

Decarbonization By **Digitalization.**

*The Digital Journey of Operational
Ship Propulsion Performance Improvements*

Greener Shipping Summit – November 2025

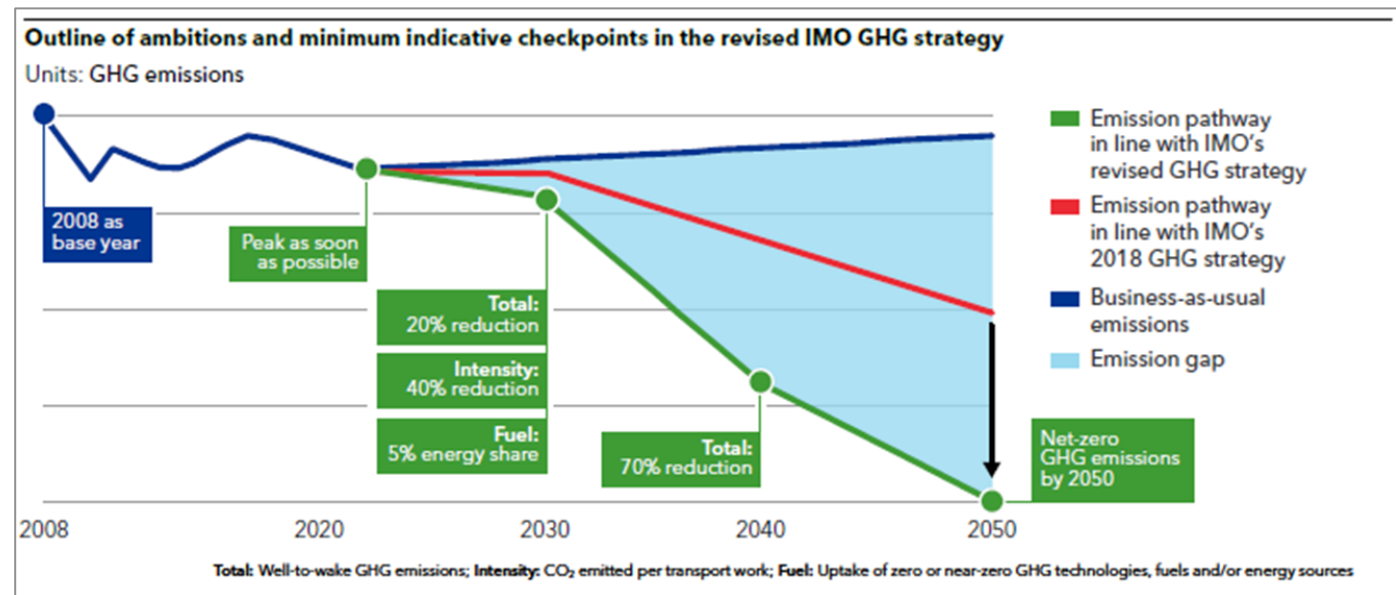
Martijn Schols – Commercial Director



Maritime key trends



1. GHG emissions reduction



IMO Global Legislation: Shipping Net-zero in 2050

Maritime Landscape| key trends

Maritime key trends



1. GHG emissions reduction



2. increased GHG legislation

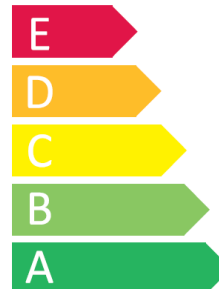


IMO DCS



EU MRV
EU ETS
FUEL EU

EEXI
CII



POSEIDON
PRINCIPLES

A global framework for
responsible ship finance



SEA CARGO
CHARTER

mandatory GHG Emission measuring, reporting & taxation (EU):

- IMO
- EU
- Ship Financing
- Cargo Owners

Maritime key trends



1. GHG emissions reduction



2. increased GHG legislation



3. alternative maritime fuels

alternative fuels to reduce GHG emissions:

LNG:



Bio Diesel:



Ammonia:



Methanol:



Maritime key trends



1. GHG emissions reduction



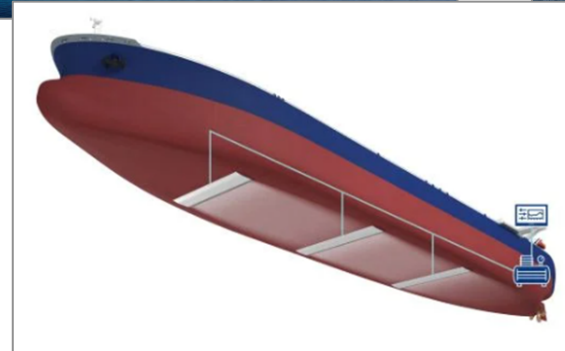
2. increased GHG legislation



3. new maritime fuels



4. Energy Saving Devices



Maritime Landscape| key trends



IACS E26
and E27
cyber security
requirements

Maritime key trends



1. GHG emissions reduction



2. increased GHG legislation



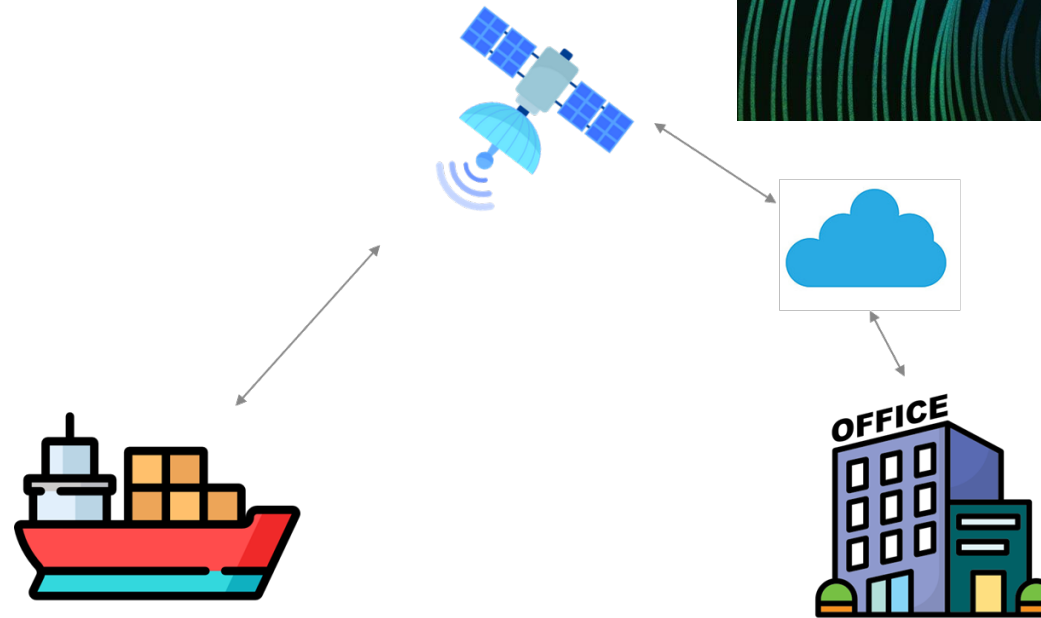
3. new maritime fuels



4. Energy Saving Devices



5. digitalization



digital sensors & data collection:

- Vessels are getting connected
- High frequent data for reporting & improvements on fuel & GHG

The world of VAF - Ship Propulsion Performance Monitoring

VAF



- Dutch company
- Founded in 1938
- **70% world fleet has 1 or more VAF products / solutions**
- Global service & agent network
- Part of Aalberts Industries



The world of VAF – VAF products & solutions topics

VAF



Fuel efficiency

Gain deeper insight in fuel consumption and propulsion efficiency gained by fuel flow measurement.



Environmental compliance

Compliance with the latest rules and regulation like CII, EU/ETS, MRV, FUEL EU, and more.



