

WIDE AWAKE

Unlocking the full power of engine data

WinGD Integrated Digital Expert

The digital display features a map of South and Southeast Asia, with a blue icon representing a vessel's location in the Bay of Bengal. To the right of the map, a list of engine performance metrics is displayed:

Timestamp:	92.32
Latitude:	- (%)
Longitude:	47.24 (%)
Torque:	66.57 (rpm)
Power:	17.87 (kr)
Crank Shaft Rotational Speed:	17.15 (kr)
Speed Through Water:	- (%)
Speed Over Ground:	- (%)
Slip STW:	257.67 (deg)
Slip SOG:	23.33 (kr)
Course Over Ground:	332.27 (deg)
Wind speed rel:	- (m)
Wind direction:	2.00 (deg)

Below the metrics, a gauge labeled "Power [%]" shows a value of 47.2. Further down, a section titled "Engine Performance" displays a "Compressor Pressure" of 60.36 (bar) and a "Firing Pressure" of 109.93 (bar). A "Reference" value of 94.31 is also visible.

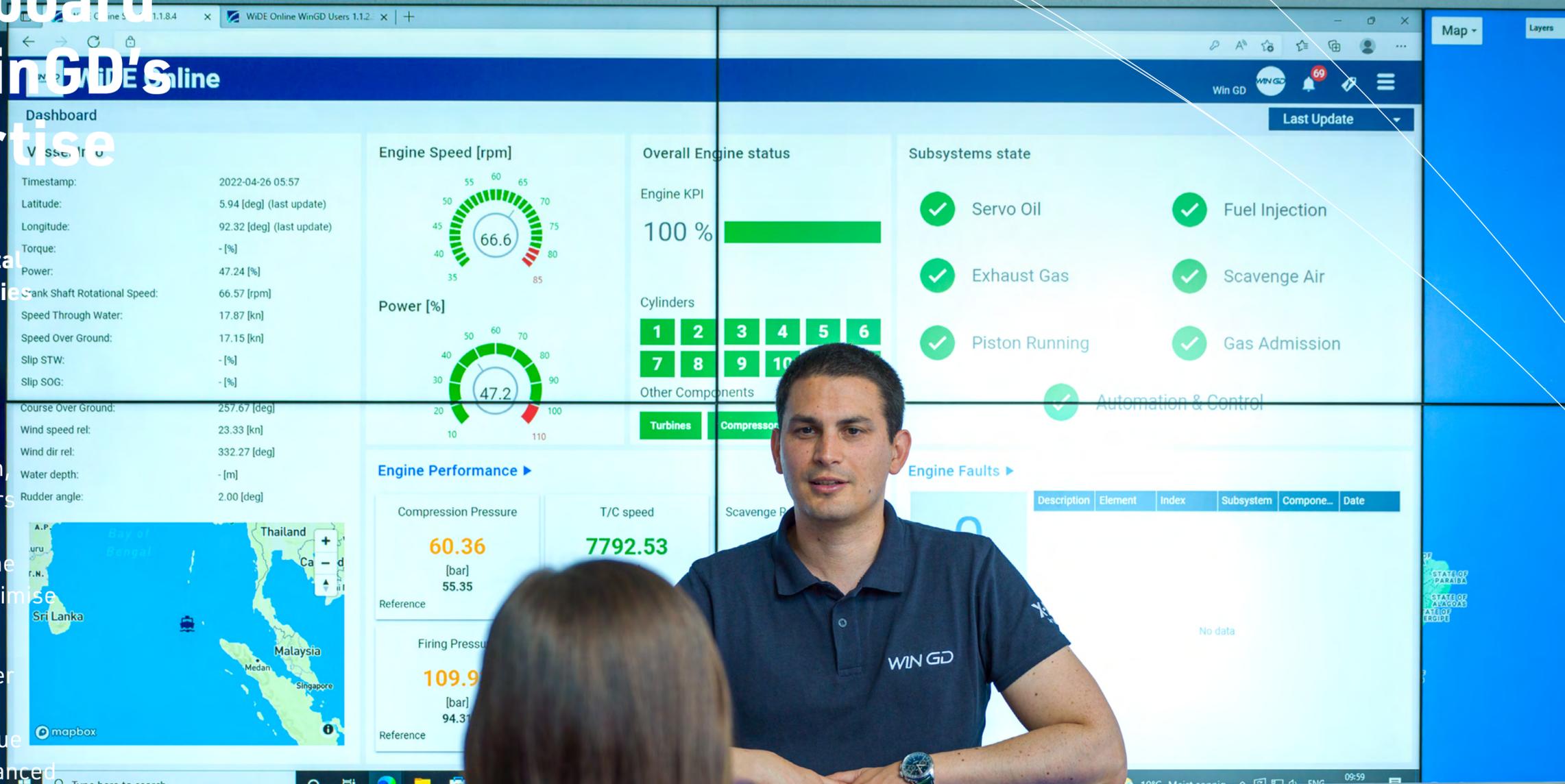
The WinGD logo is located in the bottom right corner of the image.

Empower onboard crew with WinGD's engine expertise

Data is the starting point for ultimate vessel optimisation. Digital technologies offer new opportunities to operate ships and machinery more efficiently, and to manage the fleet in an optimised way.

WinGD Integrated Digital Expert (WiDE) is a comprehensive solution, providing ship owners and operators with full awareness of their ships' operating condition and allowing the necessary action to control and optimise their asset and fleet operations.

The system harnesses the full power of the engine and machinery data, extracting value by combining unique expert engine knowledge with advanced data analytics techniques. In the process, it strengthens operational efficiency and crew decision-making related to the engine and ship operations.



