to optimize efficiency, enhance usability, and reduce complexity.

From supplying individual drive components to planning and delivering complete drive systems; our experts are ready to support you all the way.

We draw on decades of experience within industries that include:

- Chemical
- Cranes and Hoists
- Food and Beverage
- HVAC
- Lifts and Escalators
- Marine and Offshore
- Material Handling
- Mining and Minerals
- Oil and Gas
- Packaging
- Pulp and Paper
- Refrigeration
- Water and Wastewater
- Wind

You will find it easy to do business with us. Online, and locally in more than 50 countries, our experts are never far away, reacting fast when you need them.

Since 1968, we have been pioneers in the drives business. In 2014, Vacon and Danfoss merged, forming one of the largest companies in the industry. Our AC drives can adapt to any motor technology and we supply products in a power range from 0.18 kW to 5.3 MW.

VLT® | VACON®

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