Advanced data management

From basic data collection and automated reporting to advanced analysis and visualisation for fleet management.



Remote onboard diagnostics

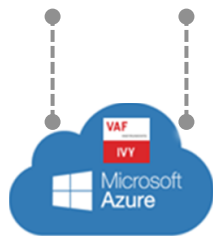
Digitalization allows remote health check of onboard sensors and data collection systems.

Total Solution Provider

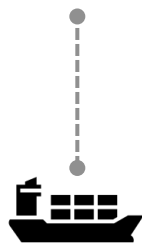


CUSTOMER
BI SYSTEM

VAF IVY
OFFICE
SOLUTION



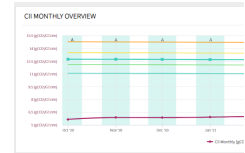
ONBOARD DATA
COLLECTION
& ENRICHMENT TO
CLOUD



ONBOARD
SENSORS

Carbon Emissions Management

Automated CII, IMO
DCS EU MRV/ETS
Reporting



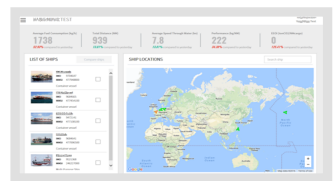
ShaPoLi (EEXI compliance)



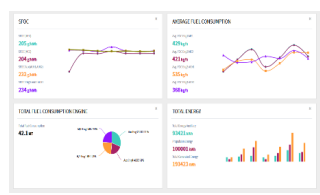
ShaPoLi Data
Collection Box

Dashboarding

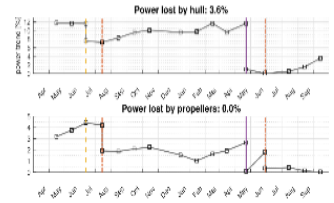
Fuel consumption &
Automatic voyage reporting



SFOC, Engine Performances



Hull & Propellor Trend



VAF Data provided to 3rd Party:

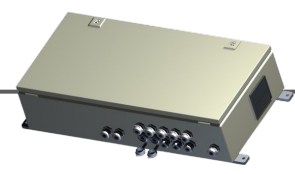
Data Collection

On board (VPMS)



ECR Touch screen

Data acquisition & enrichment



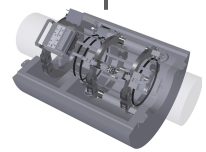
SPU-3

External data (optional)

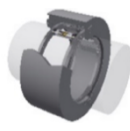


IPC

Sensors



Torque & Thrust



Torque



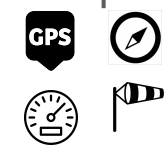
Fuel



Fuel



Viscosity & Density



Other Sensors

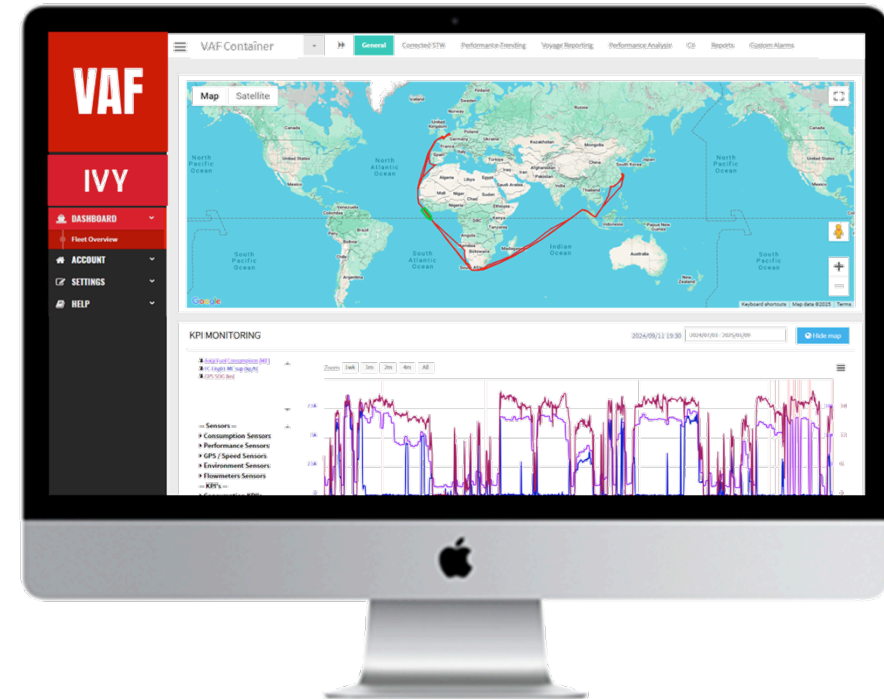
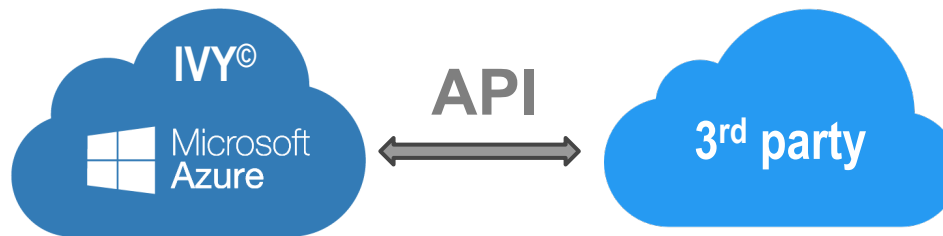
>85 YEARS
DOMAIN
KNOWLEGDE

▶ IVY[©] cloud solution

High frequent data in cloud

**Data analysis propulsion
performance monitoring:**

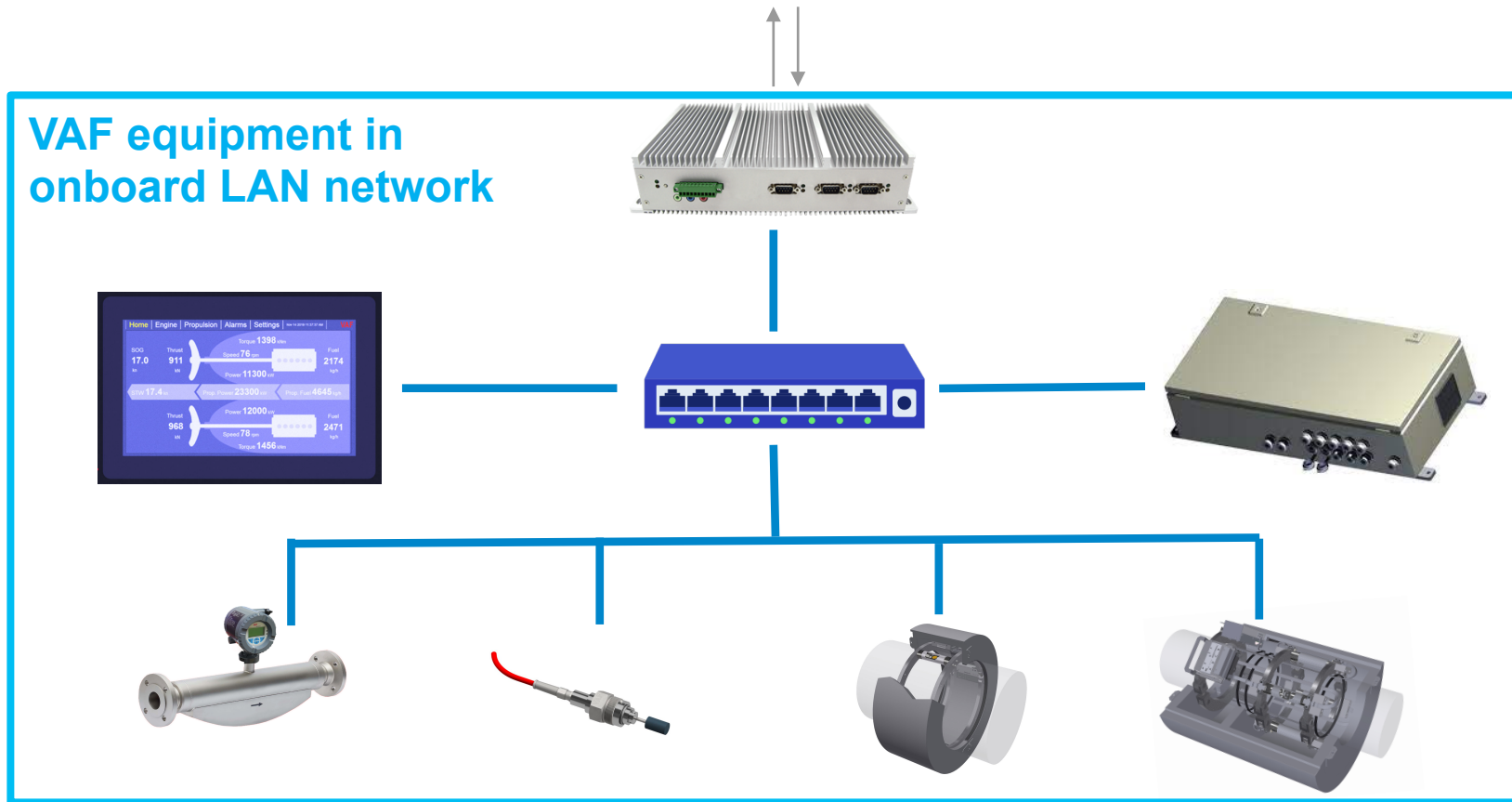
- **Fuel efficiency**
- **GHG reporting**