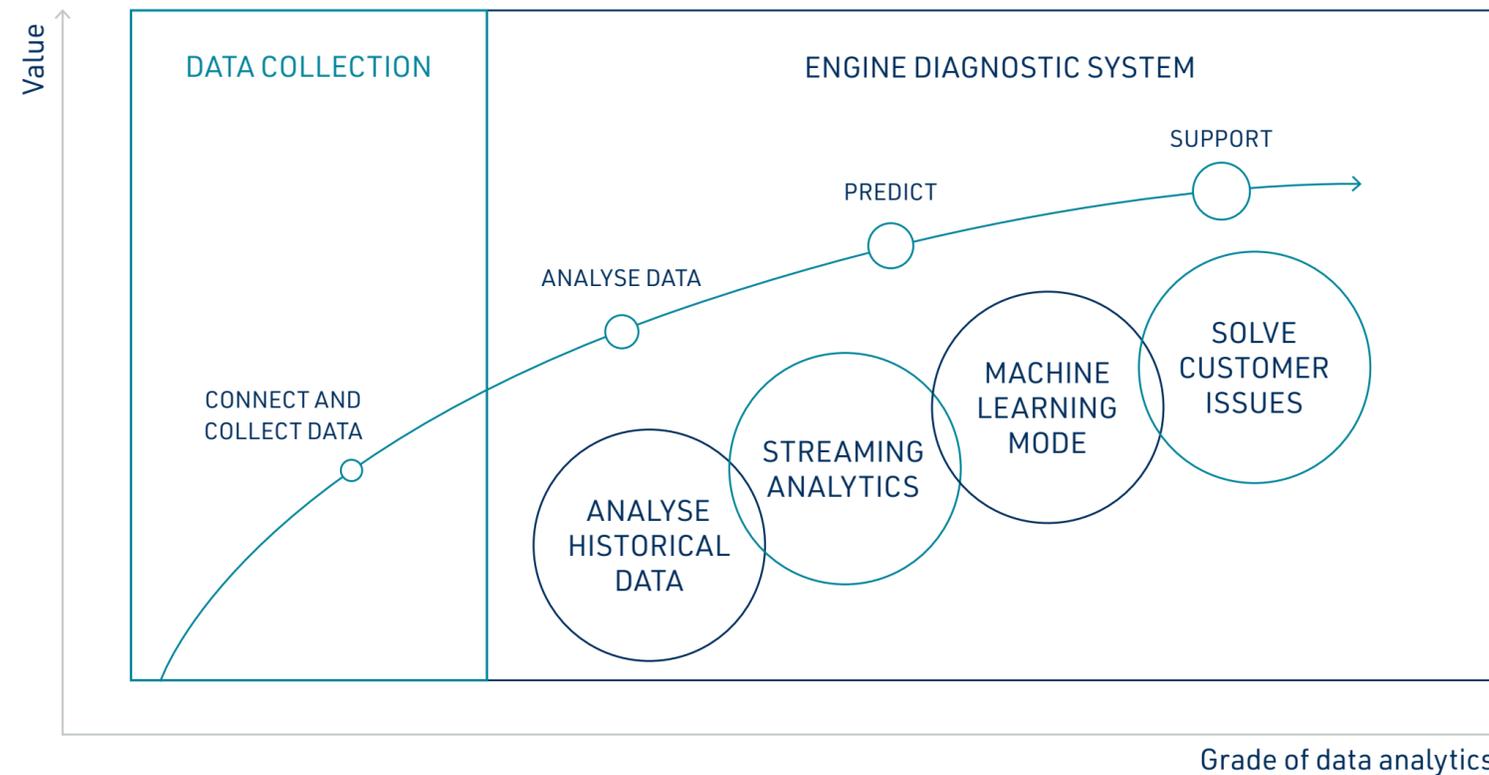
X-DF20

FUTURE READY

WiDE processes and benefits

WiDE constantly collects engine and ship data, making them available both onboard and onshore. Data are analysed to provide valuable insights on the status of the engine's components, to anticipate alarms and to facilitate crew daily operations.

These features and capabilities are integrated into a user-friendly onboard system that deploys state-of-art hardware and software based on WinGD's latest experience and efficient data analytics techniques.



The WinGD integrated digital expert path to value

PROCESS				
	Collect	Analyse	Predict	Support
BENEFITS	<ul style="list-style-type: none"> • Collect engine and ship data • Display trends • Communicate engine data ashore • Store data in a secured environment • Display cylinder pressure monitoring and other fast signals 	<ul style="list-style-type: none"> • Intelligently diagnose engine status via performance information, sub-systems and current behaviour of the main components. • WiDE analysis is complemented by a troubleshooting module that guides and empowers the operator to solve the problem. WiDE also helps to identify parts to be changed. 	<ul style="list-style-type: none"> • Prediction and diagnosis of component malfunctions and potential extension of maintenance intervals 	<ul style="list-style-type: none"> • WinGD experts provide periodic reports on engine status and recommendations on optimising engine performance. • Abnormalities are addressed by providing customers with more detailed information on key components affected and the relevant steps needed to fix the malfunction.

