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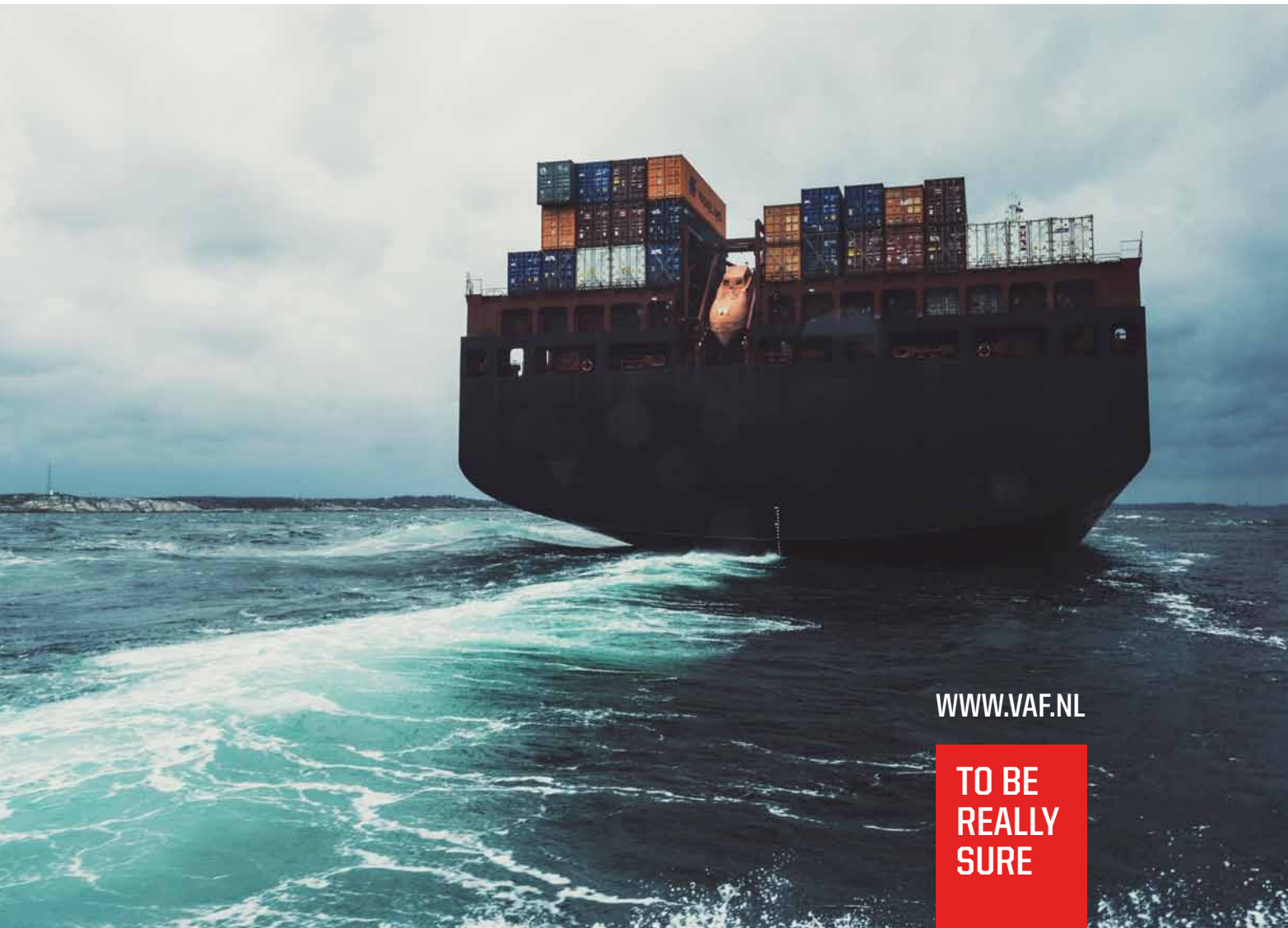
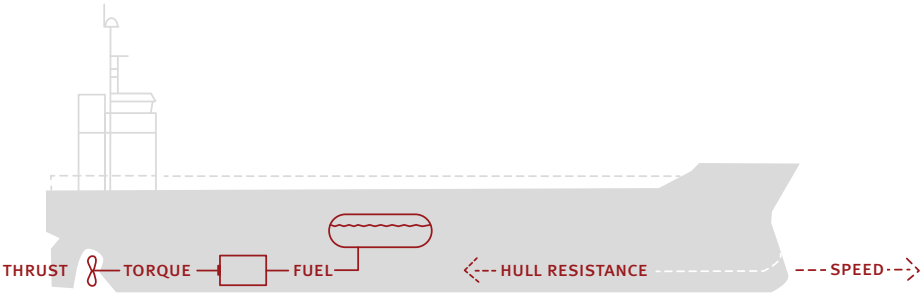
Application Bulletin – 366

