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e-Condition Based Monitoring System

Smart Ships Predict Engine Failures Themselves

eCBM

CONTENTES

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eCBM

: e-**C**ondition **B**ased **M**onitoring System

eCBM : e-Condition Based Monitoring System

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eCBM

A system that analyzes and processes large amounts of data generated during voyages using data analysis technology, and which provides predictions for engine defects.

Predicts performance and failure with AI

Provides reports on performance and fault diagnosis

Real-time analysis and monitoring

Provides real-time ship location and engine condition information

Comparison of conditions between ships

Compares performance between ships of the same specification

Fault diagnosis

Predicts ship engine failures with AI

Efficient voyages

Provides fuel efficiency information during voyage

Safe routes

Displays navigation plan information and recommends safe routes

eCBM service process

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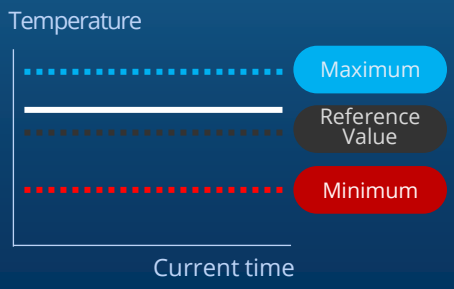
Before Sailing

The ship equipment sensor maintains normal range

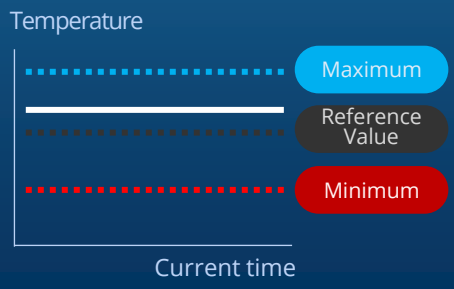
State of main engine : **normal**



During Operation

Ship data is transmitted to land and data is analyzed in real time

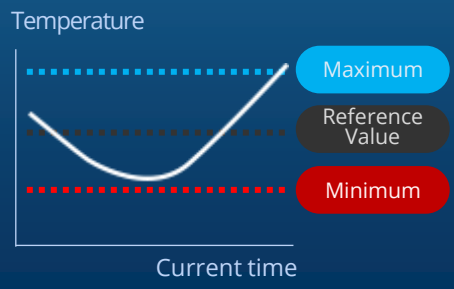
State of main engine : **normal**



⚠ Error Prediction

Alarms predict ship equipment errors and provide maintenance guides

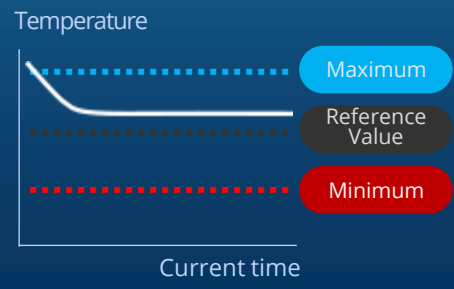
⚠ **Error Occurrence Prediction**



Arrival

Ship arrives at destination through normal operation

State of main engine : **normal**



eCBM service process

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Land Control Center (User)

- Real-time engine condition check
- Ship location and voyage information
- Quick response to accidents

◂ Real Time Monitoring

Shows Registered Ports

- Shows all registered ports
- Navigates to a location on the sea through port name search and sea area selection
- Ship location and voyage information