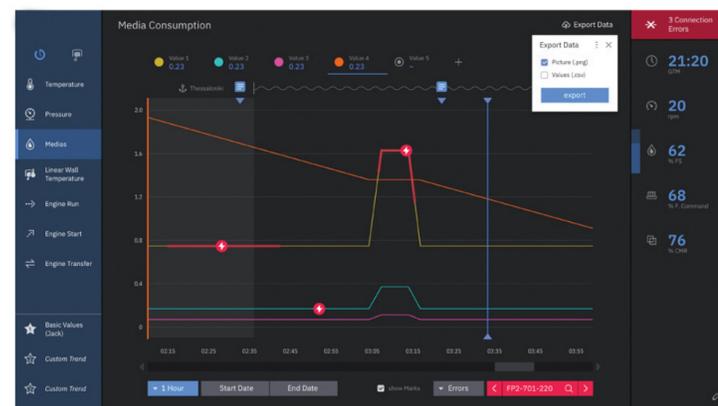
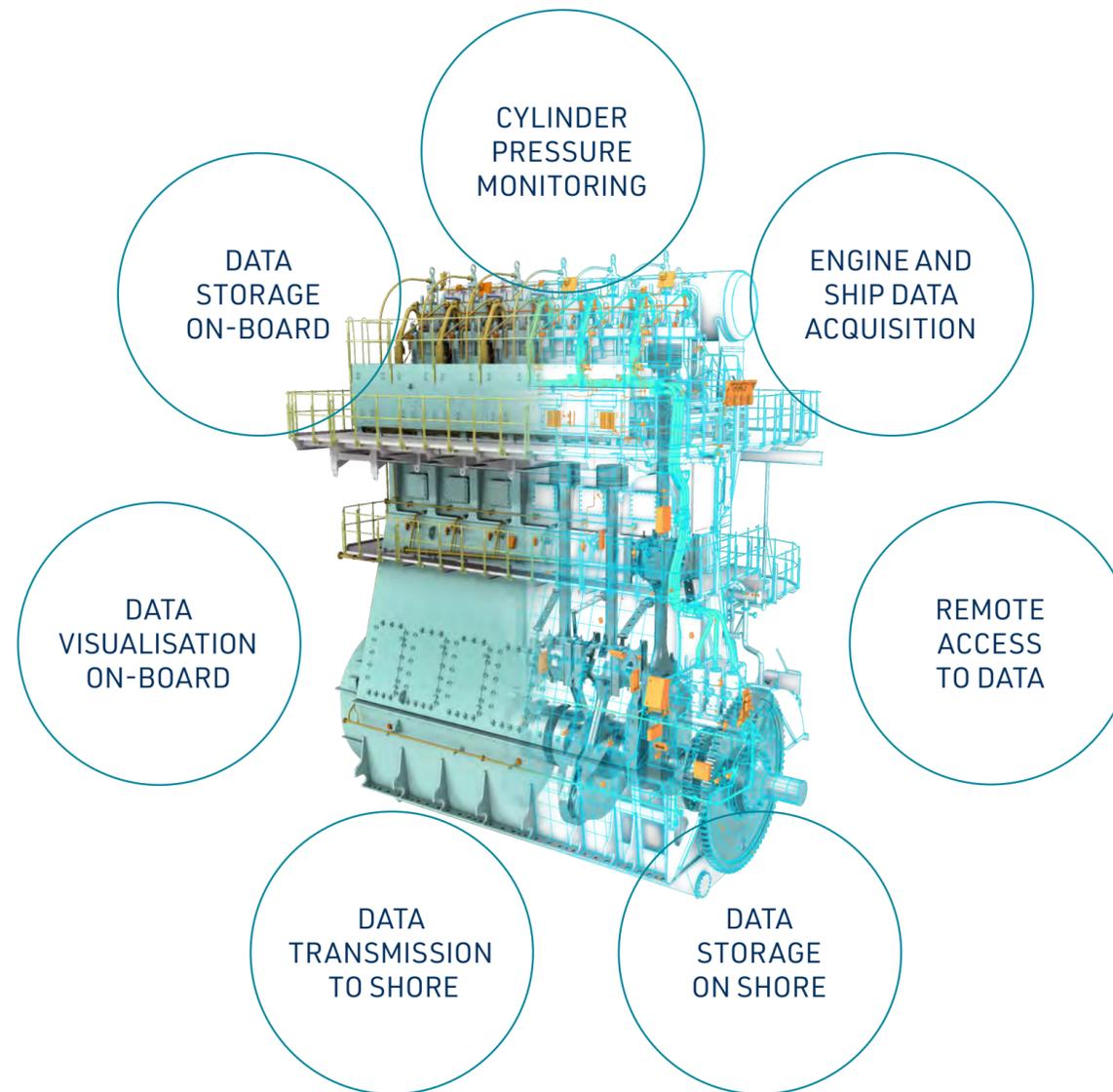
Data Collection

Providing access to machinery data onboard and onshore

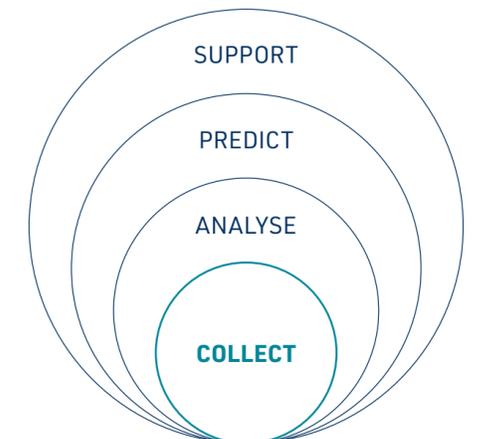
The first step in the WiDE value creation process is to collect engine and ship data.

All WinGD engines are equipped with advanced data collection and monitoring capabilities. All slow and fast signals are captured from the WinGD main engine and other ship machinery.

Collected data is sent via a secure encrypted communication channel to a WinGD server. The data are made available on a dedicated web portal accessible by a protected user account. The data are stored both on-board and ashore in a secure database designed for data analytics applications.



