

Automated marine gearbox

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Directional changes put a particular strain on traditional hydraulic-actuated marine transmissions: Gear changes are abrupt as rotating masses must accelerate in the opposite direction within a short period of time. With Bachmann's support, REINTJES GmbH, based in Hameln, Germany, has developed an automated marine reverse transmission that precisely regulates hydraulic pressure on the clutch plates and facilitates smooth gear shifting.

REINTJES GMBH

- Founded in 1879, based in Hameln, Germany
- Internationally active group of companies
- Over 500 employees worldwide
- Product portfolio includes marine and industrial gear units and related services

www.reintjes-gears.de

The challenge lies in the fact that conventional, hydraulic-actuated marine transmission clutches are subject to various external factors. These include, for example, ambient temperature, which also determines oil viscosity in the hydraulics, as well as mechanical elements that are subject to wear and system-related inertias. This makes it impossible to exactly reproduce the bite point. The result: shocks during gear shifting that stress both the transmission and the entire driveline.

Technological progress

REINTJES is taking an innovative new approach: The classic hydraulic shift components have been minimized, and the clutch control implemented with proportional valves. This eliminates inherent variable inertias, and the bite point can be approached precisely and with repeated accuracy. Based on Bachmann's M200 control system, REINTJES developed the 'Gearbox-Automation (GBX-A)', a modular system that automatically optimizes the coupling process, thus enabling a more protective mode of operation.

How the control lever is operated – in simple terms, whether it is moved quickly or more moderately – determines the shift characteristics automatically selected by the GBX-A. This kind of situational gear shifting has the advantage that, during normal operations, it is the only way to maximize smooth engagement of the clutch – that is also gentle on the transmission. "In dangerous situations, of course, the clutch is engaged without delay, which won't immediately damage the system, but is not system-friendly – you wouldn't want to drive like that every day," explains Norman Klippel, Technical Subproject Manager Automation at REINTJES.

Perfectly customizable and easy to handle

The GBX-A has a modular design and can be configured via predefined parameters. The Bachmann OT1200 terminal can be used to activate or deactivate any functions, as well as to adjust parameterization, without specialist programming knowledge. Thanks to an integrated calibration function, the clutch control can be perfectly adapted to any drivetrain. Recalibration is automatic, and current clutch status is visualized on the GBX-A terminal.

The REINTJES system also logs historical data on request, paving the way for condition monitoring and the development of an optimized maintenance strategy. For example, gear changes can be analyzed and compared within the same fleet to optimize vessel operation and maintenance schedules.

Exactly as required

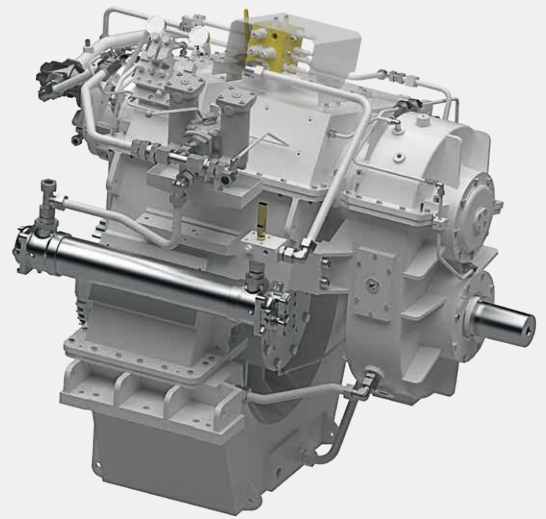
REINTJES uses Bachmann's proportional valve amplifier, the PVA204, which can connect up to four coils, to control the proportional valves. Due to current control, any change in valve coil temperature will not influence the valve position. Up to 20 interpolation points are available for characteristic curve correction per coil, which enables highly accurate linearization. "For the perfect component fit, we needed to adapt the PVA module firmware. And Bachmann took care of it for us," says Norman Klippel.

Six classifications covered

Compared with conventional shipbuilding, the REINTJES system is unique because it covers the five largest classifications: Bureau Veritas (BV), Lloyd's Register of Shipping (LR), American Bureau of Shipping (ABS), Det Norske Veritas (DNV) and Registro Italiano Navale (RINA). "A major advantage for us was that the Bachmann system components already had all the necessary certifications in the maritime sector," says the REINTJES sub-project manager.

The transmission of the future

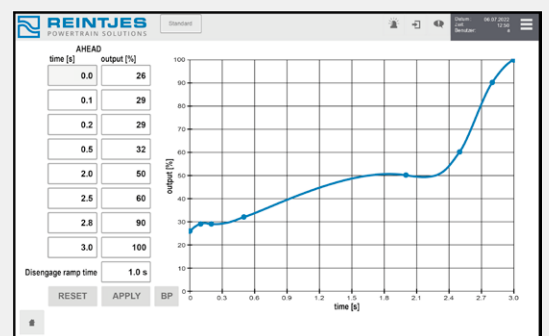
The GBX-A does not simply increase transmission control system automation. It also significantly contributes to an increase in ship availability and a reduction of lifecycle costs. Gentle shifting extends the service life of the entire drivetrain, while condition monitoring enables targeted maintenance and reduces downtime in the shipyard.



REINTJES' 'Gearbox-Automation (GBX-A)' is a stand-alone marine gearbox clutch control system. It communicates with the ship's control system via a fieldbus.



The PVA204 and PVA208 modules allow direct control of four or eight proportional valves, without amplifiers, with one coil, bipolar or with dual coils.



The GBX-A detects maneuver type, based on operation of the control lever, and automatically selects optimum gear shifting. During normal operations, this enables the gentlest possible clutch engagement for the transmission.

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