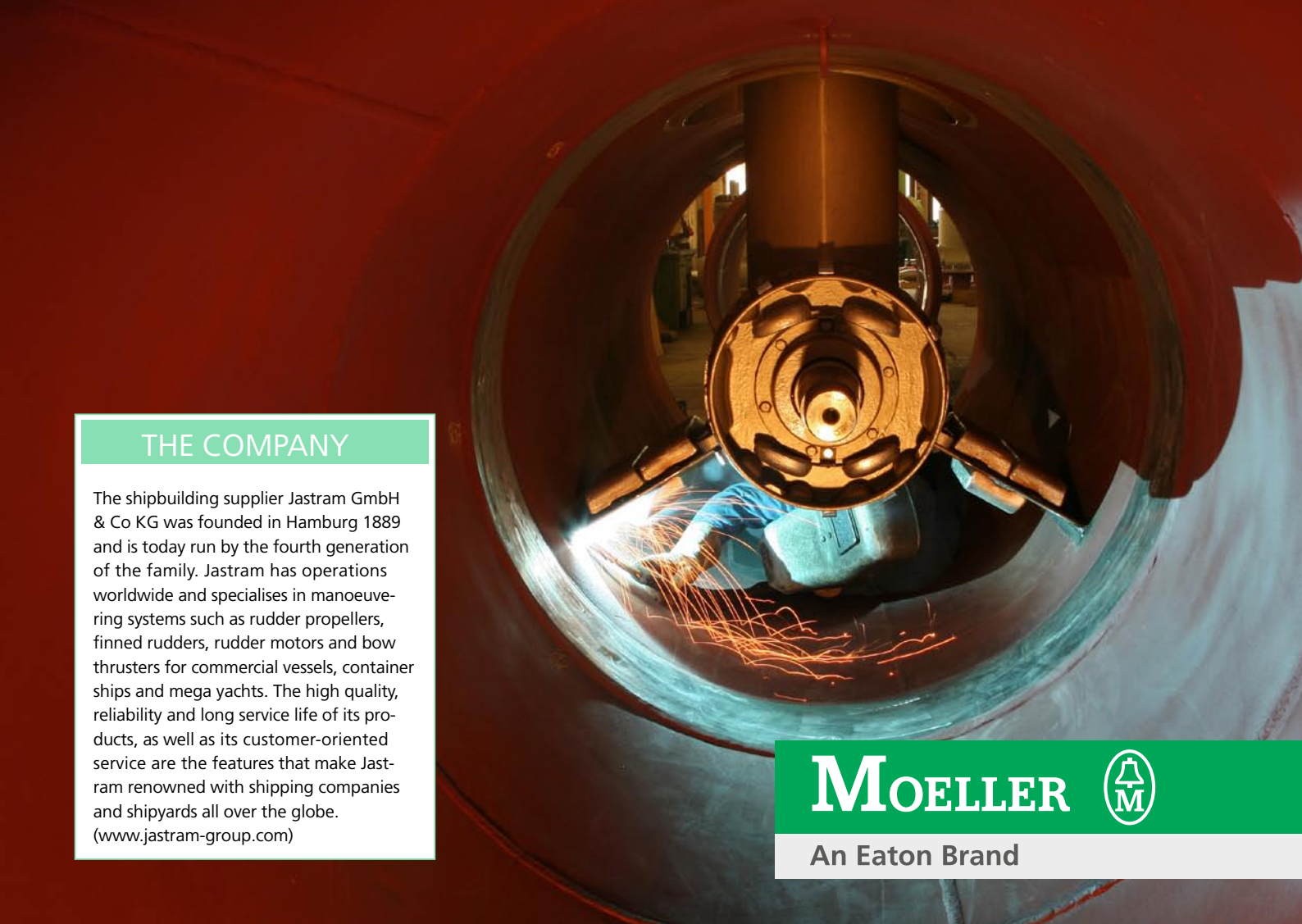
Hard to Port

Contactors set transverse thrusters in motion

Only large ships like mega yachts or container ships with a transverse thruster are allowed to enter harbours on their own, thus enabling them to manoeuver in the harbour basin without the need for expensive tugs. Transverse thrusters are also called bow or aft thrusters, depending on where they are mounted. The manoeuvering system consists of a tube running through the body of the ship across the direction of motion and a propeller mounted in the centre of the tube, which, depending on the rotation direction, causes the ship to move to port or starboard by the force of the flowing water. The well-established Hamburg-based company Jastram offers different manoeuvering systems and has primarily specialised in transverse thruster systems in the range from 50 kW to 1650 kW. The rheostats for controlling the slip ring motors are switched using reliable and durable Moeller DILM contactors with vacuum technology.