WinGD's WiDE provides access to and visualisation of engine and ship data



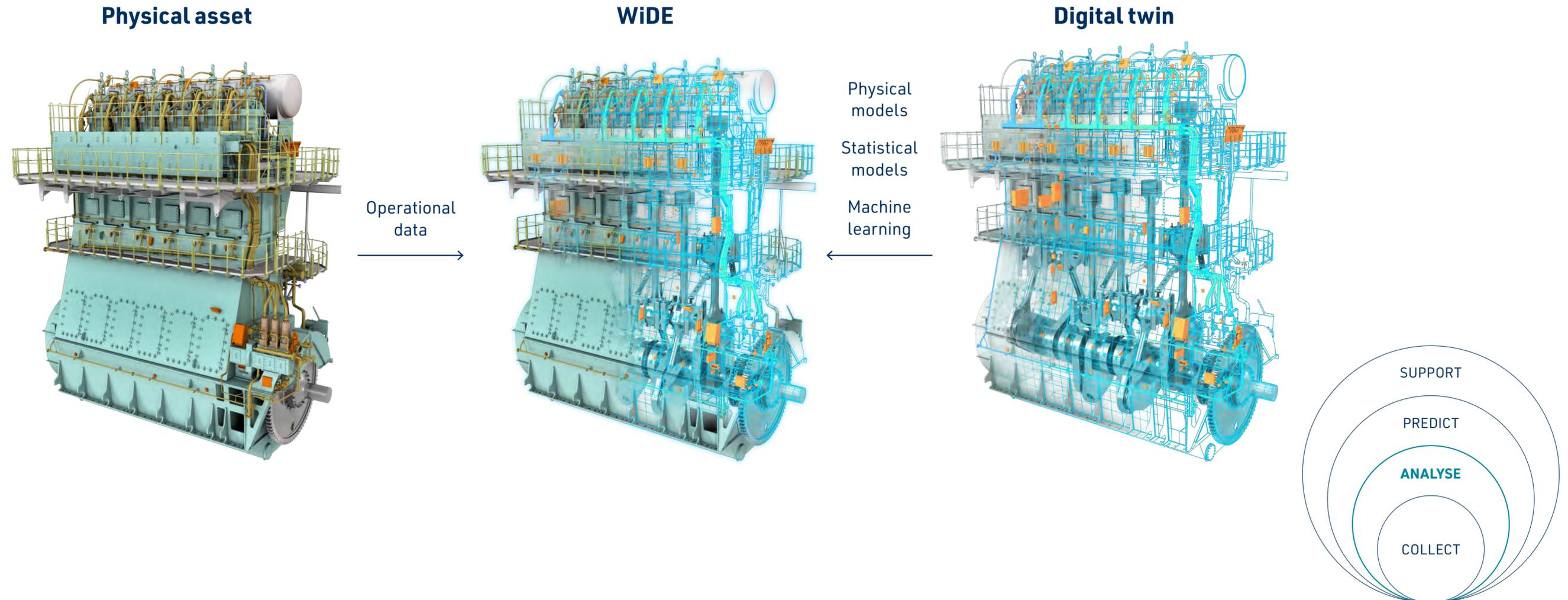
Engine Diagnostics

The intelligent core of WiDE's expert analysis

The advanced analytics of WiDE's software uses ship and machinery data to perform engine diagnostic analyses. The data collected and stored onshore in the secured WinGD server enable the remote support service offered by WinGD experts to shipping companies.

The diagnostic capabilities use the power of the digital data monitoring system to deliver valuable information to customers. It enables operators to optimize ship performance locally and provides WinGD experts with the knowledge to assist the operator in his daily activities.

WiDE's modular software solution includes the following applications: Performance Module; Components Diagnostic; Troubleshooting Support; Maintenance Planning and Spare Parts.



