

Case m/s Mariella, Viking Line
Cost efficient winch retrofit using
the ACS800 industrial drive





The existing motor, motor cable, mechanical disc brake and operator control stand were reused.

Built-in auto-mooring with mechanical brake control keep the ship securely docked.

Retrofitting mooring control on the m/s Mariella

Customer benefits	
Economical solution	Existing motor, motor cable and operator control reused.
Everything built into the drive	Eliminates need for external sensors, includes mechanical brake control and auto-mooring functionality.
Reduced maintenance and costs	Softstarting reduces startup current peaks and smooth stepless speed and torque control reduces stress on the whole mooring system.

“The old system is breaking the motors, when we are in the harbor, when we have torque control, it’s going on and off all the time. It’s full ahead or nothing.” says Jonas Rautelius, the ship’s electrician describing the existing three-speed mooring control system.

When the ship arrives in port, the ship’s winches keep it secure to the dock so the passengers can safely board and depart the ship. The ship’s six winches, in operation since 1985, use a three-speed control system with three-winding, direct-on-line (DOL) motors and an external mooring controller and load sensor in the gearbox.

Existing control

Using this system to moor the ship, winch operators watch the rope until it is taught, adjusting the speed of the winch accordingly. Each speed change made to the winch (low, middle, or high speed) results in a direct-on-line start of one of the motor’s windings. DOL starting combined with the high torque demands of the mooring operation place substantial stress on the winch system, and as a result, rotors on the winch motors would break periodically. In addition, the age of the winches makes finding spare parts more difficult, typically some spare parts could have long delivery times, especially for the motor parts.

Contactors used to start the motors direct-on-line are also prone to failures, adding to the maintenance of the ship. If the winch is bringing in the rope and a contactor fails, it is possible for the rope to continue to spin around the winch’s drum, uncontrolled, until the main power could be disconnected.

Cost efficient modernization with ABB drives

After contacting ABB, Viking Line decided to evaluate and test ABB’s proposed solution on one winch. Using the ship’s drawings from 1985, ABB specified the marine certified ACS800-01 industrial drive with the built-in winch control program. This allowed the m/s Mariella to keep the existing three-winding motor, motor cable, and operator control stands. “It was quite cheap to do it like this” says Jonas. “This is a big factor in deciding to do the rest.” The drive’s IP55 enclosure permitted it to be mounted directly to the wall of the ship.

Measuring torque allows auto-mooring without load cell sensors

Because the drive uses ABB’s direct torque control (DTC), it does not rely on external sensors such as a load cell sensor in the gearbox or encoder on the motor. DTC allows open-loop control of the winch motor which permitted the m/s Mariella to reuse the existing



Rope tension is maintained automatically using time control sequences without a load cell sensor.



The wall mounted ACS800 industrial drive with built-in winch control program replaced contactors for smooth, trouble free starting.

winch motor without having to install an encoder. The winch control program in the drive uses DTC and patented winch application torque measuring logic to measure the rope's tension and calculate the required torque at every start without a load cell sensor.

Easier operation

With the ABB solution, as the ship arrives in harbor, the winch operation starts with the drive in hand-mooring control to quickly and smoothly let out the rope at a high speed. When the rope is connected to the harbor, the winch brings in the slack rope quickly, until the winch control program's peak torque protection function automatically stops the hand-mooring operation when the torque limits are reached. Winch operators then switch to auto-mooring mode. In auto-mooring mode, time control sequences are used to continually monitor the rope's tension, automatically making adjustments as needed to keep the ship secure.

"The best thing is that we don't have to touch it anymore." says Jonas. "It's easier, winch operators can just put the auto-mooring control on and leave the winch. With the old system, they had to constantly see if the rope was tight."

Integrated mechanical brake control

Brake control is integrated into the winch's brake circuit through a relay output on the drive. The drive ensures the disc brake is closed before stopping the drive's torque control. When opening the brake, the sequence is reversed, the drive determines and brings the motor to the needed torque to hold the rope's tension, and then opens the brake.

Cost efficient retrofit

- Improved reliability
- Reduced maintenance
- Reuse existing winch motor
- Reuse existing motor cable
- Reuse existing operator control stand
- Replaced contactor control
- Eliminated external load cell sensor
- Eliminated auto-mooring unit
- Integrated brake control
- Soft starting eliminated startup peaks
- Smooth stepless speed and torque control
- Improved operator experience
- Marine certified hardware (ACS800-01)
- Wall mounted drive
- Adaptive programming in the drive used to match existing signals to drive controls



m/s Mariella

Built	1985
Length	176.9 m
Width	28.4 m

With room for 2,500 passengers and 450 cars, a disco, a casino, restaurants and shopping, Viking Line's cruise ship the m/s Mariella is a floating family entertainment experience providing service between Helsinki and Stockholm.

Viking Line

Today Viking Line has seven vessels which sail between the Finnish mainland, Åland Islands and Sweden as well as between Finland and the Baltic states. Operations include passenger services, recreation and cargo carrier services.

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