

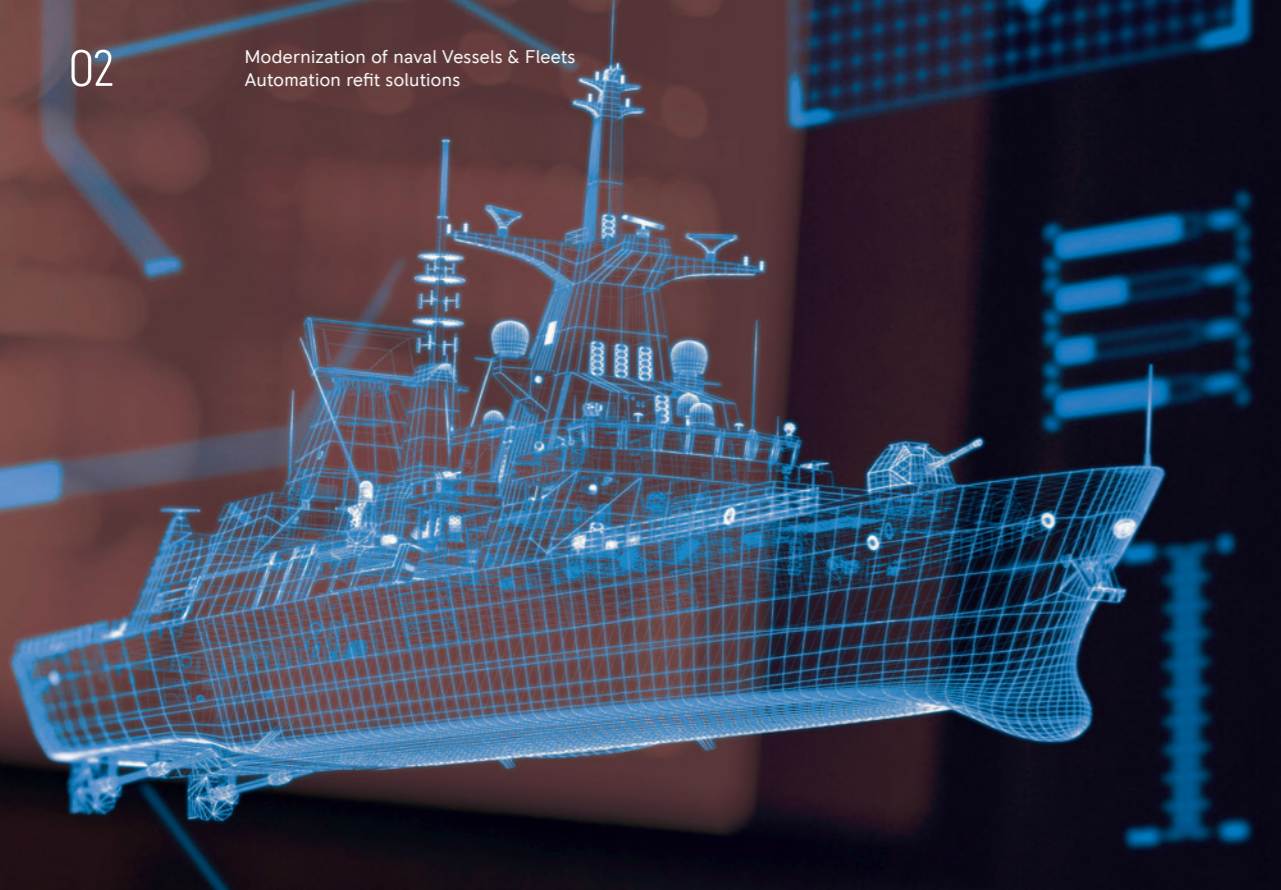


Automation refit solutions

MODERNIZATION OF NAVAL VESSELS & FLEETS



A Rolls-Royce
solution



POWER TO PROTECT. POWER TO PERFORM.

We at Rolls-Royce provide world-class power solutions and complete life-cycle support under our product and solution brand **mtu**. Fully utilizing the potential of digitalization and electrification, we strive to develop climate-neutral drive and power generation solutions that are even cleaner and smarter and that provide answers to the challenges posed by climate change and the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems.