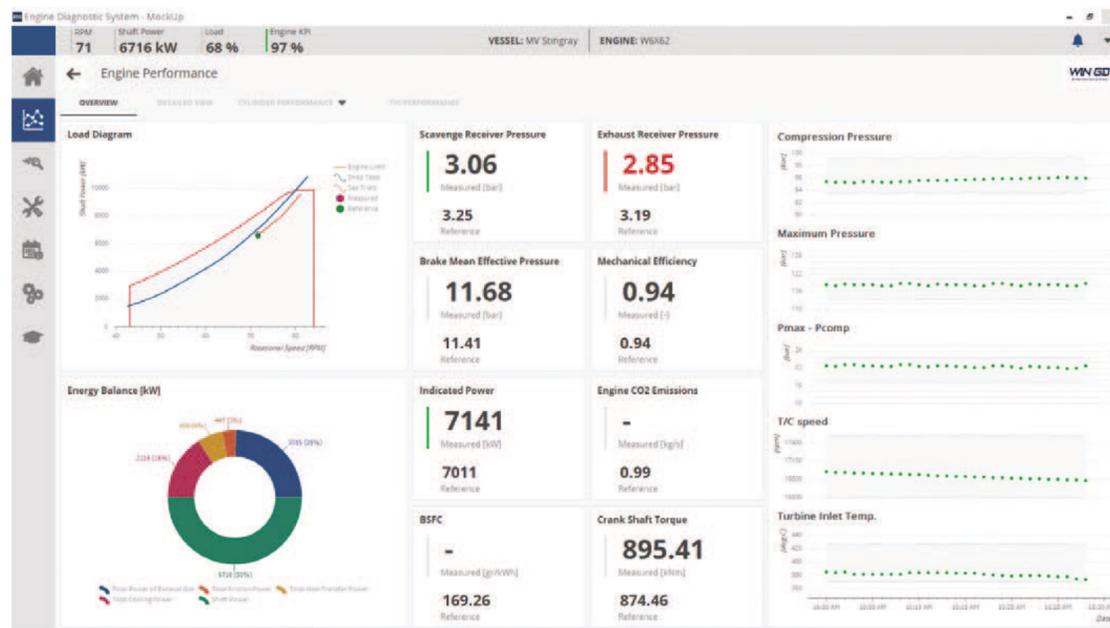
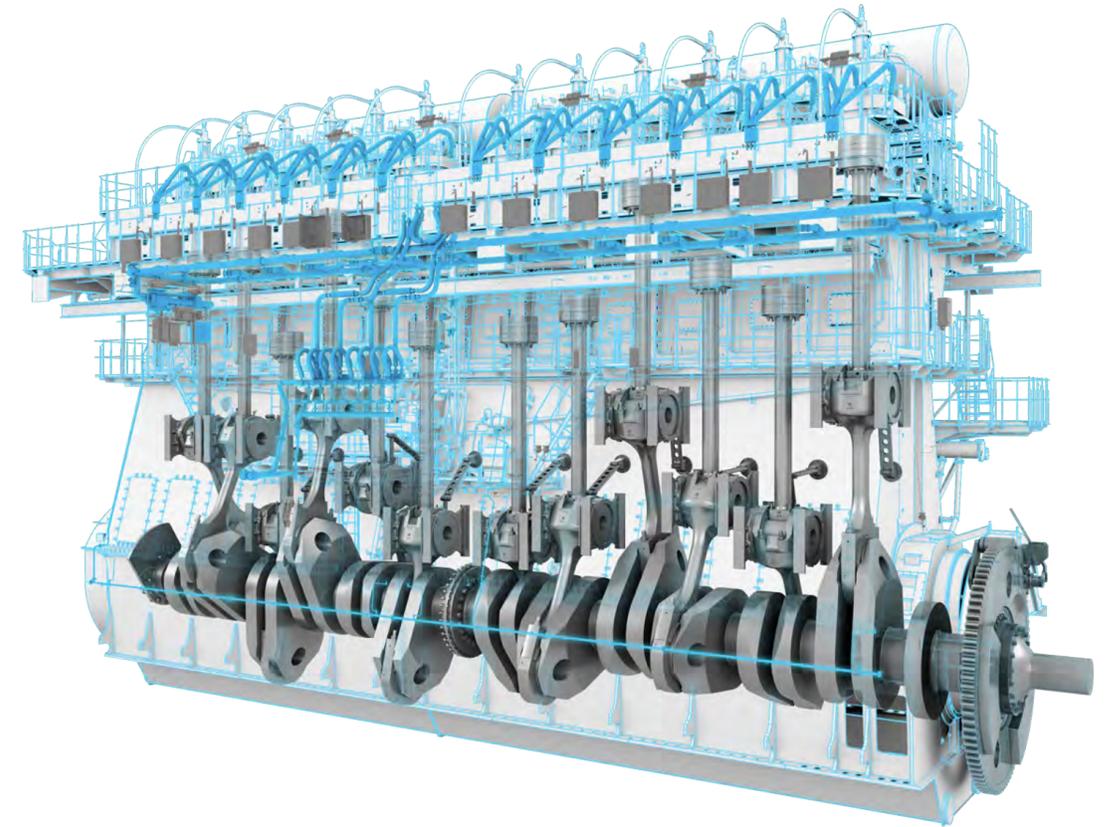
Performance Module

The digital twin of your engine

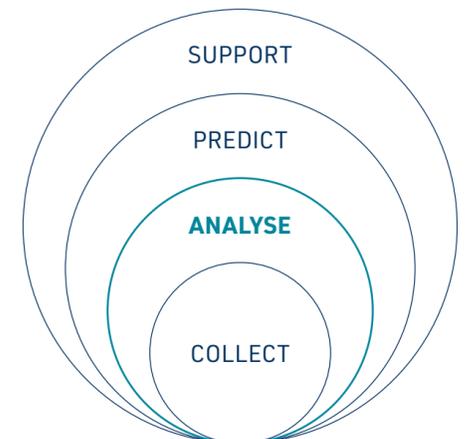
The Performance Module is based on an individual thermodynamic engine model produced by WinGD for each unique delivered engine that constantly calculates the ideal engine performance and defines a reference optimal condition for any possible combination of engine operation settings, ambient conditions and fuel type

The model is calibrated using the recorded data from that engine's shop tests and the sea trial data. As a result, the model is an accurate digital twin of the real engine in operation.

The engine's operating performance is measured by collecting relevant data from the engine and the ship. The deviation between actual and reference performance is quantified and a root-cause analysis provided, with solution suggestions.