eCBM

Decision Making — Optimal Management

Data Analysis — AI and Algorithms

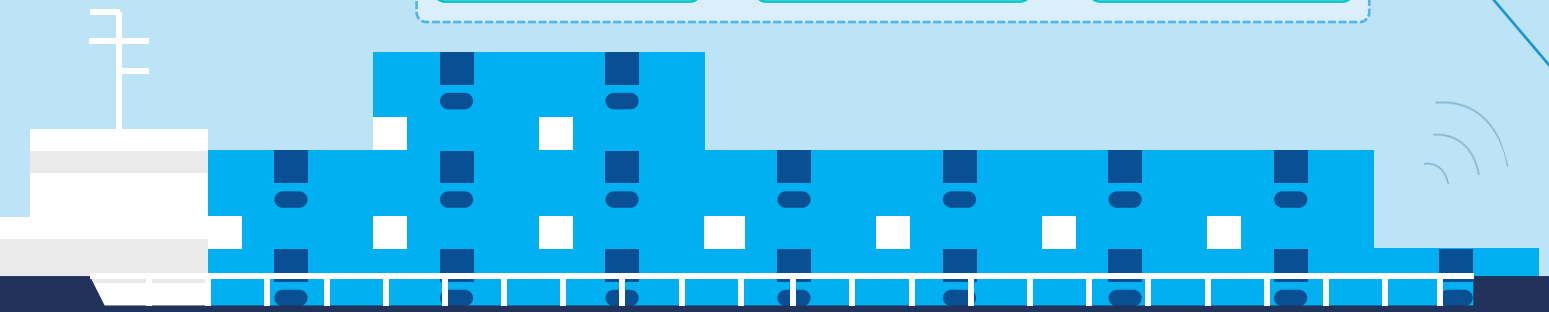
Data Collection — AMS, VDR, Passage Plan

Marine and Climate Environment

- Wave height and tidal currents
- Wind speed and direction
- Water temperature, depth, speed, and air temperature
- Visibility

Real-time Analysis of Engine Condition

- Real-time monitoring of the ship's engine condition



Big Data — AMS Data, VDR Data

Data Collection Server

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eCBM Screen & Function

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01

System Screen & Function

Fault Diagnosis

- Determines signs of abnormalities in major parts of the ship's engine
- Condition diagnosis by situation is possible through filter

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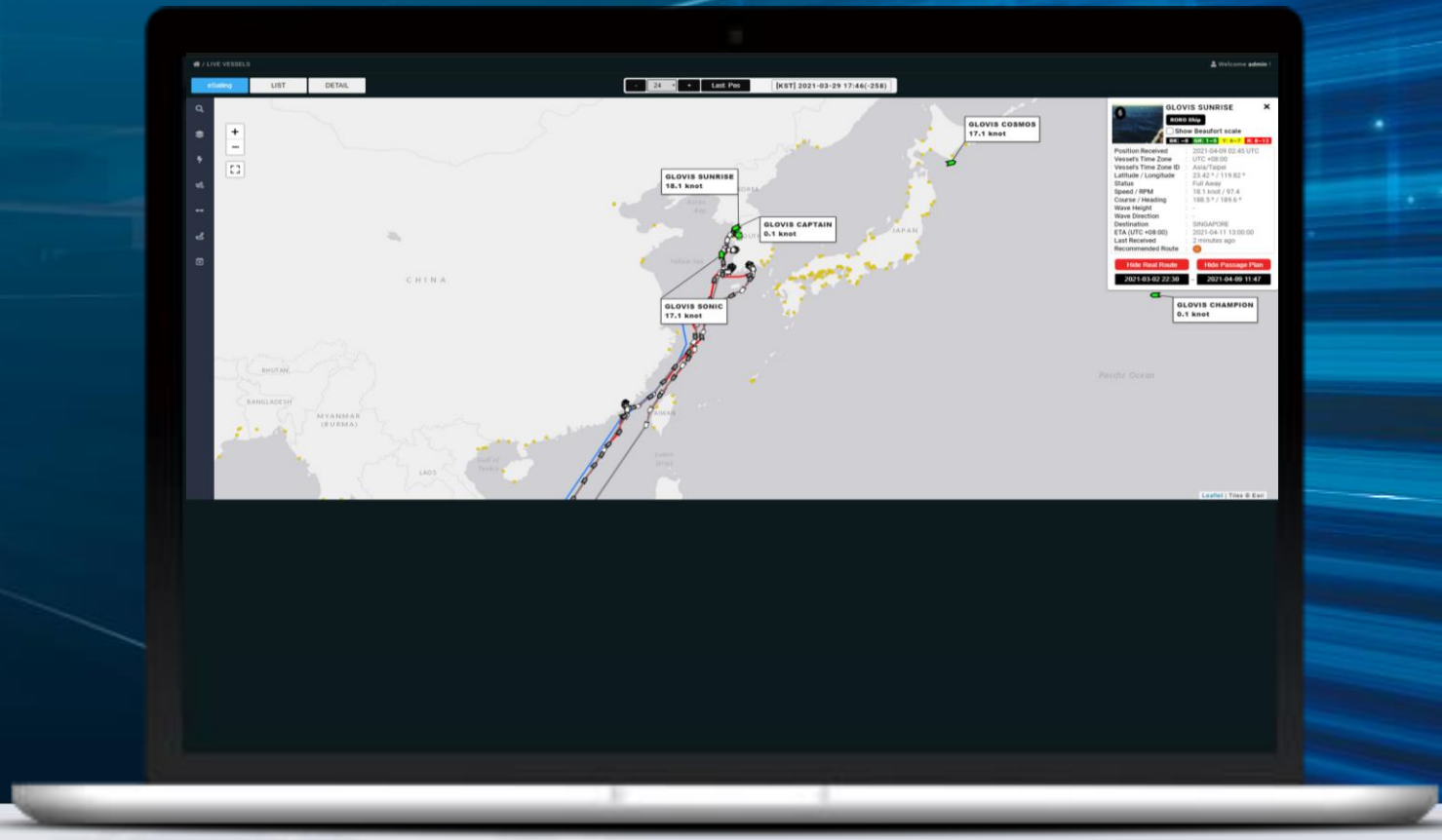
02