BE READY FOR THE NEXT MISSION. PREVENT OBSOLESCE RISK.

It is important to address obsolescence issues early in current supply chain congestion, as obsolete or unavailable components can impact fleet availability. Early action such as switching to new technologies can minimize the impact of obsolescence and ensure availability, even extend the life of the automation system and vessel.

Through our continuous development, we can provide regular updates in the form of upgrades for optimized operation of your vessels and fleets. With obsolescence upgrades as part of mid-term refits, we provide assistance to propulsion systems in the middle of their life cycle. Worn parts are replaced, age-related failures are avoided, and functions and capabilities are brought up to original levels. The result extends the life of the systems and the entire vessel with less downtime and lower maintenance costs. Thus, you can avoid extensive waiting time for new ship construction and keep your fleet available and ready.

For some of our classic engines, such as the **mtu** Series 396, 538, 595 etc. the retrofit includes replacing the mechanical governor with our new ADEC-UNI electronic governor. The replacement of the governor is a prerequisite for further refit with state-of-the-art marine automation solutions such as our **mtu** NautIQ portfolio. The **mtu** NautIQ Master, Core and Foresight modules cover various tasks on board, such as copiloting, damage control, engine monitoring and management, also reducing crew workload and improving operations.

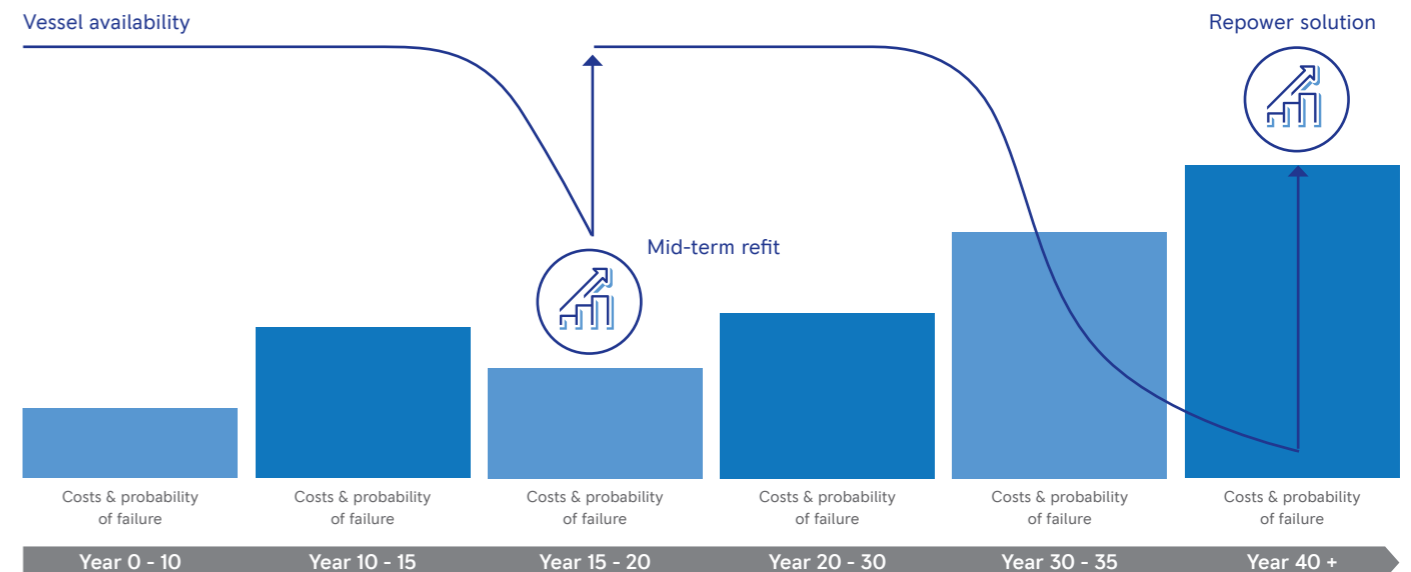
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Extends the life of the systems and the entire vessel
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Less downtime and lower maintenance costs
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Keep your fleet available and ready
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Effective operation, low fuel consumption and long service intervals



Source: Military research study of Vyacheslav A. Kharchenko: Problems of reliability of electronic components