PROPULSION PERFORMANCE MANAGEMENT



Propulsion Performance Management

Managing a fleet comes with numerous responsibilities and challenges. When it comes to fleet management, optimising fleets' performance is key. But Fleet Performance Management is not only driven by cost-effective goals and decisions. Environmental impact, competition and pending rules and regulations are also taken into account. To be one step ahead in Propulsion Performance Management, IVY®, VAF Instruments' software solution for Propulsion Performance Management, will provide you the fleet at your fingertips.



Energy conversions & efficiencies
Only by measuring propeller thrust you are able to separate the propeller efficiency from the hull resistance

Fleet performance

IVY®, Propulsion Performance Management system provides a relevant overview of the performance of the fleet as a whole. It enables monitoring and comparing the performance of the entire fleet of ships, as well as on individual ship level. IVY® automatically collects all data, performs powerful analyses and visualises dedicated Key Performance Indicators (KPIs) and provides insight into full graphical display of sensor data. In addition, sister ships' performance can easily be compared in the fleet overview.

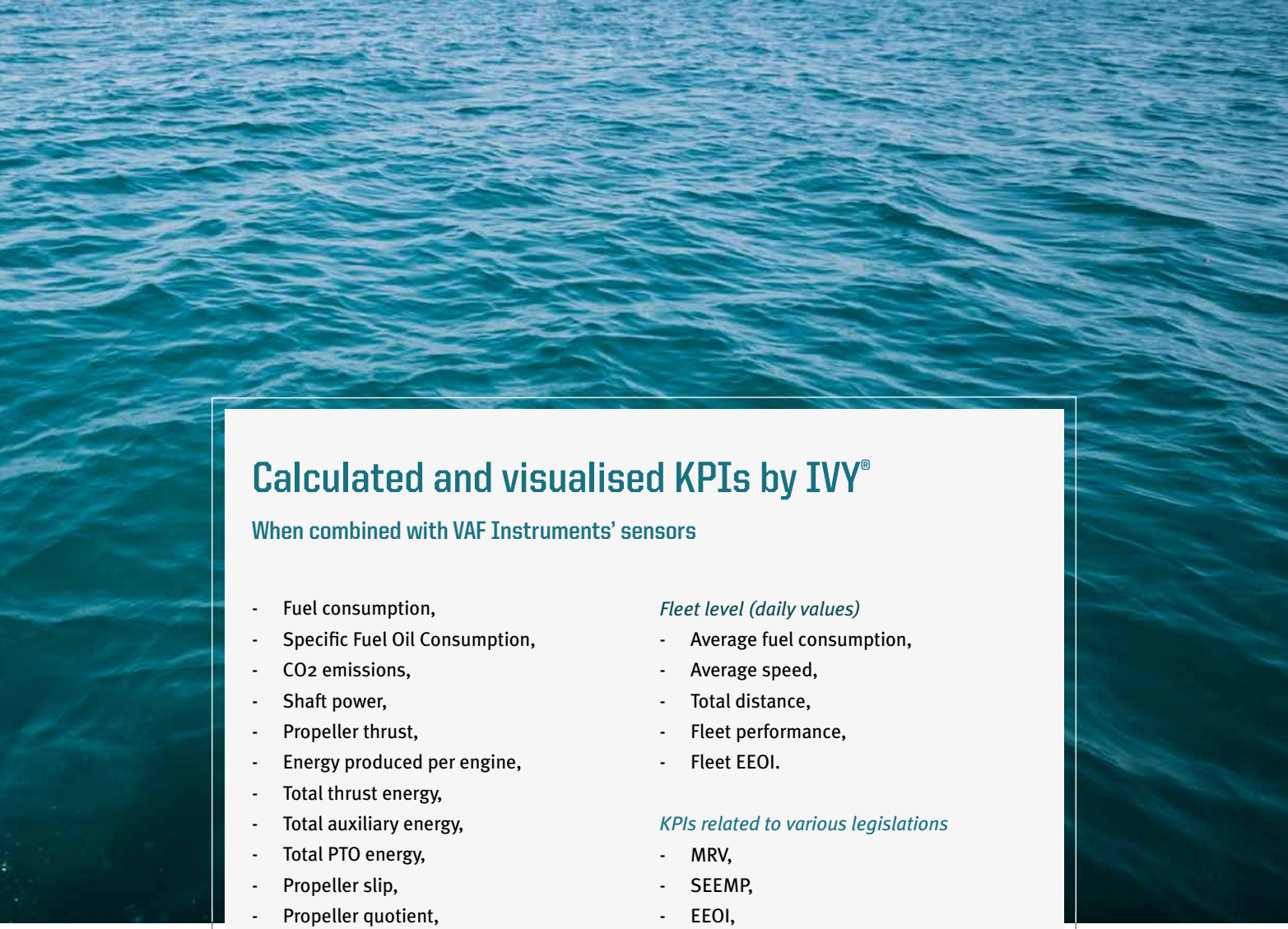
From sensor to KPI

Collection of data of the relevant sensors on board of various ships of a fleet usually results in unmanageably large amounts of data, so called Big Data. Nonetheless, the most important and difficult step is to refine the vast amount of raw measurement data into the relevant data points. This enriched data is critical for KPIs on which decisions for ship performance optimisation can be based.

Big Data enrichment is automatically performed by IVY® and is based on the use of strong mathematical algorithms, which have been developed by VAF Instruments over many years. These mathematical algorithms of IVY® provide clear Key Performance Indicators (KPIs) on which the performance of the various ships and the fleet can easily be tracked.

With the powerful analysis by IVY®, visualising raw sensor data and making difficult, time consuming data analysis is no longer necessary. IVY® enriches and then analyses data into KPIs which are presented to the ship and fleet performance decision maker through a powerful visualisation dashboard. These KPIs enable optimisation of operational costs, energy efficiency, fuel consumption, emissions and maintenance.

If, based on the displayed KPIs, there is a necessity for further analysis of the performance of the individual ship or fleet, IVY® also offers the possibility to zoom in on the individual sensor signals resulting in a KPI. This enables the user to perform more in depth analysis of a possible change in a trend.