The EDS performance detects and analyses actual engine data



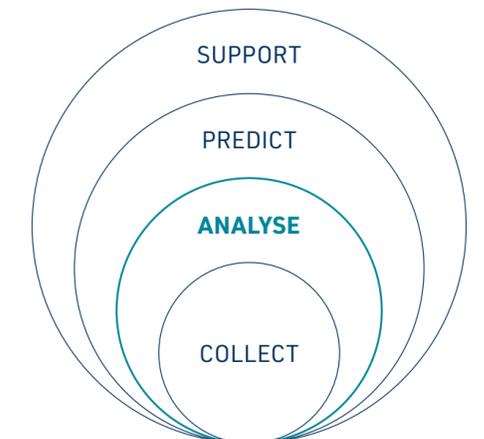
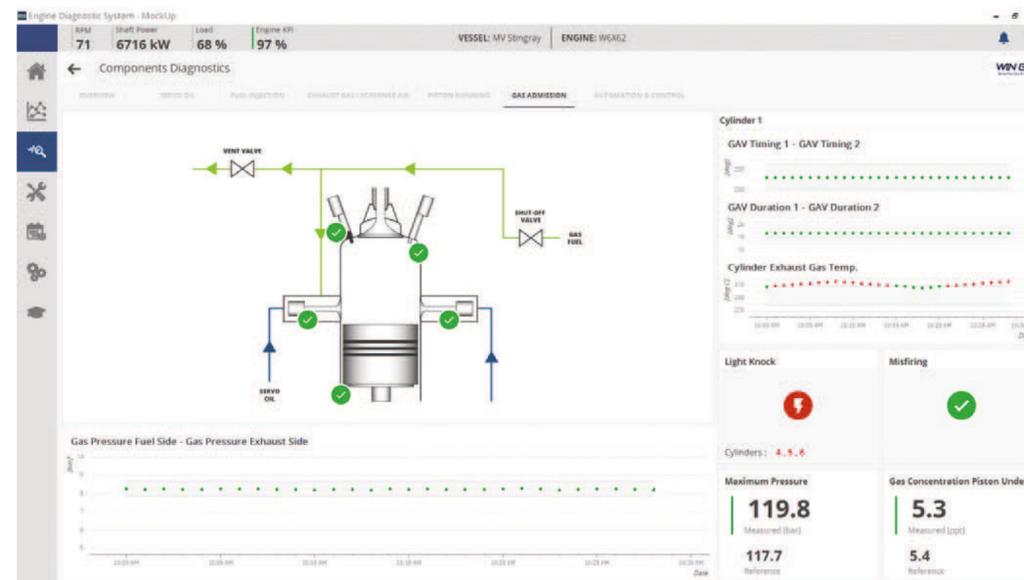
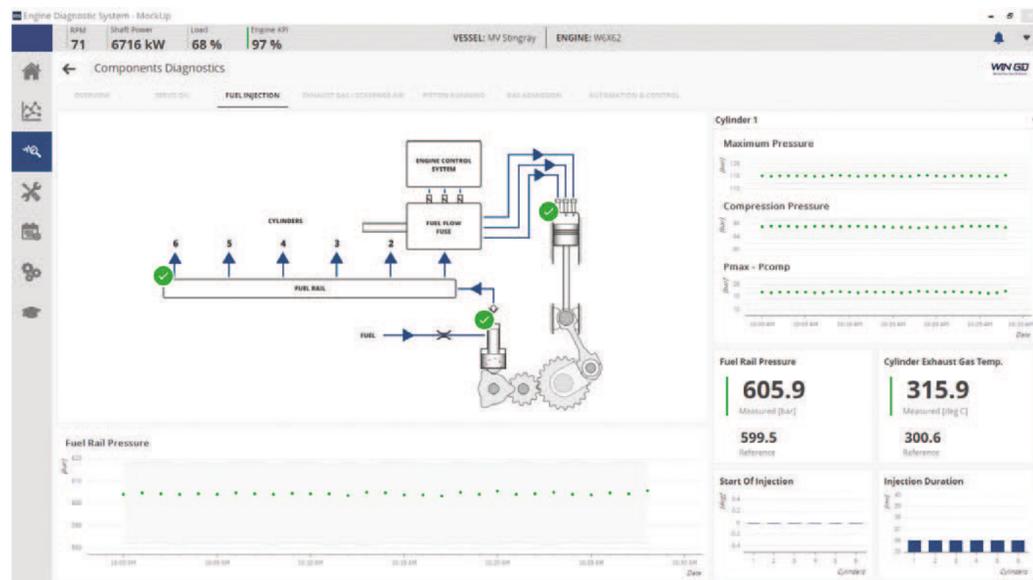
Components Diagnostic

The **Components Diagnostic** application collects and monitors signals from all of the engine's sub-systems. It analyses received data using advanced analytics techniques and defined correlations between signals to predict engine component malfunctions and generate actionable insights.

The analytics used are based on WinGD's expertise as well as statistical and predictive models and machine learning algorithms.

The following engine components data are monitored and analysed:

- Fuel injection system
- Exhaust valve gas system
- Piston running behaviour
- Scavenge air system
- Turbo charger
- Engine control automation system
- Gas admission system (for X-DF engines)
- iCER (for X-DF engines)



Troubleshooting Support

The Troubleshooting Support application provides customers with instructions on what to do in case a warning message is generated by WiDE. It reports the potential problem and the list of events recorded, identifies the component involved and automatically provides drawings and documents of relevant components as supporting material.

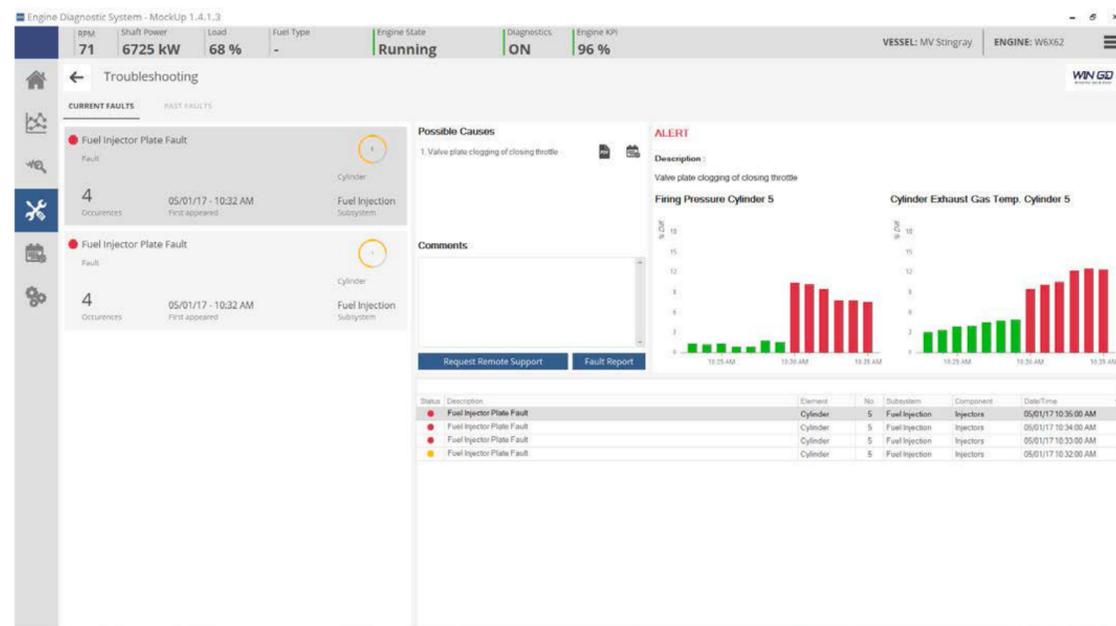
The Troubleshooting Support module displays detailed instructions on how to prevent a potential problem from taking place, including extracts from the engine manual related to the problem.