Products & Solutions – VAF remote diagnostics

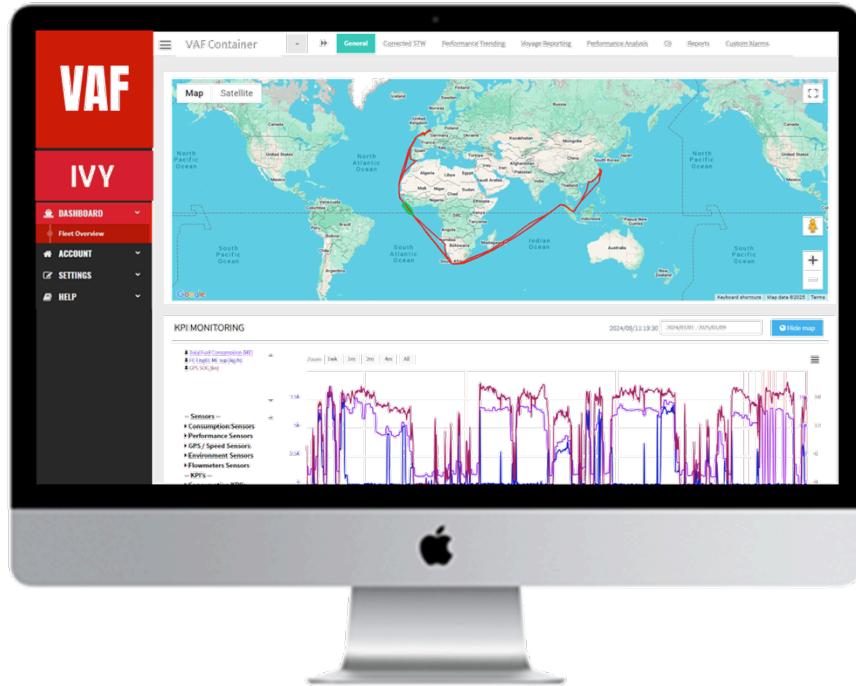
VAF

VAF - remote diagnostics VAF onboard equipment



Products & Solutions – Digitalization opportunities

VAF



Digitalization opportunities:

1. Ship propulsion performance
 - High frequent data analysis
 - Fuel monitoring
 - Environmental compliance
2. Sensor health monitoring
 - Calibrations
 - Zero settings
3. Remote onboard diagnostics
 - Software updates
 - Settings updates



VAF Service Level Agreements (SLA) for remote system & sensor support

VAF reference examples

VAF



How can digitalization support you with ship propulsion performance and emissions ?

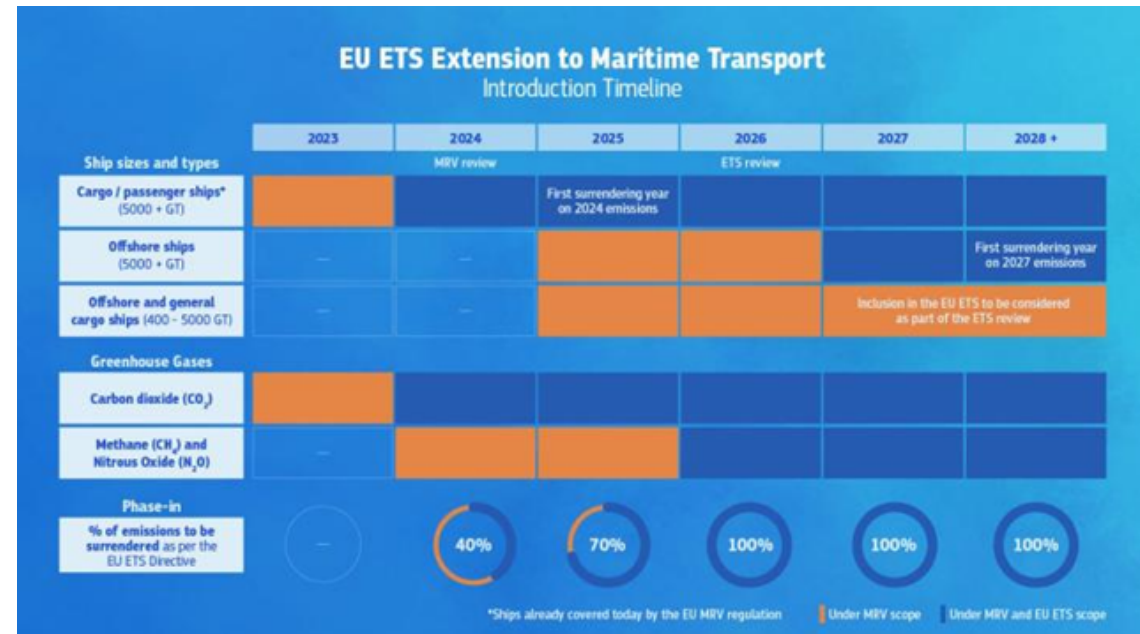
Have a clear view on what you want to achieve with digitalization and data.

