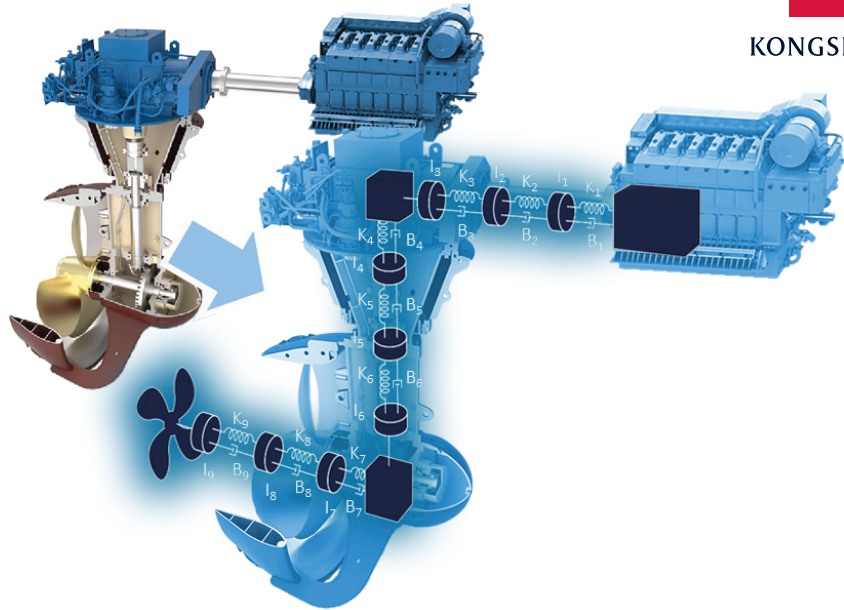# THRUSTER RUL

Thruster Remaining Useful Life (RUL)

Thruster Remaining Useful Life is a Health Management Service enhancement, offering state of the art predictive maintenance (Digital Twin) prognosis. The Thruster Digital Twin system measures load and environmental conditions for the thruster driveline components. Physics-based data processing provides quantitative probabilistic predictions of the components remaining useful lifetime with a significantly longer prediction horizon than any available condition-based maintenance solutions. Additionally, physics-based analysis supports a better understanding of cause and effect relationships between operational data and expected component lifetimes.

Predictive maintenance

Reduce cost by minimizing downtime and making maintenance decisions with the best possible information. Business opportunity for different maintenance planning scenarios:

- Optimise maintenance intervals and scope based on Digital Twin predictions
- Early maintenance scheduling at convenient times to ensure uninterrupted operation without unnecessary downtime
- Use of scenario analysis to extend component life until the next overhaul

KEY PRODUCT BENEFITS

- Optimised maintenance planning
- Improved management of spare part stock
- Extension of inspection and service intervals
- Sustainable risk and safety management
- Remote readiness
- Service agreement and Extended Thruster Coverage availability

Fleet screen gives information on all vessels in the fleet, showing the total running hours and fuel consumption in DP, General, Port, Manoeuvre, EcoTransit, Transit and Fast Transit Fuel consumption and CO2 for each vessel in fleet.

Vessel screen gives exact information from a specific vessel on the total running hours and fuel consumption in DP, General, Port, Manoeuvre, EcoTransit,Transit and Fast Transit. Sailing performance (L/nm). Passive performance (L/h). Engine and propulsion condition.
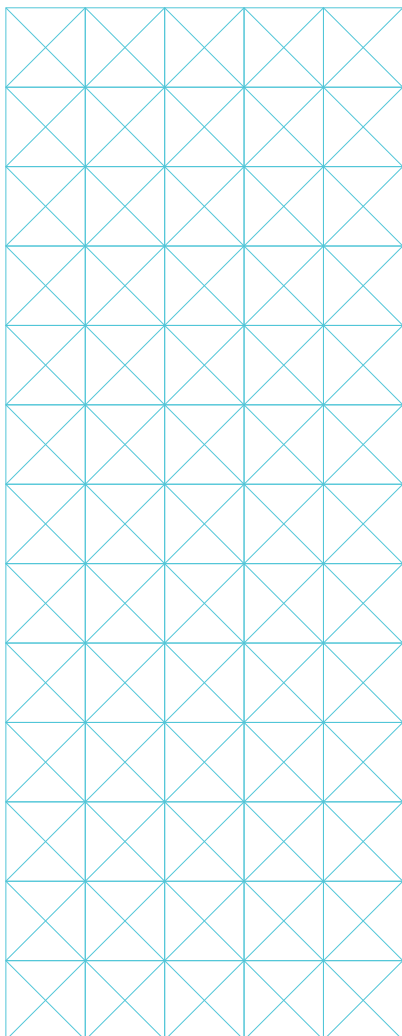
Hardware

Hardware consists of physical sensors, measurement devices and industrial edge PC on board.

Remaining Useful Software has two main data processing layers

Firstly, virtual sensors can sense load and environmental quantities on locations, which can be expensive or impossible to measure with physical sensors.

Vessel screen health warnings give exact information of pre-warnings and alarms with descriptions

Secondly, physics-based virtual components, such as gears, bearings, and shafts, can predict the remaining useful lifetime based on actual measured vessel-specific loads and conditions. Finally, the key performance indicators are synchronised between the local database and the cloud-side.
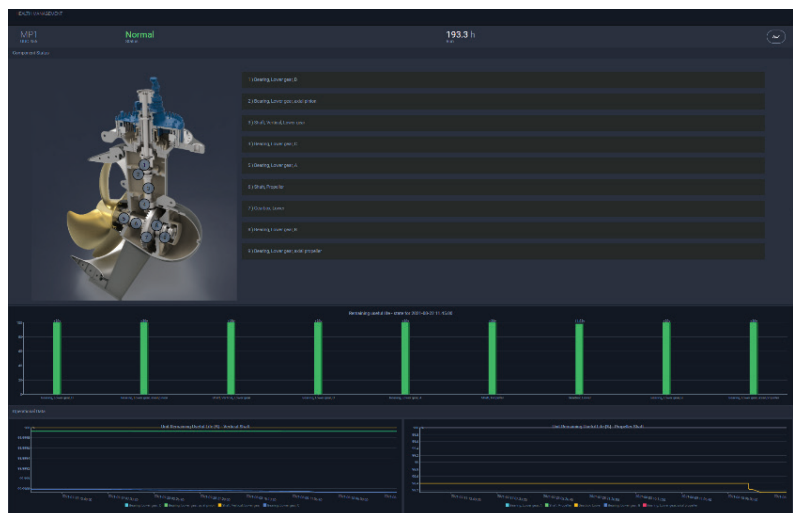
Remaining Useful Life dashboard gives exact component and Remaining Useful Life status and trends

Thruster RUL is part of the Kongsberg Maritime Health Management portfolio. Today, Health Management is offered for Bergen Engines, Kongsberg Maritime propulsion, low-pressure deck machinery, and 3rd party rotating machinery.

Leveraging highly scalable technologies

Health Management leverages Vessel Insight as an end-to-end data infrastructure for secure collection, transfer, storage, and analysis of ship data.
Data analysis is performed on the Kognifai cloud platform using a wide range of techniques, such as Machine Learning, and passed to Experts-in-the-Loop who provide targeted recommendations and feedback to the operator and vessel crew to avoid disruption to their operations, and plan maintenance intelligently.