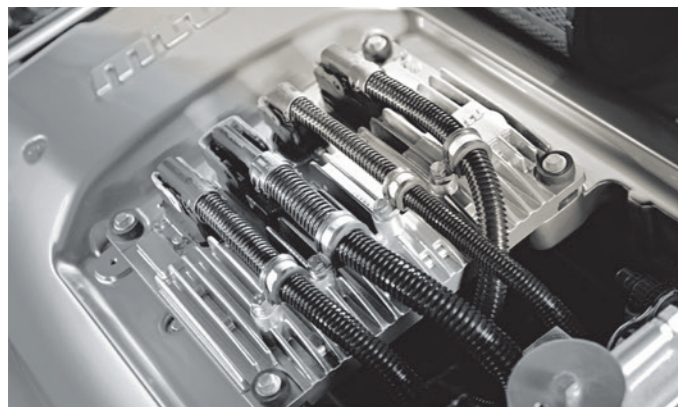
Automation refit

ENSURE THE AVAILABILITY OF YOUR
VESSEL IN THREE STEPS

Be proactive, avoid downtime and upgrade early to benefit from extra automation system security. An automation refit requires three steps:

1. Modernization of engines: replacing obsolete parts (governor/ECU)

The engine control unit (ECU) is the engine's central control unit and affects all important functions, including fuel delivery, ignition and emissions control. Incorrect replacement or configuration of the ECU can cause serious damage to the engine and endanger safety. The ECU should only be replaced by *mtu* certified technicians, as only they have the specific knowledge and experience to understand and handle the complex electronics and mechanics of the engine. If necessary, engine-related electronics (wiring, sensors, controllers) and associated components that may affect the life of the engine (e.g. the injection pump) can be replaced in addition.



3. Integrating the *mtu* NautIQ automation solution

Once all the relevant hardware and software adjustments have been completed a state-of-art intelligent electronic management system can be installed to benefit from comprehensive vessel function control. Our advanced automation management systems *mtu* NautIQ Master, *mtu* NautIQ Core and *mtu* NautIQ Foresight allow you to fully integrate the operational functions of your vessel. As a result, you have complete command over a wide range of functions and capabilities throughout the vessel.



2. Bridge modernization: replacing obsolete parts

Addressing obsolescence is particularly critical for the brain of the vessel – the main control unit (MCU) located on the ship's bridge. It is the control center where all signals converge, are processed and acted upon. Effective bridge modernization can include the upgrade of the MCU and bridge components like touchscreen, keyboard, trackball, printer as well as the upgrade of the propulsion control system (PCS) and the remote control system (RCS) (i.e. throttle, gauges, oil pressure).



