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Modern Control System

THE SHIP PROPULSION OF TOMORROW

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THE SHIP PROPULSION OF TOMORROW

To achieve efficient and environmentally vessel operation, control system requirements are diverse and manifold. Controllers should allow the integration of hybrid drive systems, offer the highest reliability, be internet-enabled and as flexible and economical as possible. Almost every ship is unique and in this process, and the optimal interaction of individual components places high demands on interface connection, communication, control and regulation.

This is why the Schottel group relies on high-performance control systems such as Bachmann's M1 system.

The 31-meter cruiser Vanadis has a hybrid propulsion system with both diesel engines and electric motors. The latter are integrated directly into the drive train's shaft line. (Photo CCN)

Complex Ships – Intelligent Systems

The award-winning motor yacht Vanadis is a complex vessel. The 31 meter yacht is powered by a hybrid propulsion system consisting of diesel and electric engines. Both drives act mechanically coupled on the same drive train – either sequentially or simultaneously.

Depending on whether the goal is to optimize fuel consumption or reduce noise emission, either the electric or combustion engine can be used for propulsion. In combined operation, the speed and torque of both drive units must be synchronized. During this process, both the load distribution as well as the leading system change. The frequency converter and engine control unit must be adjusted so they do not interfere with each other.

Redundant Design for Full Control

A failure of the propulsion system or the maneuvering elements would in many situations prove fatal. Therefore, modern propulsion control systems are fully redundant. The transition between the systems should be as smooth as possible. Thus the hardware components, including the PLC as the core element of the system, are doubled.

Modular Software Architecture

Just as important as reliable hardware is the error-free functioning of software. The prerequisite for this is a process-reliable development including extensive and standardized tests. On the other hand, there are the large variety of components to be integrated plus requirements for real time, redundancy, and cyber security, which require a high level of flexibility. A modular software architecture provides a solution to this challenge. Meanwhile it is possible to implement this flexibility centrally and in a standardized way on the CPU through multitasking.

In addition to increasing the software quality through recurring function modules, this centralized approach reduces the total number of components. This results in a lower probability of failure and a lower risk of errors. Manufacturing activities for the construction of switch cabinets can be optimized, and the expense for future maintenance will be reduced.

Many Applications, Easily Expandable

Thanks to the flexible combination of newly developed applications in the form of standardized modules with Bachmann's Component Manager Framework, a wide range of applications can be covered, from a tugboat to a mega yacht and even a tanker. Because the individual components have been compiled and tested during development, the full application can be assembled through configuration alone and easily expanded later on. The variety of protocols supported by the Bachmann M1 facilitates integration into the architecture of the control system.

Secure Data Transfer

The system architecture is designed based on the security-by-design principle and divided into different zones. The individual zones are separated from one another by a hardware firewall. All communication between data collection and data evaluation systems runs through the specially hardened HMI. Security for file transfers is further enhanced by certificate-based signing and AES-256 encryption. Local storage (ring memory) prevents data loss, even if the internet connection is lost.

Optimum use of Potential

Operating data such as ship movement and environmental conditions combined with corresponding status data of the propulsion system, such as the propeller speed, form the basis for discovering, implementing and ultimately even quantifying efficiency improvement potentials. If the high-resolution data is processed directly at the source, the information is available to the crew even when operating offline. This ›on-board post-processing‹ on the Bachmann M1 controller together with the IoT Gateway can also be retrofitted as a standalone version in a switch cabinet on existing ships.

The mobile communications standards now globally available near the coast allow cost-effective networking. This offers the possibility of introducing a future-oriented, data-based lifecycle management even for smaller units such as tugs, work boats or ferries. The most important key figures on fuel consumption, speed, drive maneuvering, and environmental factors can be visualized at a glance in an online portal.

SCHOTTEL GROUP

- Headquarters in Spay am Rhein (Germany)
- Founded in 1921
- Employs over 1,300 employees at around 100 sales and service locations worldwide
- Global leading manufacturer of drives and control systems for ships and offshore applications

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