Spare Parts

In the event it is necessary to order a spare part, the application integrates the spare part codebook of the entire engine into WiDE. It can be used to create a parts order to request delivery from external suppliers.

Maintenance Planning

Engine data analytics enables predictive maintenance. The engine maintenance plan therefore becomes dynamic, based on actual condition and prediction rather than calendar-based scheduling. The Maintenance Planning module helps customers obtain an overview of the maintenance schedule and record all maintenance actions.



SUPPORT

PREDICT

ANALYSE

COLLECT

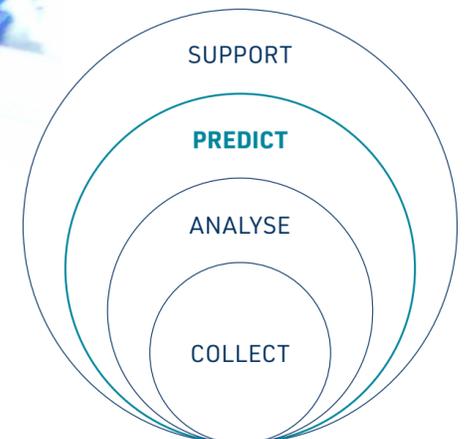
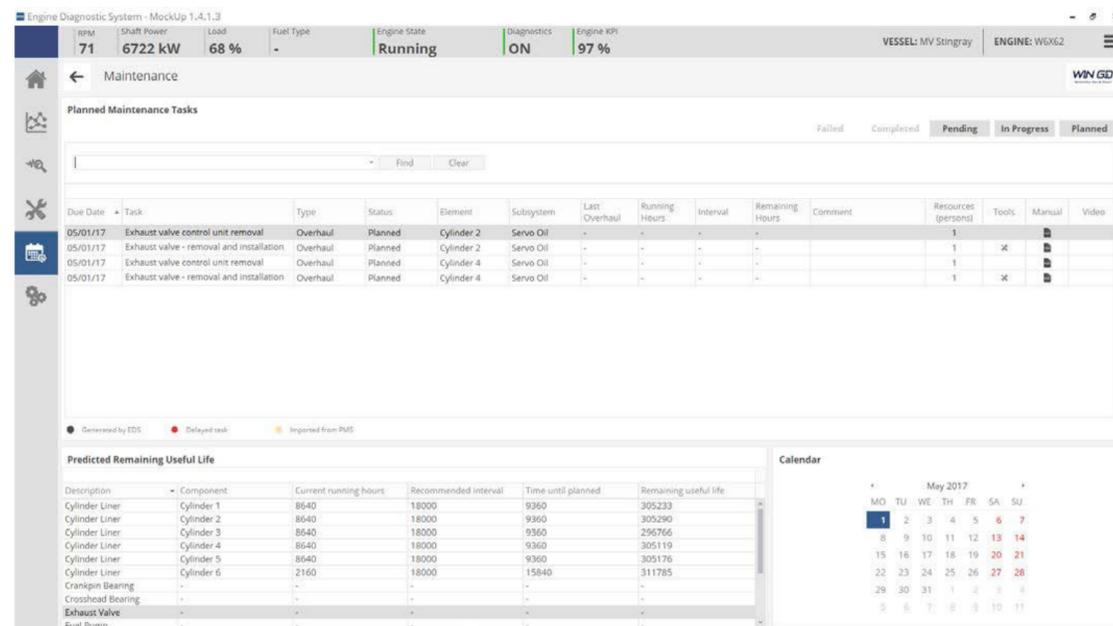
Intelligent data analytics and machine learning

WiDE uses advanced data analytic techniques to predict component failures and help avoid unplanned downtime. The predictive maintenance system derives insights from machine data to predict failures. A broad data collection system, available in real time, allows access to engine data history and systematic reporting of failure cases.

WiDE uses data to extract insightful patterns and identify dependencies using techniques such as association rules to find relationships between different parameters. For example, regression analysis evaluates the variation of one parameter when another is changing, providing new criteria to identify engine component or subsystem malfunctions.

Such techniques allow abnormalities to be identified even if the standard static pre set alarm does not activate. The predictive maintenance system enables ship operators to act in a timely manner to avoid unplanned engine stoppages and failures.

The machine-learning model is widely implemented in WiDE. The system learns from the data provided to identify normal or abnormal engine behaviour and to predict future behaviour.



