



▼ Offshore wind farm and ships.

REVOLUTIONARY E-MOTORS FOR ZERO-EMISSION MARINE SHIPPING

thanks to intelligent mechatronics development

LCM is paving the way for zero-emission marine shipping with the pioneering development of the electrified Voith-Schneider propeller (eVSP). The project was realised together with the Voith Group and ELIN Motoren.

The 'Voith Schneider Propeller' (VSP) was invented in 1927 by the Austrian Ernst Schneider. It reduces the rolling motion of ships by up to 70% and has been produced by Voith Turbo Marine since its invention. LCM is paving the way for zero-emission marine shipping with the pioneering development of the electrified Voith-Schneider

propeller (eVSP). The project was realised together with the Voith Group and ELIN Motoren.

Even with 4.5 metre high waves, ships with VSP can maintain the target position precisely. This is a particularly critical factor in offshore operations.

Voith recently developed the electrically driven Voith Schneider Propeller (eVSP) in order to be able to offer this dynamic positioning and high manoeuvring performance in the most resource-saving and energy-efficient way possible. Thanks to its highly specialised expert knowledge, in-depth understanding of the system and many years of experience with electric drives, LCM was

brought on board at an early stage of the project to develop the electrified Voith Schneider Propeller (eVSP).

The 'SyMSpace' software platform was used to carry out the complex multi-objective optimisation required for the design of this completely new drive.

"We believe LCM is a key company for our competitiveness."

Dirk Jürgens,
Manager R&D Voith Turbo Marine

Multi-objective optimisation

Target variables such as the total weight of the permanently excited synchronous motor, the copper mass of the coils, the magnet mass or the axial lengths should be minimised, while the efficiency and power factor should be maximised. The simulation of losses in the winding and rotor was particularly tricky. This is because heat losses occur that are difficult to dissipate and shorten the service life of the motor. Because several thousand variants had to be calculated for the multi-objective optimisation, the LCM computing cluster was heavily utilised.

Pareto optimality

The result is certainly impressive and is Pareto-optimal: no parameter can be further improved without worsening another. Practically all parameters of the original design could be improved. Efficiency has been significantly increased with the new electric

motor. In addition, two gear stages have been eliminated, which has a favourable effect on system costs, maintenance intervals and the amount of oil required. The eVSP can also be controlled much more dynamically and steplessly - while minimising noise.

Prepared for future technologies

Although the power supply is currently still provided by diesel generators, it is planned to use fuel cells and hydrogen as an energy source at a later date. The tanks for this are already planned in the first ships. This is making waves in the industry, as a first major order from Østensjø shows. In order to achieve the planned emission targets, the Norwegian shipping company has ordered eight eVSPs, each with 2,516 hp, from Voith. The gensets are already being manufactured on an ongoing basis at the subsidiary ELIN Motoren in Weiz (Styria) and, after final assembly at Voith in

▼ Interior of the eVSP drive motor



Heidenheim (DE), will be installed in the Østensjø ships at a Spanish shipyard, where they will then be used for maintenance work on offshore wind turbines.

This brings the energy transition on the world's oceans a big step closer. Because LCM is a key company for Voith to strengthen its competitiveness, the company will continue to be at the forefront of shaping the path to zero-emission shipping as a development partner.

FACTBOX MECHATRONICS

LCM supports companies on their path to energy efficiency and climate neutrality with its broad expertise in the field of mechatronics.

- ◆ The tried-and-tested software platform 'SyMSpace' is used both in the development and optimisation of mechatronic components and systems.
- ◆ This enables customised, needs-based product development and reduces expensive development time, prototype phase costs and time-to-market.
- ◆ This results in marketable solutions that realise hidden savings potential and are based on the use of innovative technologies that are not yet available on the market.
- ◆ As a development partner, LCM has already supported numerous successful GreenTech projects - from mechanical and plant engineering to wind and hydropower through to shipping and e-mobility.

ABOUT

VOITH TURBO MARINE

The German technology group Voith operates worldwide and comprises the Voith Hydro, Voith Paper and Voith Turbo divisions. Voith Turbo specialises in mechanical, hydrodynamic, electric, hydraulic and electronic drive and braking systems. In the Marine division, Voith supplies customised drives through to complete ship concepts.