Calculated and visualised KPIs by IVY®

When combined with VAF Instruments' sensors

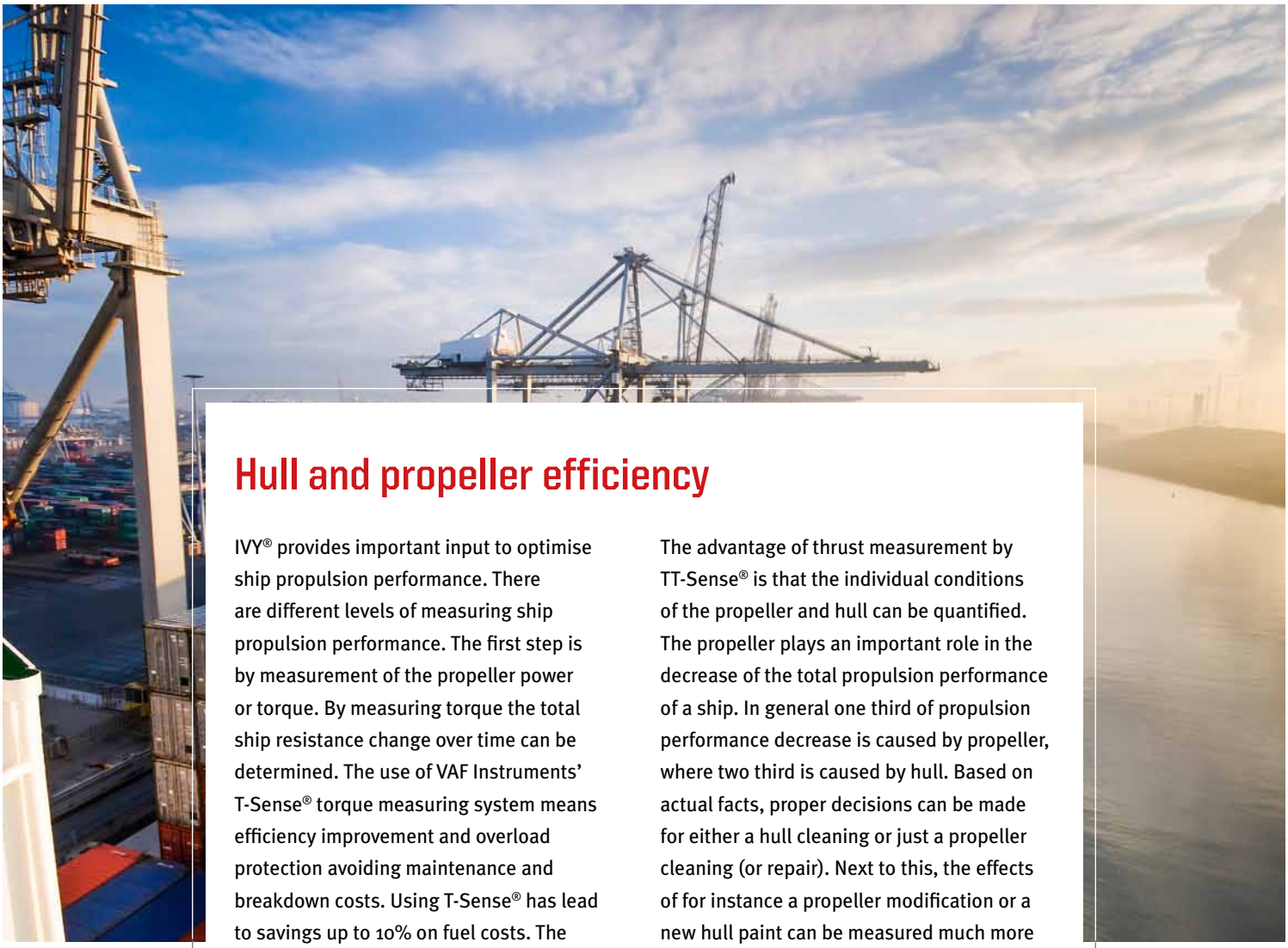
- Fuel consumption,
- Specific Fuel Oil Consumption,
- CO2 emissions,
- Shaft power,
- Propeller thrust,
- Energy produced per engine,
- Total thrust energy,
- Total auxiliary energy,
- Total PTO energy,
- Propeller slip,
- Propeller quotient,
- Propulsion quotient,
- Shaft speed and total revolutions per day,
- Power-speed diagram,
- SFOC diagram,
- Engine load diagram,
- Ship speed,
- Sea-current speed and direction,
- Wind speed and direction,
- Ship locations, track and heading,
- Total distance sailed,
- Average sea depth,
- Average draft.

Fleet level (daily values)

- Average fuel consumption,
- Average speed,
- Total distance,
- Fleet performance,
- Fleet EEOI.

KPIs related to various legislations

- MRV,
- SEEMP,
- EEOI,
- ECA,
- ISO19030 "Measurement of changes in hull and propeller performance".



Hull and propeller efficiency

IVY® provides important input to optimise ship propulsion performance. There are different levels of measuring ship propulsion performance. The first step is by measurement of the propeller power or torque. By measuring torque the total ship resistance change over time can be determined. The use of VAF Instruments' T-Sense® torque measuring system means efficiency improvement and overload protection avoiding maintenance and breakdown costs. Using T-Sense® has lead to savings up to 10% on fuel costs. The system is based on an highly accurate optical sensor technology and can be mounted on shafts in power transmission systems. The T-Sense® can measure the combined effect of propeller and hull. But in order to separate the propeller performance and the ships' hull performance, the propeller thrust needs to be measured as well.