High Frequent Data Collection:

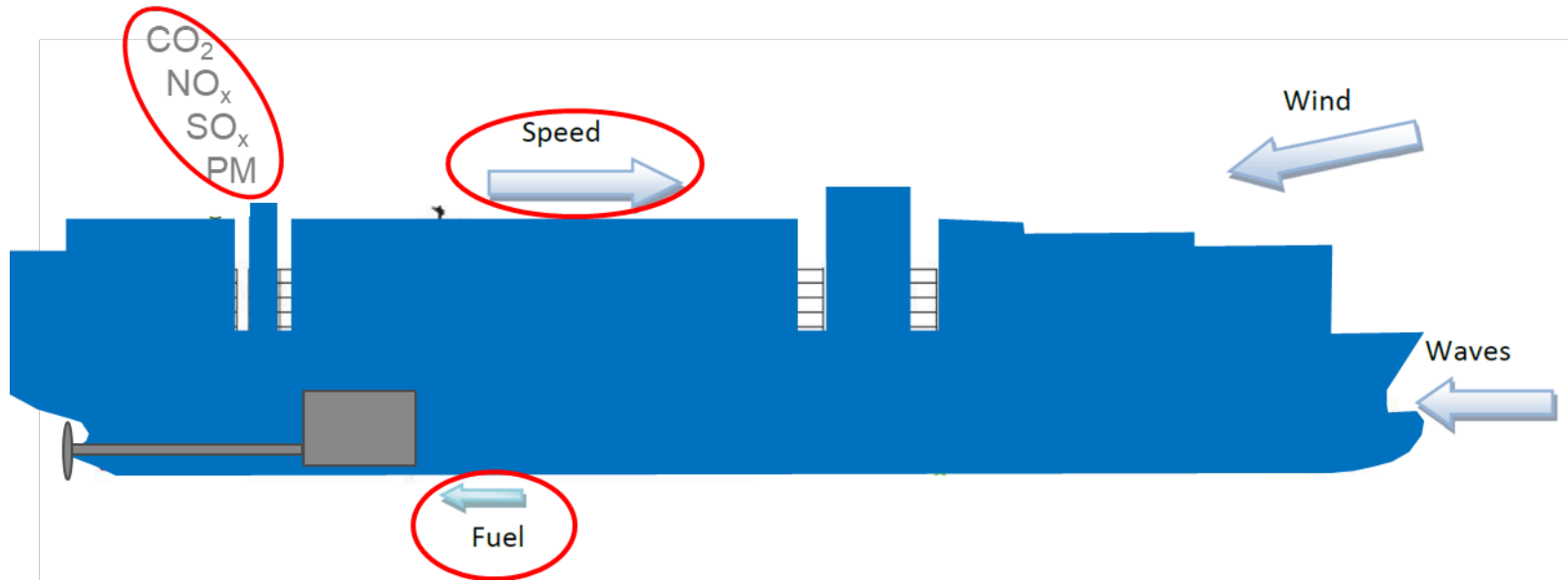
- *Purpose & goal to achieve*
- *Experience and domain knowledge*
- *Based on this choose the dataset*

But the good news is:

“For ship propulsion performance & emissions monitoring, a limited dataset is needed !”

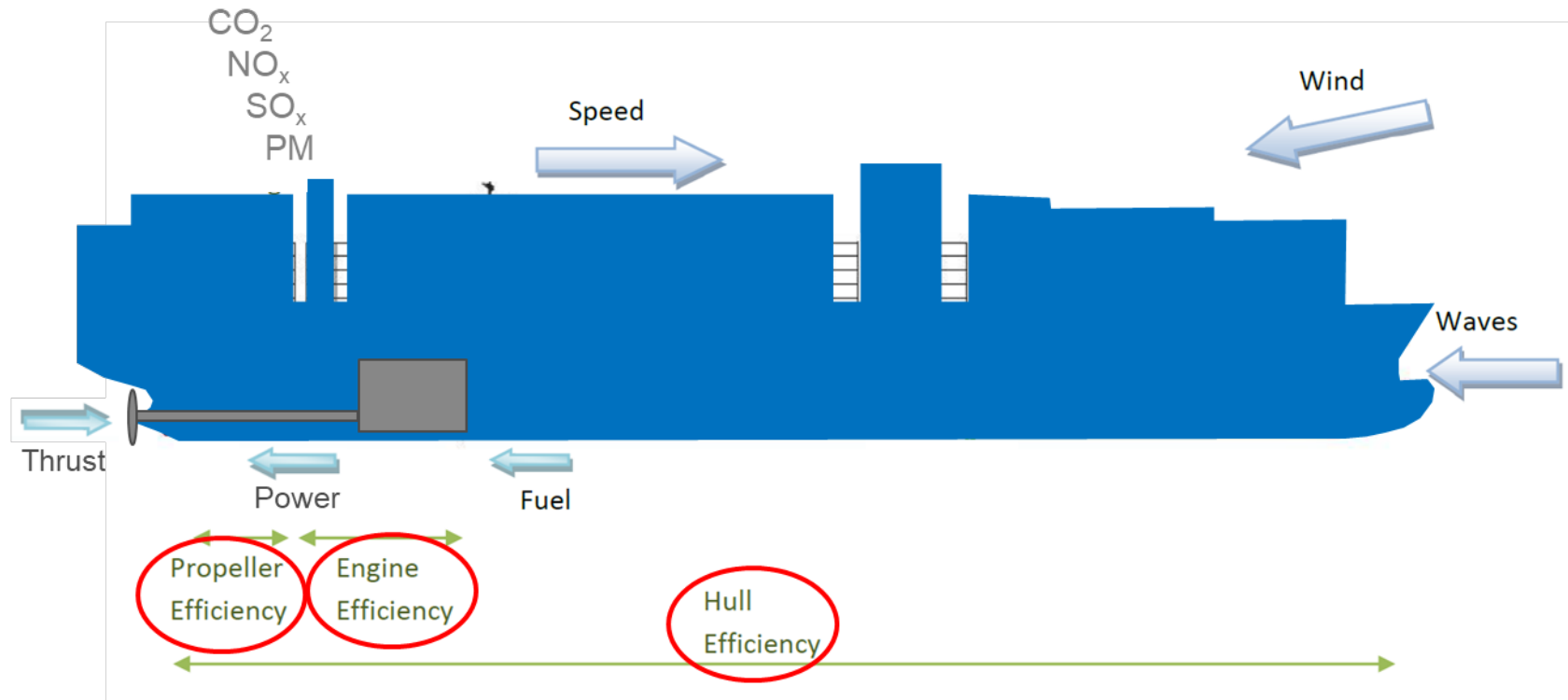


The Basics – which sensors / data is needed

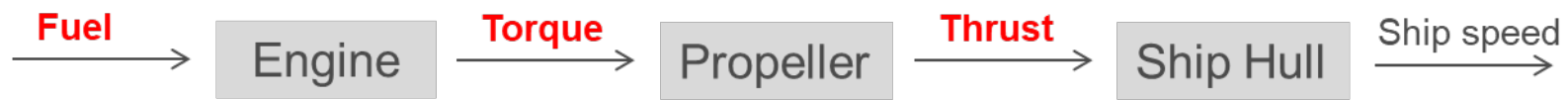
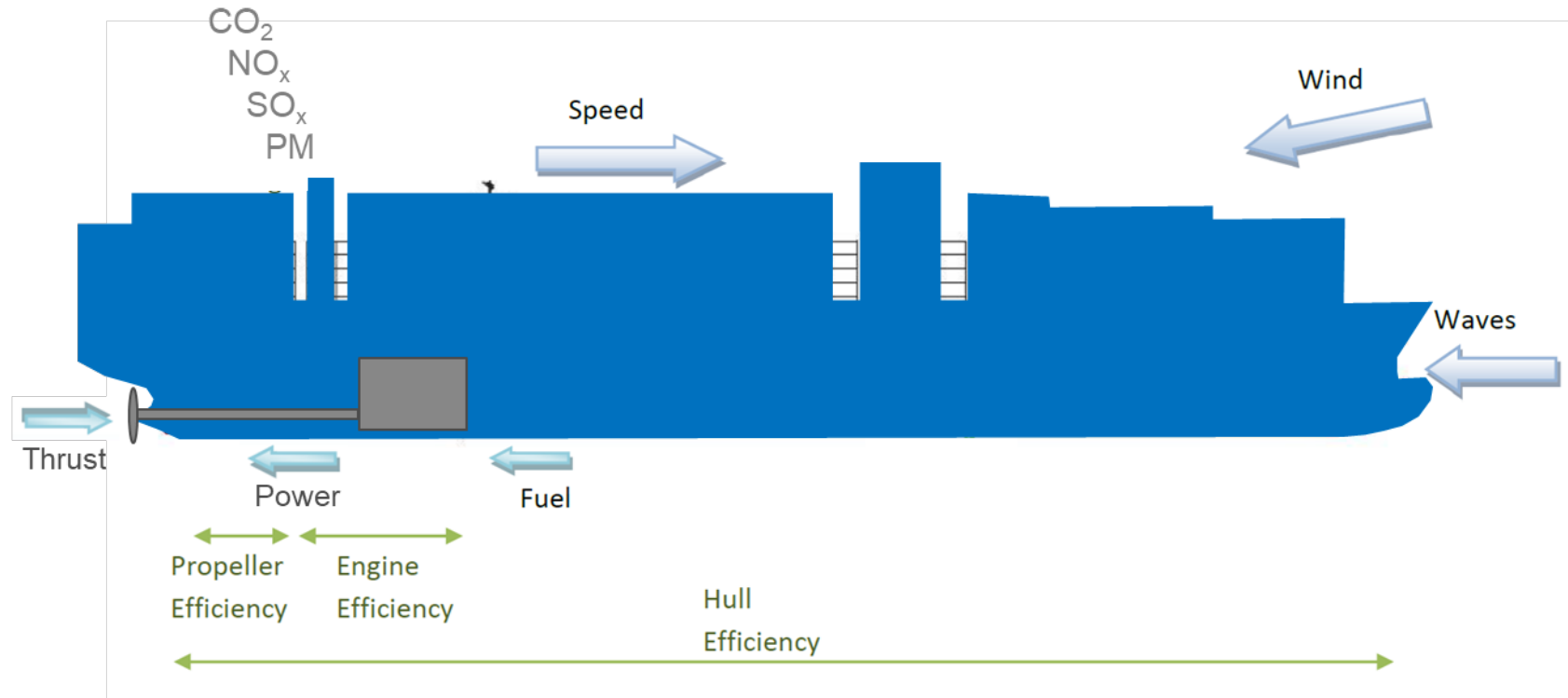