System Screen & Function

Safe Routes



- Shows actual route and route plans
- Recommends safe routes based on route planning
- Notifies users when deviating from the safe route

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03

System Screen & Function

Efficient Voyage

- DFOC (daily fuel oil consumption) and SPEED predicted by the selected factors (WIND OFFSET, AFT DRAFT, etc.) using the learned data of a specific ship are compared with the actual measured DFOC and SPEED values and plotted as a graph
- On-Off is possible with the On-Off function of variables in the graph
- The number of daily data can be adjusted

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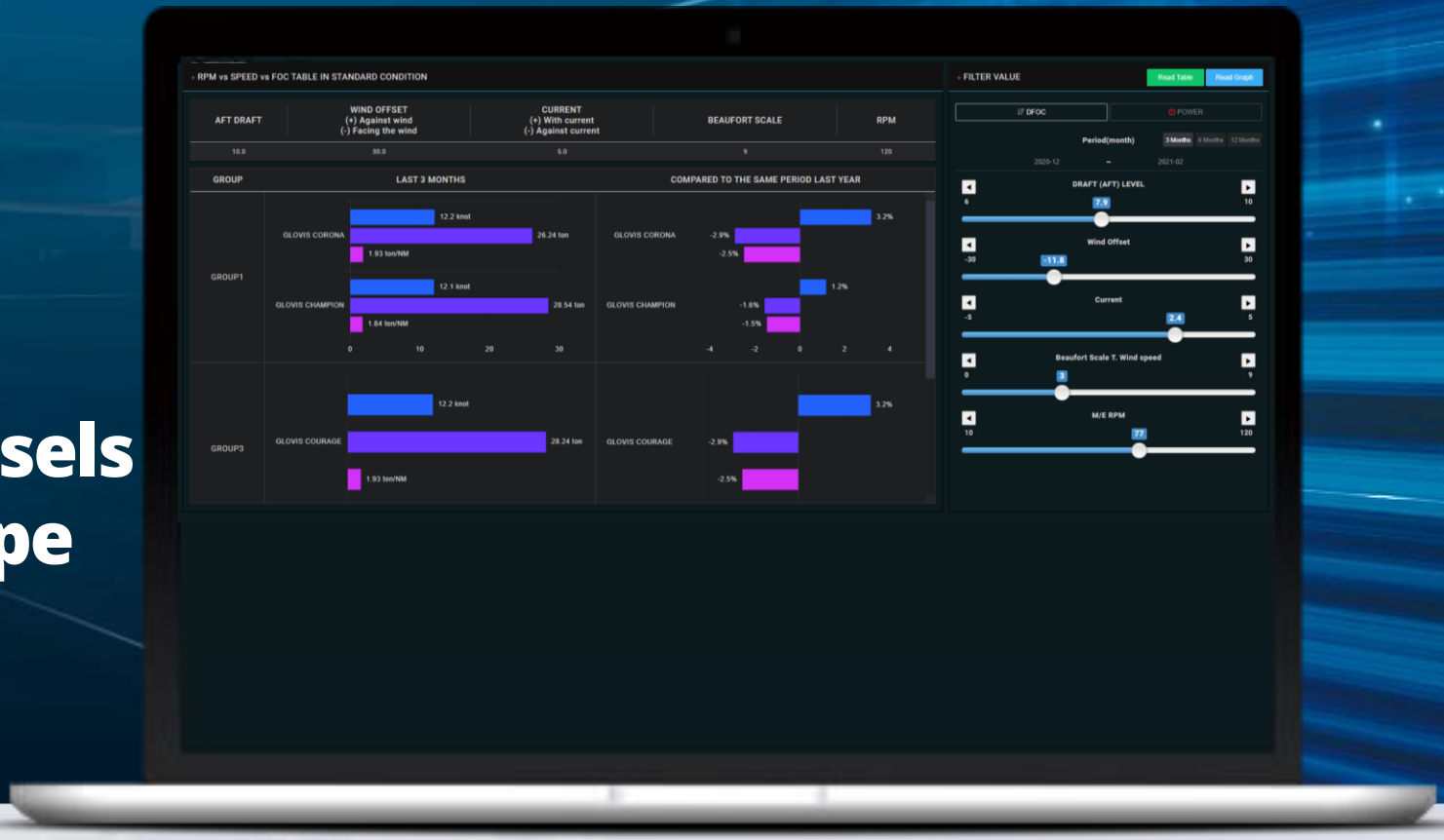
04

System Screen & Function

Comparison Between Vessels Of Similar Type



- Comparison of speed, daily fuel oil consumption, and fuel oil consumption per mile of ships for external variables (AFT, WIND OFFSET, etc.)
- Comparison of speed, daily fuel oil consumption, and fuel oil consumption per mile by group consisting of ships with the same specifications for external variables