The advantage of thrust measurement by TT-Sense® is that the individual conditions of the propeller and hull can be quantified. The propeller plays an important role in the decrease of the total propulsion performance of a ship. In general one third of propulsion performance decrease is caused by propeller, where two third is caused by hull. Based on actual facts, proper decisions can be made for either a hull cleaning or just a propeller cleaning (or repair). Next to this, the effects of for instance a propeller modification or a new hull paint can be measured much more accurately. At the end this provides essential input towards proper investment decisions for propulsion energy saving measures and greenhouse gas reductions.
In addition to torque measurement, combining IVY® and VAF Instruments' TT-Sense® offers the unique possibility to separate propeller and hull resistance, thus maximizing the total savings potential on your maintenance and fuel bill up to 20%.

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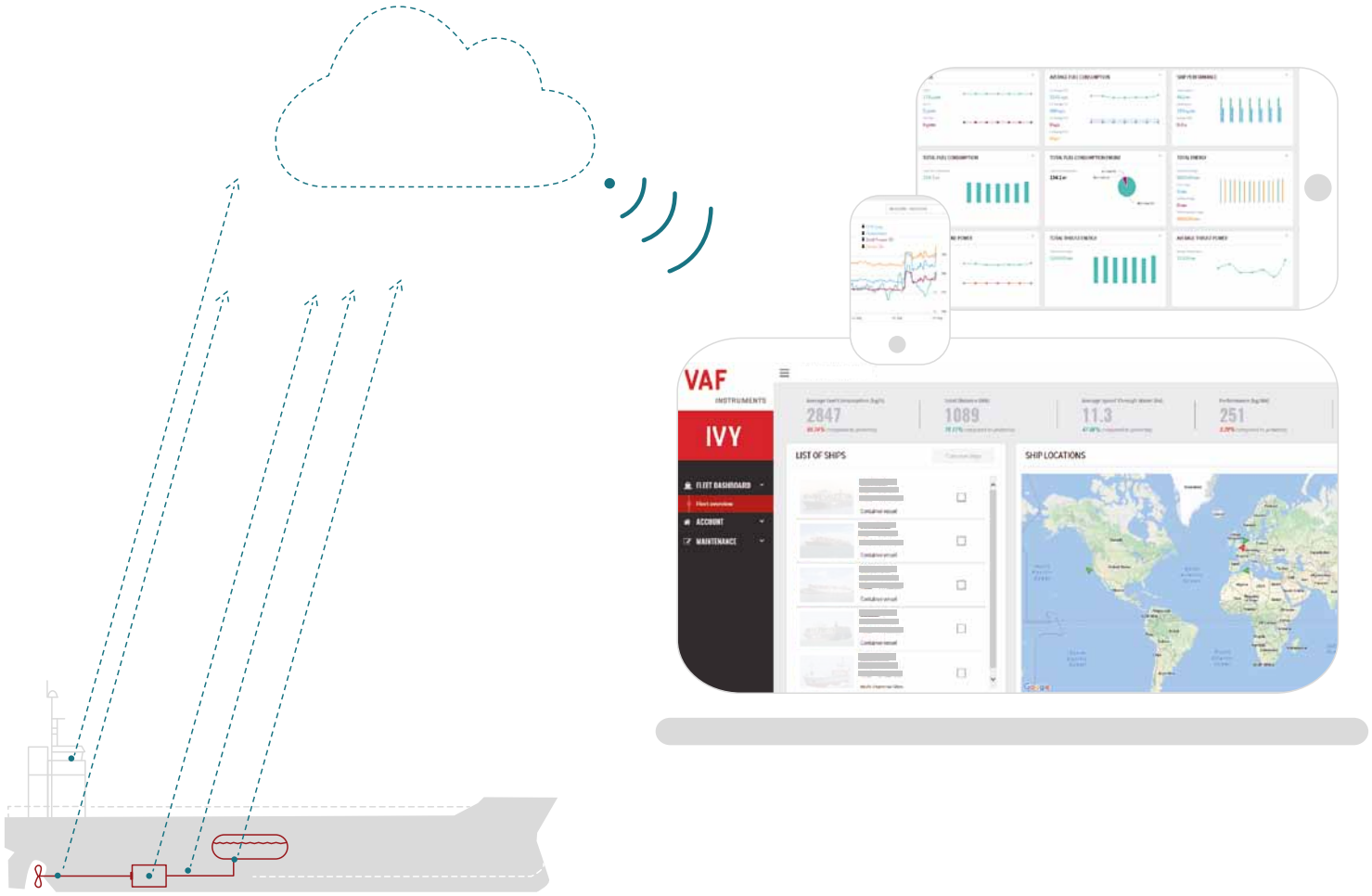
TO BE REALLY SURE