The ingredients for EU-ETS, FUEL EU & CII calculations

The Basics – which sensors / data is needed

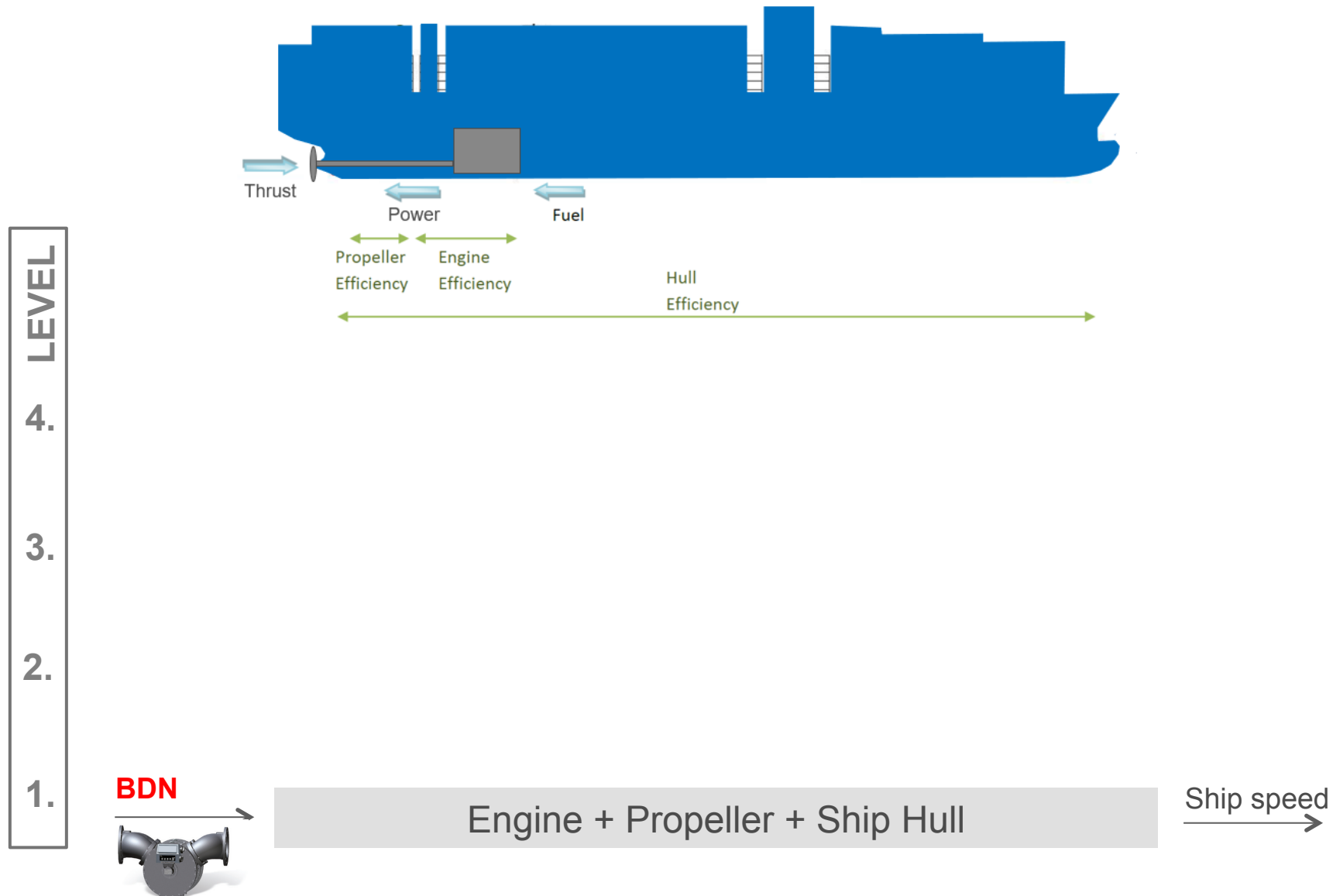


The Basics – which sensors / data is needed



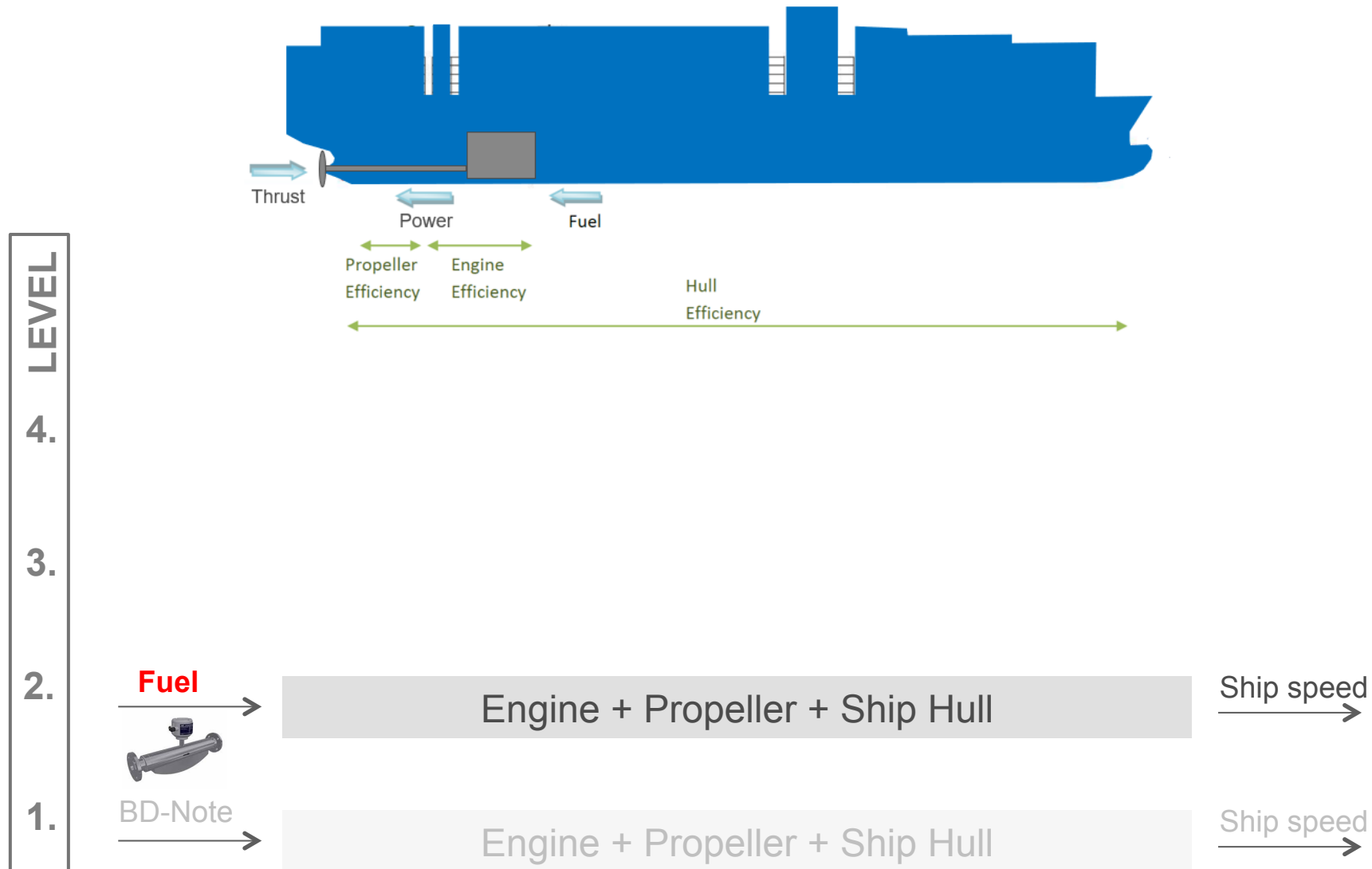
LEVEL 1 - Bunker Delivery

VAF



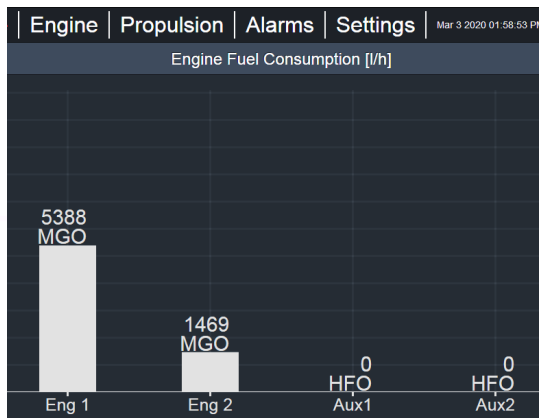
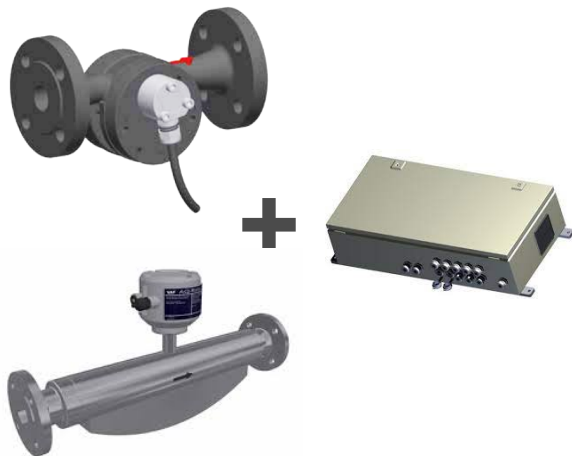
LEVEL 2 - Fuel Consumption Data

VAF



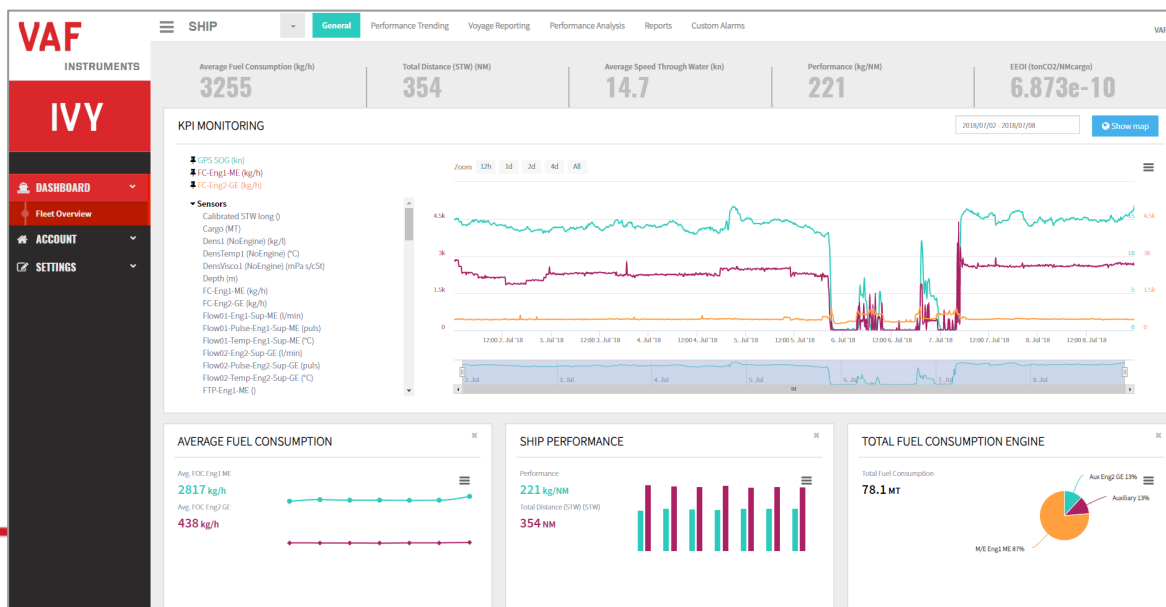
LEVEL 2 - Fuel Consumption Data

VAF



On board measuring fuel consumption per consumer:

- Main engine
- Auxiliary engine(s)
- Boiler
- Data visualisation



Office analysis via IVY®:

- High frequent data collection
- In depth fuel efficiency
- Automated GHG reporting
- Integration 3rd party BI-tool

LEVEL 2 - Fuel Consumption Data – auto voyage reports



Waypoints

Voyages

Map

Satellite

2024/08/11 - 2024/10/10