- Comparison of speed, daily fuel oil consumption, and fuel oil consumption per mile of last year and this year of ships with the same specifications for external variables
- Measures the ship's speed, daily fuel oil consumption, and fuel oil consumption per mile according to the learning period

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eCBM Case Study

eCBM Case

CASE 01

CASE 02

CASE 03

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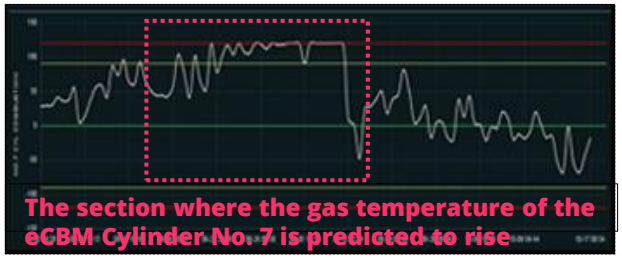
Diagnosis Case	Pre-diagnosis of main engine cylinder problems through eCBM
Client Company	Container ship A managed by H, a large Korean shipping company
Year and Month of Occurrence	August 2019
Diagnosis Contents	eCBM system detected signs of cylinder gas leaks and rising exhaust gases from valve 7 of the main engine
Diagnosis Result	· Through the eCBM system notification, the problem situation was identified and the valve detected by the sensor was checked and replaced · After replacing the 7th valve, the temperature rise of the exhaust gas and the gas leak disappeared, and it is checked as normal.

