

Shipping goes electric

Numerous case studies have demonstrated how permanent magnet motors can be beneficial in electric propulsion

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Low-speed permanent magnet motors are ideal as direct drives for vessel propellers. The specific behavior and reliability of these motors were key factors in their implementation by German company Oswald Elektromotoren in a host of vessels. For example, they are used as the main propulsion devices in a seagoing fishing vessel, the MDV Immanuel, an industry first. The hybrid concept of this particular vessel incorporates diesel generators and a single 400kW propulsion motor and has proved a successful application since the vessel was launched five years ago.

Alternatives to direct drive use of such motors include passing drive through a gearbox, powering thrusters, or combinations of the above to meet specific application needs. One of Oswald's main engineering

roles is finding means of realizing the design ideas of systems integration engineers and shipyards in the realm of electric boat propulsion. The company has long experience with speed-regulated AC and PM motors and its product range includes induction and PM motors from 15kW up to around 3MW; the range of high torque motors is up to 200kNm rated torque. Oswald is a specialist in customized motors to cover the gamut of project-related technical demands.

Another example of its work is the Norwegian sightseeing vessel, Vision of the Fjords, which combines diesel hybrid operation and pure electric running. On long trips its diesel generators provide power to the drive motors, while for low-speed maneuvering it relies on battery power, operating with zero emissions.

Heavy lifters

Also noteworthy is the recently commissioned ferry IJveer, based in Amsterdam, which operates with thruster propulsion driven by two of Oswald's 250kW electric motors. Meanwhile the RPA8 range of patrol craft for the Rotterdam Port Authority required the deployment of motors with a hollow through shaft to allow operation both as a propulsor and energy recovery device for battery charging – a requirement that Oswald was able to meet.

For the construction of the inland tanker Bacchus, the system integrator and shipyard

created a new demand: that axial load from the propeller should be carried by the direct-drive, low-speed motors. To achieve this reliably, Oswald created a solution using integrated thrust bearing, similar to existing systems in direct-driven extruders.

Moving up the power range, on the inland cargo ship Feniks, an Oswald 630kW high-torque motor works in-line with a hollow-shaft motor. This installation provides redundant electric propulsion. Using an alternative arrangement, the Sendo Liner has two Oswald high-torque motors running a pair of independent propulsion shafts. This innovative concept was duplicated for the new Sendo Mare and Sendo Nave ships, but scaled for higher loads, using uprated machinery.

Looking at another Oswald project, for the hybrid ferry Fjordled, the system integrator delivered a total hybrid propulsion package. It provided the ship's builder with propellers, effect rudders, Servogear HDE220 hybrid gearboxes coupled to Oswald electromotors, control systems, power management and batteries. With this system, the operator is able to choose between full-electric drive and hybrid propulsion in city harbors, giving the potential for zero local emissions. The hybrid solution also results in operational cost savings and provides a lifetime extension for the main engine.

Although all the ships listed feature hybrid propulsion systems, they could all be adapted for battery-only operation in the future. +



1. Oswald supplied Sendo Liner with two high-torque motors

2. Hybrid ferry Fjordled features Oswald PM motors and Servogear HDE220 hybrid gearboxes



3. Main propulsion motor housed in the Sendo Mare vessel



4. PM motor for the IJveer ferry, which was recently commissioned