Search

Port departure	Departure date	Port arrival	Arrival date	Hours at sea	Total Distance [NM]	Total fuel [MT]	Avg Draught [m]	Avg speed [kn]	Performance [kg/NM] (based on STW)	Cargo [mT]	CII Rating	CII	CII Required	CII Underway	CII Manoeuvring	EU
La Spezia	2024/10/07 21:05	Genoa	2024/10/08 18:06	21.02	75	13.2	10.2	3.55	176.72	98634	A	3.811	5.646	2.57 (41 %)	9.28 (43 %)	Within EU
Piraeus	2024/10/04 11:52	La Spezia	2024/10/06 22:31	58.65	990	313.5	11.3	16.87	316.67	108819	E	7.068	5.646	7.06 (93 %)	8.16 (6 %)	Within EU
Suez South Anchorage	2024/10/01 04:00	Piraeus	2024/10/03 07:12	51.20	713	171.1	11.7	13.92	239.88	112936	C	5.413	5.647	5.4 (97 %)	7.96 (3 %)	To EU

LEVEL 2 - Fuel Consumption Data – auto CO₂ reporting

VAF

MRV Report 5678901 VAF Bulk Carrier (Basic) 2021

Generated by

VAF

INSTRUMENTS

IVY

[2021-10-19 07:11:28]