eCBM Screen

▼ The valve was replaced after the blow-by of the cylinder was predicted



▼ The valve was replaced after an increase in cylinder exhaust gas was predicted

eCBM Case

CASE 01

CASE 02

CASE 03

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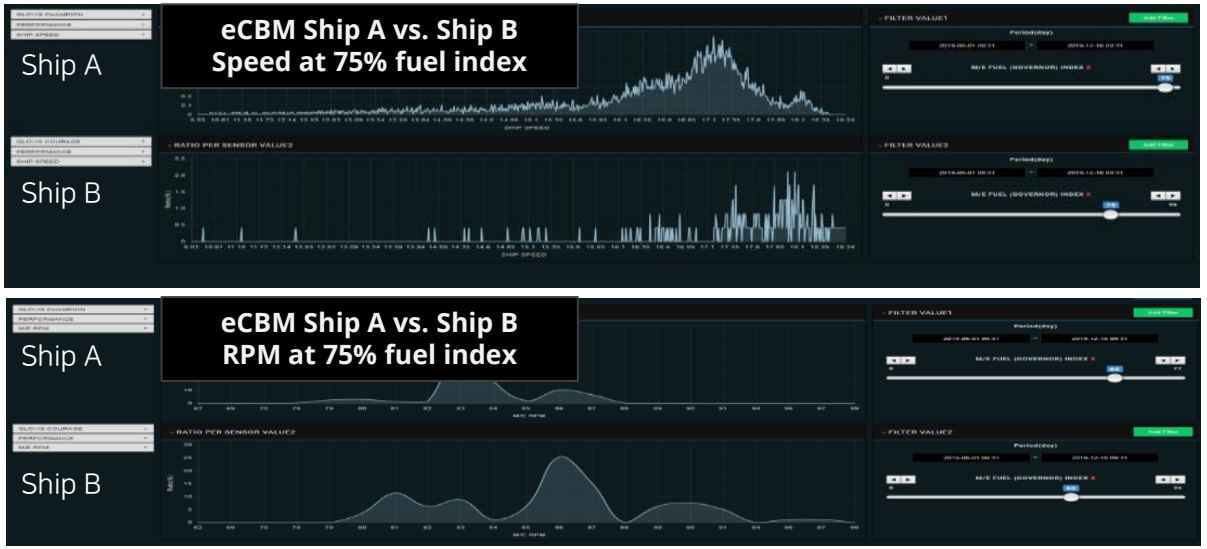
Use Case	Comparison and analysis of fuel consumption between ship A and ship B through eCBM
Client Company	Container ships A and B managed by H, a large Korean shipping company
Year and Month of Occurrence	August 2019
Background of Application	Container ship A showed signs of lowering fuel efficiency than other ships due to poor propeller performance, and it was necessary to analyze how much fuel efficiency has deteriorated through comparison between other ships.
Diagnosis Result	· As a result of eCBM analysis, it was confirmed that in the same condition, fuel index 75%, ship A was at least 3 rpm lower than that of ship B, and the amount of fuel required to achieve the same speed was further increased. · In addition, it was confirmed that in the same environment, fuel index 60%, ship A was at least 3 rpm lower than that of ship B, and in fuel index 75%, ship A was about 0.8 knots lower than that of ship B. · As a result of the actual Noon report analysis, it was confirmed that ship A had more fuel consumption by about 4 tons per day than ship B, based on 17 knots.
eCBM Screen	

eCBM Case

CASE 01

CASE 02

CASE 03

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Use Case	Improved performance of ship C through the analysis of ship data of the same specification in the eCBM system
Client Company	Container ship C managed by H, a large Korean shipping company
Year and Month of Occurrence	March 2021
Background of Application	· There was a request for improvement from the department in charge due to the deterioration of performance of container ship C.
Diagnosis Result	· As a result of comparing and analyzing ship C with ship A, a ship of the same specification through eCBM, the operation of the limiter was identified with a fuel index of 79. · Based on the result of comparing and analyzing the ships by eCBM, the limiter was adjusted upward, and the performance was improved to a level that could be increased.
eCBM Screen