THE COMPANY

The shipbuilding supplier Jastram GmbH & Co KG was founded in Hamburg 1889 and is today run by the fourth generation of the family. Jastram has operations worldwide and specialises in manoeuvering systems such as rudder propellers, finned rudders, rudder motors and bow thrusters for commercial vessels, container ships and mega yachts. The high quality, reliability and long service life of its products, as well as its customer-oriented service are the features that make Jastram renowned with shipping companies and shipyards all over the globe. (www.jastram-group.com)

MOELLER

An Eaton Brand

Bow thruster BU90F, with a tube diameter of 1600 mm and a drive output 700 kW, generates a thrust of 96 kN at 1770 rpm.

Jastram supplies transverse thrusters for new ships and conversions for older ships. The sailing school ship of the German Navy, the "Gorch Fock" and the "Bodo Supplier", which were converted to a cable repair and maintenance ship are examples of vessels that were retrofitted with Jastram transverse thruster systems. On mega yachts such as "Al Mirqab" (Kusch yacht building), Jastram transverse thrusters are used with noise reduction. The technology and the dimensioning of transverse thrusters are anything but simple, even the mounting involves precision work.

Structure of a bow thruster system

A bow thruster system basically integrates a drive and gear unit as well as a propeller. Diesel, hydraulic or electric motors are used as drives.

When mounted, the bevel gears of the cyclo palloid gear and the propellers are expanded hydraulically and adapted to the gear shaft. For this oil press fit, the contact pattern or contact surface is examined closely to ensure a 100 percent fit.

Transverse thrusters have either a variable or fixed pitch propeller. Variable pitch propellers are run at a constant speed and the thrust is controlled by changing the pitch of the propeller blades. Fixed propellers are driven with slip ring motors and rheostats as well as frequency controlled systems. The circuit of the resistors in the rotor circuit controls the speed over three to seven stages, and three-stage transverse thrusters are mostly used.

Each bow thruster and all individual components are tested and approved by classification societies such as Lloyd's Register (LR), Germanischer Lloyd (GL), Det Norske Veritas (DNV), Bureau Veritas (BV) and American Bureau of Shipping (ABS) etc.

DIL - rugged, reliable and durable

Jastram drives switch ratings of up to 1650 kW, which means that conventional bar-mounted contactors or motor-operated circuit-breakers and switch-disconnectors with remote operators are used. Transverse thruster systems are designed for an average ship lifetime of 25 years, and so the corresponding switchgear assemblies must be dimensioned accordingly. With 3000 to 4000 switch operations a year, this amounts to around 75,000 to 100,000 operations after 25 years. For these kinds of applications, a 1600A switch-disconnector is unsuitable since it is only designed for around 2000 switch operations in AC-3 applications. On the other hand, the DILM 1600 A contactor with vacuum technology in AC-3 operation (starting/stopping, squirrel-cage motors) at 100 percent of the rated current Ie has a device lifetime verified at around 250,000 switch operations. The vacuum tubes on the DILM are ideal for switching high voltages as arcs are not produced and no escaping gases occur during switching. As the switching of a slip ring motor can only be assigned to utilisation category AC-2, the DILM offers sufficient reserve for zero maintenance operation with a ship lifetime of 25 years.

The propeller speed can be varied on a 3-stage rudder system by shorting the resistors in the rotor circuit in stages of 70, 85 and 100 percent of the rated speed. The shorting of the resistors is handled by maintenance-free DILM 400/ 300 contactors. The rotation direction of the propeller and thus the starboard or port thrust is implemented with a reversing contactor circuit consisting of two DILM 1600 contactors.

Switchgear for a 700 kW bow thruster system, consisting of two DILM 1600 contactors for controlling the propeller rotation direction and DILM 400/ 300 for the speed control by bridging the resistors in the rotor circuit.

CONCLUSION

Torsten Jensen, responsible at Jastram for the electrical design of the bow thrusters, had this to say about the use of Moeller components: "We only know a few other suppliers on the market with products that can switch currents up to 2000 A with the required 4000 switch operations per year, and which also have all the relevant shipping approvals. Our suppliers must have a worldwide logistics network so that we can ensure the procurement of spare parts at any time. A comprehensive, partner-based support is equally important to us. This is why we rely on Moeller technology."

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