Ship Information

Name	VAF Bulk Carrier (Basic)	Owner Details	Company Details
IMO Number	5678901	Name	VAF Instruments BV
Home Port	Dordrecht	Address	Vierlinghstraat 24
Category	1A		3316EL Dordrecht
Ice Class	1		
EEDI/EIV			

Voyage Information

Begin		End		Voyage / Port				Total CO2 emission				Total consumption per fuel type																		
Port	EU port	Time, Date [UTC]	Port	EU port	Time, Date [UTC]	Type	Time in Port [hr]	Time at Sea [hr]	Distance travelled [nm]	Cargo [PAX]	Work [Cargo*nm]	Within EU port [kg]	EU inbound [kg]	EU outbound [kg]	Between EU ports [kg]	HFO			LSFO			n.a.			n.a.			n.a.		
																	FOC [kg]	CO2 Factor	Sulphur Factor	FOC [kg]	CO2 Factor	Sulphur Factor	FOC [kg]	CO2 Factor	Sulphur Factor	FOC [kg]	CO2 Factor	Sulphur Factor		
Genoa	yes	08-10-2021 18:06	Genoa	yes	10-10-2021 09:32	port	39,4					75643					24288	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	07-10-2021 21:05	Genoa	yes	08-10-2021 18:06	voyage		21,0	76,9	98634	7587298,58				41051		13181	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	06-10-2021 22:31	La Spezia	yes	07-10-2021 21:05	port	22,6					69587					22344	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	04-10-2021 11:52	La Spezia	yes	06-10-2021 22:31	voyage		58,7	986,5	108819	107348295,54				976295		313478	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	03-10-2021 07:12	Piraeus	yes	04-10-2021 11:52	port	28,7					44322					14231	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Singapore	no	18-09-2021 16:59	Piraeus	yes	03-10-2021 07:12	voyage		341,9	5703,2	111440	635562684,20		4408591				1415551	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	28-08-2021 06:12	Singapore	no	11-09-2021 21:23	voyage		342,9	5703,2	111439	635561763,32			4813413			1545534	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	27-08-2021 01:32	Piraeus	yes	28-08-2021 06:12	port	28,7					44322					14231	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	24-08-2021 14:52	Piraeus	yes	27-08-2021 01:32	voyage		58,7	986,8	108819	107383086,79				1063618		341516	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	23-08-2021 16:18	La Spezia	yes	24-08-2021 14:52	port	22,6					69587					22344	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Genoa	yes	22-08-2021 19:39	La Spezia	yes	23-08-2021 16:18	voyage		20,7	76,9	98611	7583005,54				41424		13301	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Genoa	yes	21-08-2021 03:51	Genoa	yes	22-08-2021 19:39	port	39,8					76457					24549	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Fos Sur Mer	yes	20-08-2021 09:16	Genoa	yes	21-08-2021 03:51	voyage		18,6	227,8	105524	24038062,85				130634		41945	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Fos Sur Mer	yes	18-08-2021 11:16	Fos Sur Mer	yes	20-08-2021 09:16	port	46,0					52045					16711	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Valencia	yes	17-08-2021 13:05	Fos Sur Mer	yes	18-08-2021 11:16	voyage		22,2	364,9	107262	39135498,24				456606		146611	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Valencia	yes	16-08-2021 08:49	Valencia	yes	17-08-2021 13:05	port	28,3					65247					20950	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	13-08-2021 06:16	Valencia	yes	16-08-2021 08:49	voyage		74,0	1257,8	105565	132777326,09				1240258		398233	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	12-08-2021 05:11	Piraeus	yes	13-08-2021 06:16	port	25,1					5506					1768	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Jeddah	no	06-08-2021 23:33	Piraeus	yes	12-08-2021 05:11	voyage		119,3	1425,6	112879	160923591,11		1079327				346560	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	19-06-2021 08:10	Singapore	no	03-07-2021 20:24	voyage		340,0	5706,6	113144	645667356,56			4695885			1507798	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	18-06-2021 02:50	Piraeus	yes	19-06-2021 08:10	port	29,3					35677					11456	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	15-06-2021 21:24	Piraeus	yes	18-06-2021 02:50	voyage		53,4	984,2	107263	10563048,02				1061051		340692	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
La Spezia	yes	14-06-2021 22:24	La Spezia	yes	15-06-2021 21:24	port	23,0					27616					8867	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Genoa	yes	14-06-2021 09:01	La Spezia	yes	14-06-2021 22:25	voyage		13,4	74,5	103179	7686905,92				37626		12081	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Genoa	yes	12-06-2021 21:50	Genoa	yes	14-06-2021 09:01	port	35,2					40612					13040	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Fos Sur Mer	yes	11-06-2021 16:43	Genoa	yes	12-06-2021 21:50	voyage		29,1	244,5	105570	25808800,31				133278		42794	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Fos Sur Mer	yes	09-06-2021 01:21	Fos Sur Mer	yes	11-06-2021 16:43	port	63,4					21040					6756	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Valencia	yes	08-06-2021 05:15	Fos Sur Mer	yes	09-06-2021 01:21	voyage		20,1	357,5	108890	38928892,04				388359		124698	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Valencia	yes	06-06-2021 23:09	Valencia	yes	08-06-2021 05:15	port	30,1					43891					14093	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	03-06-2021 08:04	Valencia	yes	06-06-2021 23:09	voyage		87,1	1258,0	107844	135665844,24				937963		301170	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Piraeus	yes	02-06-2021 02:52	Piraeus	yes	03-06-2021 08:04	port	29,2					43004					13808	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	
Jeddah	no	29-05-2021 04:50	Piraeus	yes	02-06-2021 02:52	voyage		87,7	1332,1	111518	148554401,87		1135492				364594	3,114	3,500	0	3,114	0,100	0	3,114	0,000	0	3,114	0,000	0	