Remote troubleshooting support

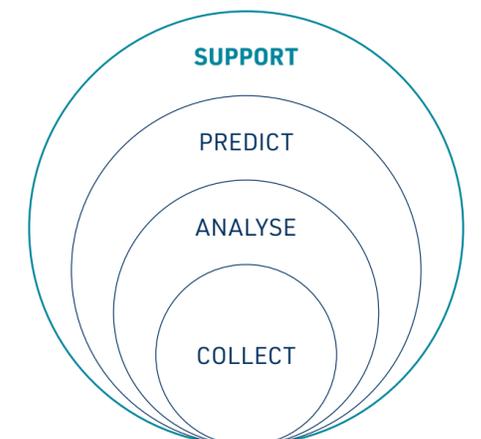
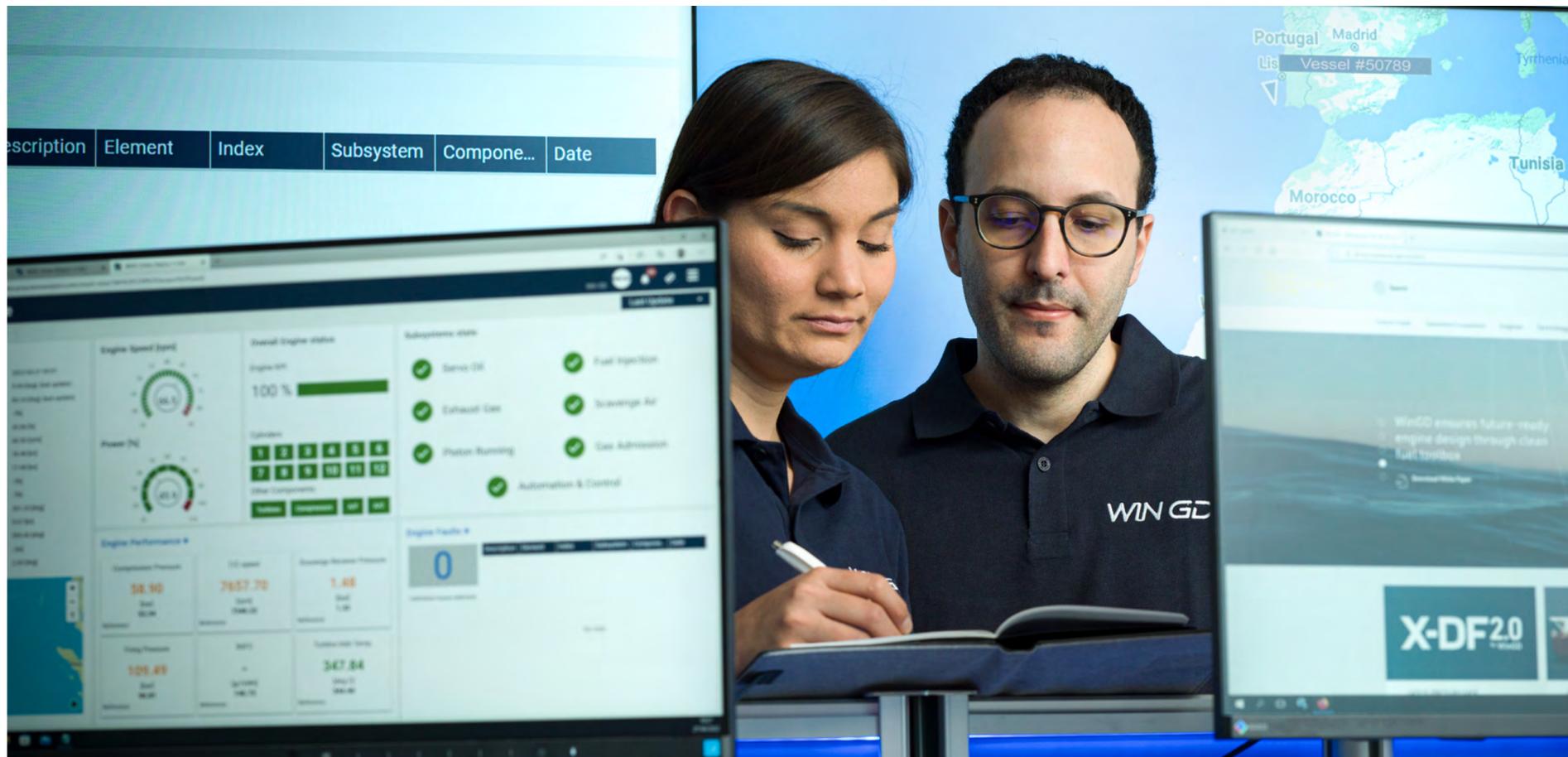
Using the language of data to solve issues quickly

WinGD experts offer remote troubleshooting support alongside the enhanced visibility provided by WiDE. WinGD experts can help customers solve issues faster by using the data collected and shared by WiDE.

Experts can also provide operational recommendations to support the customer in coordinating further technical support if required.

A typical case of support from WinGD Customer Operation Experts

- A WinGD expert identifies **unusual liner wall temperature fluctuations**
- A **detailed investigation** is initiated by WinGD, which **pro-actively informs** the crew about a potential leaking **injector**
- A close inspection confirms WinGD's analysis and the defective fuel injector is replaced. **The issue is solved before any malfunctions occur**



WiDE Online Application

Remote access to engine and ship data

WiDE makes engine and ship data available onshore by using a secure encrypted communication channel. The data are available on a dedicated WinGD online platforms, the WiDE Online Application.

The **WiDE Online Application** receives data from the WiDE installed onboard and provides a clear view of the engine status for a particular vessel and fleet, further supporting the on-board crew. Users can also see detailed vessel and engine data including engine speed and performance, subsystem state and engine faults identified. The application also visualizes engine faults identified during selectable time periods. It is available for computers, tablets, and smartphones.



WinGD Integrated Digital Expert (WiDE)

WinGD's engine's expertise in your hands



www.wingd.com

WiDE^{WinGD}

Committed to a low-carbon future through sustainable energy solutions

Swiss-based WinGD designs marine power ecosystems utilising the most advanced technology in emissions reduction, fuel efficiency, digitalisation, service and support.

With their two-stroke low-speed engines at the heart of the power equation, WinGD sets the industry standard for reliability, safety, efficiency and environmental design. Headquartered in Winterthur, Switzerland, since its inception as the Sulzer Diesel Engine business in 1893, it is powering the transformation to a sustainable future.

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