mtu NautIQ Ship Automation

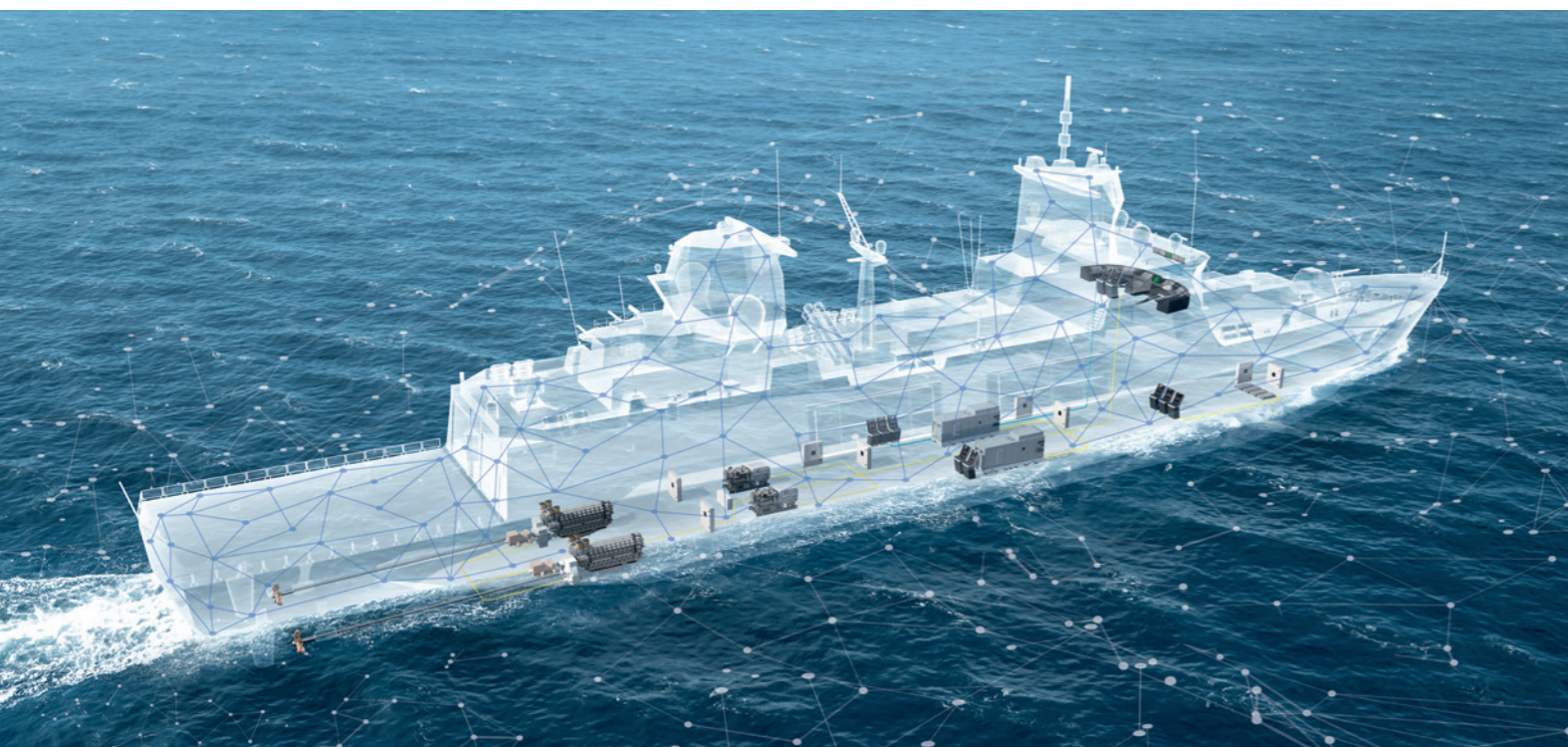
CONTROLLING THE POWER WITH **mtu** NautIQ SOLUTIONS

Our engines are powerful and technologically advanced. But in order to offer the best efficiency, reliability, safety, and environmental compatibility, they need more than just power. They need intelligent electronic management. Modern engine management systems handle the control and monitoring of the hardware and enable perfect performance. Our marine automation solutions **mtu** NautIQ are designed to offer the ideal combination of performance and precision individually for your applications from a wide range of solutions.

INTEGRATED SHIP AUTOMATION AND FLEET & EQUIPMENT HEALTH MANAGEMENT SOLUTIONS

mtu NautIQ Master
mtu NautIQ Core
mtu NautIQ Foresight

Scan the QR-code for more details about
mtu NautIQ solutions portfolio

**mtu** NautIQ Master

INTEGRATED PLATFORM MANAGEMENT SYSTEM

mtu NautIQ Master is an integrated platform management system (IPMS) and offers the optimal solutions to meet a wide range of requirements for all types and sizes of vessels. Typically used on naval and complex commercial projects.



Multiple operator workstations



Equipment Health Monitoring and Analysis



Integrable Propulsion Control System (PCS)



Remote Data Collection and Control Units



Damage Control System (DCS)



On Board Training Systems (OBTS)



Integrable Automatic Power Management System (APMS)

mtu NautIQ Foresight

FROM BRIDGE TO PROPELLER

mtu NautIQ Foresight is a fleet and equipment health management system. It allows you to monitor and have full control over the technical condition of your vessel from bridge to propeller.

The system maximizes the availability of your vessel, and you can even use it to monitor a whole fleet. By providing system status at a click, **mtu** NautIQ Foresight makes availability management easier than ever before. It provides support for the maintenance and upkeep 24 hours a day, 7 days a week – and thus helps minimize vessel downtime.

With **mtu** NautIQ Foresight, you can collect and analyze data from **mtu** systems and third-party key components on the vessel. You can also leverage additional factors such as navigation data.



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