



## E-Ship 1 - A Wind-Hybrid Commercial Cargo Ship

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As it accounts for between four and five percent of annual worldwide CO<sub>2</sub> emissions, merchant shipping plays a particularly important role in global warming. And quite apart from this, commercial shipping operators are facing a further development: the sharp increase in the cost of fuel. Indeed, prices for the most common types of fuel are more than seven-fold what they were in the 1990s, a trend which shows no signs of abating. Today, fuel prices are a significant cost factor for merchant shipping. These two areas of concern have resulted in the topic of 'fuel efficiency and environmental protection' occupying the top of the agenda for shipping companies and other businesses heavily reliant on the transport industry.

It was the need for a cargo vessel meeting Enercon's specifications that gave rise to the concept of the E-Ship 1: a cargo ship specially optimised for transporting Enercon wind power plants and their components for projects around the globe. And not only that; the vessel was to create a benchmark in terms of sustainability and low environmental impact by delivering the optimum in energy efficiency. A number of technical systems have been introduced which enable the ship to operate at the highest levels of environmental compatibility. For instance, Flettner-rotors were developed, tested and implemented specifically for the E-Ship 1: supplementary wind-operated drives which have a direct impact on reducing the vessel's fuel consumption. A variable-pitch propeller optimised for sailing mode also improves the efficiency of the powertrain, cutting fuel use even further. The development and introduction of a system to remove pollutants means that the ship's negative impact on the environment can be reduced yet again. Thus waste disposal processes have been installed for all solid and liquid pollutants.

The E-Ship 1 has undergone an intensive utilisation and trial phase over the last two years, during which it has covered more than 150,000 nautical miles in commercial operation. The performance of its innovative design features has been successfully evaluated. Overall, it was shown that considerable savings could be made by using the Flettner-rotors, a propeller/rudder combination optimised for sailing mode, and a flow-optimised configuration both above and below the water level. The use of the Flettner-rotors allow for savings up to 15%. This can sometimes be considerably more in peak conditions; for instance, in a good wind the E-Ship 1 can travel at speeds of up to 12 knots only using the Flettner rotors.

Enercon's know-how in the field of aerodynamics has greatly influenced the optimisation of the ship's design, both above and below the water level. The vessel looks very different from a comparable cargo ship. Its streamlined shape and Flettner-rotors lend the E-Ship 1 an unique appearance.

Moreover, the E-Ship 1 operates with MGO (Marine Gas Oil). Comparable vessels almost always use HFO (Heavy Fuel Oil), e.g. IFO 180). Whilst HFO has a sulphur content of up to 3.5%, the MGO used by the E-Ship 1 contains less than 0.1%. The emission of sulphur oxides is correspondingly much lower. Emissions of soot particles are also much lower when burning MGO.

Overall the E-Ship 1 sets a milestone in the area of Green-Shipping technologies.

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