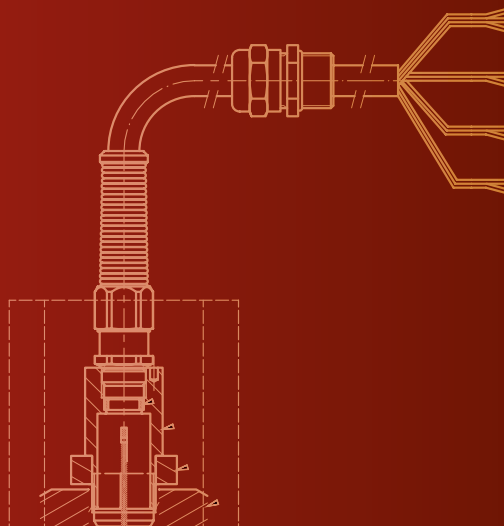


Any time, any where

All relevant and available sensors are used for real time collection of ship performance data on board of each individual ship. Via the IVY® on board solution, the gathered sensor data is enriched. Via the ships' satellite connection, the data is send to the IVY cloud and accessible at the office on shore. Data from various ships of the fleet will be available at individual ship level as well as fleet level when the ship data is combined.

The ship and fleet data can be easily accessed, visualised and analysed via the IVY® Propulsion Performance Management web application. This application is available any time and on any device with a web browser.

The fleet at your fingertips



The Internet of Ships

IVY® is the total solution for fleet and ship propulsion performance management. From ship to shore, IVY® provides relevant ship and fleet performance data and KPIs, instead of just Big Data visualisation. All this information is displayed on an easily-accessible dashboard either on an office desktop, mobile laptop, tablet or any other device. IVY® enriches big data for powerful analysis, fleet and ship performance visualisation and insight into the relevant data and KPI's via the IVY® dashboard. VAF Instruments' Propulsion Performance Management system IVY®, turns the Internet of Things into the Internet of Ships and brings Big Data back to the essence.

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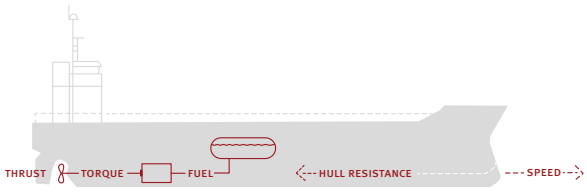
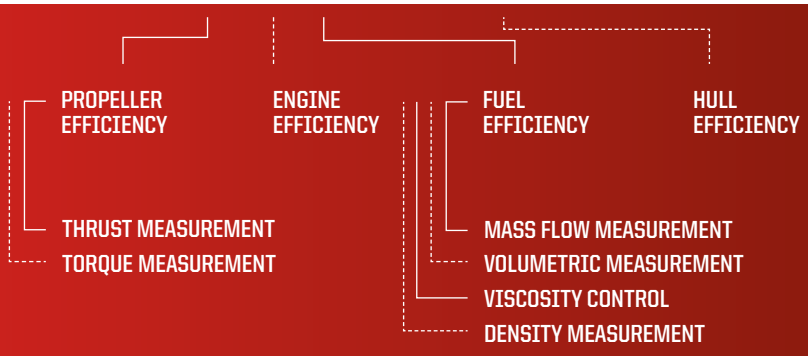
VAF Instruments is the most preferred supplier of the top 100 shipyards and market leader in maritime measurement systems. Since 1938, VAF Instruments has gained a worldwide reputation as a specialist in developing and manufacturing measurement and control systems for the maritime and process industry. Our mission is to develop innovative and accurate measurement systems to maximize efficiency, improve operational excellence and reduce the environmental impact of these operations.

With agents around the globe, VAF Instruments has a worldwide network. Over 70 representatives are specialised in VAF Instruments' products and solutions. Please feel free to contact us or one or our representatives, any time, any place.





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