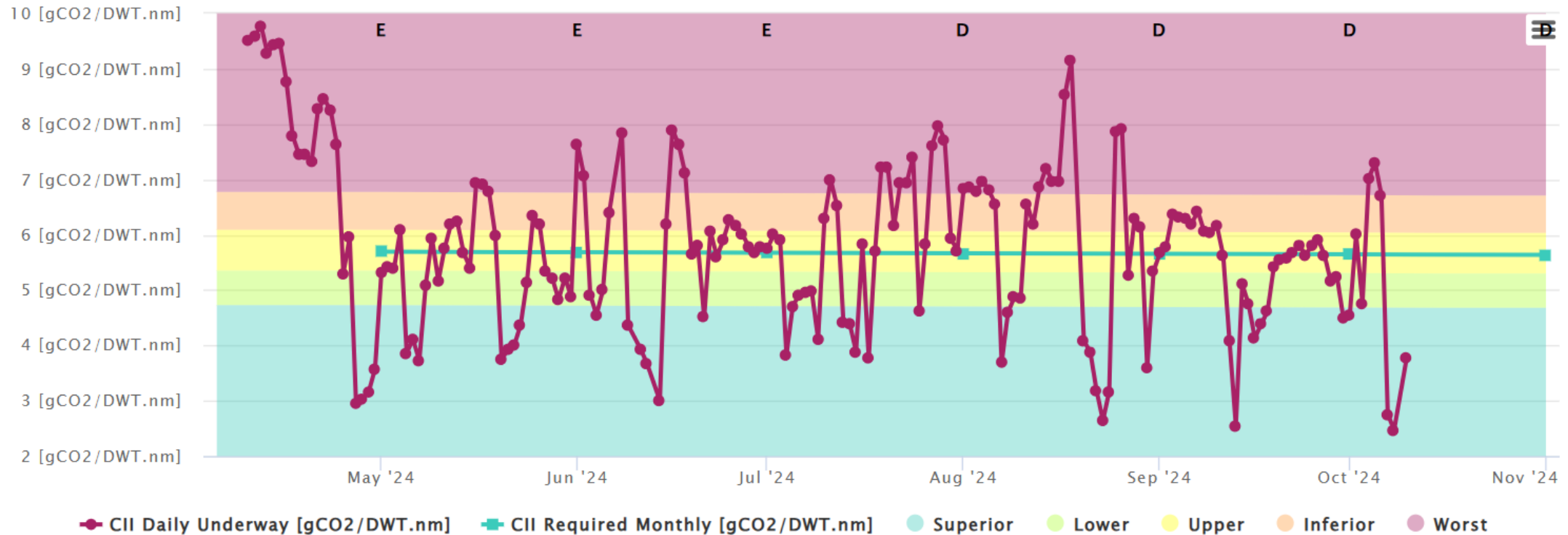
Year Totals

Distance travelled [nm]	Total Time spent at Sea [hr]	Transport Work [Cargo*nm]	Total CO2 emission [MT]	Within EU Ports CO2 [MT]	EU inbound CO2 [MT]	EU outbound CO2 [MT]	Between EU ports CO2 [MT]	FOC / Distance [kg/nm]	FOC / Transport Work [g / Cargo*nm]	CO2 / Distance [kg/nm]	CO2 / Transport Work [g/Cargo*nm]	Total consumption per fuel type											
												HFO		LSFO		n.a.		n.a.		n.a.		n.a.	
												FOC [kg]	CO2 Factor	FOC [kg]	CO2 Factor	FOC [kg]	CO2 Factor	FOC [kg]	CO2 Factor	FOC [kg]	CO2 Factor	FOC [kg]	CO2 Factor
26767	1709	2965776461,22	23355,43	714,56	6623,41	9509,30	6508,16	280,17	2,53	872,55	7,87	7499174	3,114	0	3,114	0	3,114	0	3,114	0	3,114	0	3,114

LEVEL 2 - Fuel Consumption Data – auto CII reports

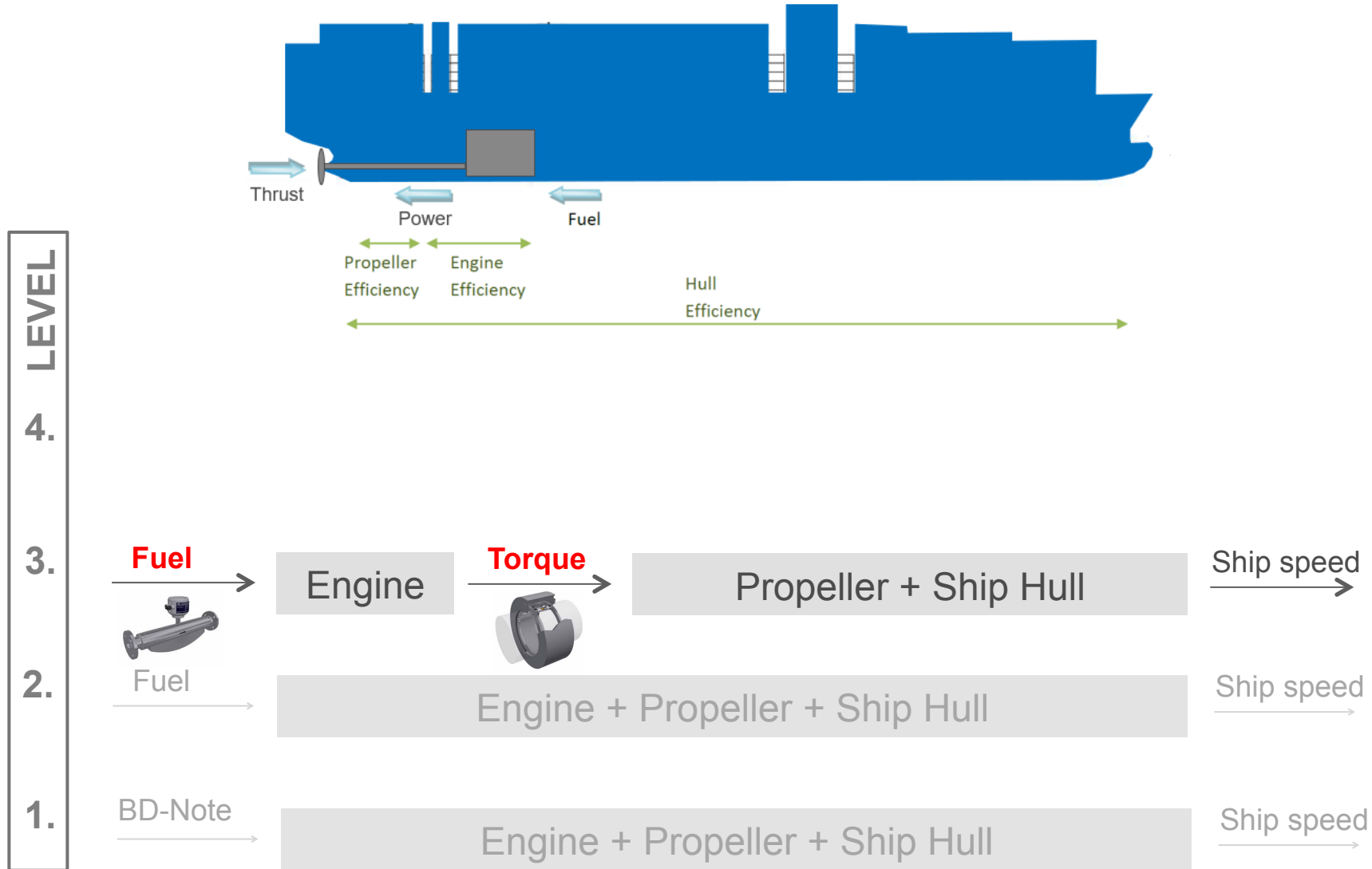
VAF

CII DAILY UNDERWAY DETAILS OVERVIEW



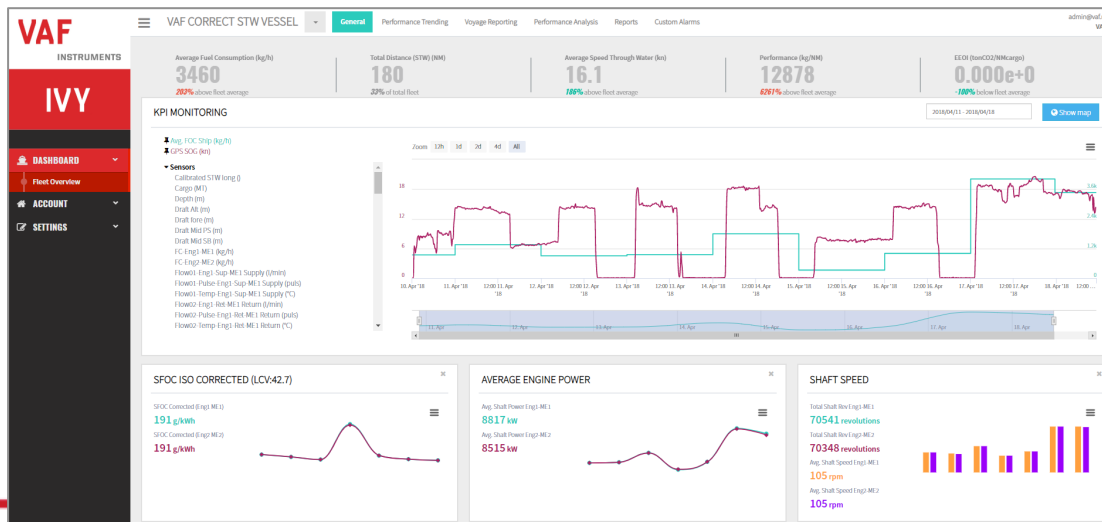
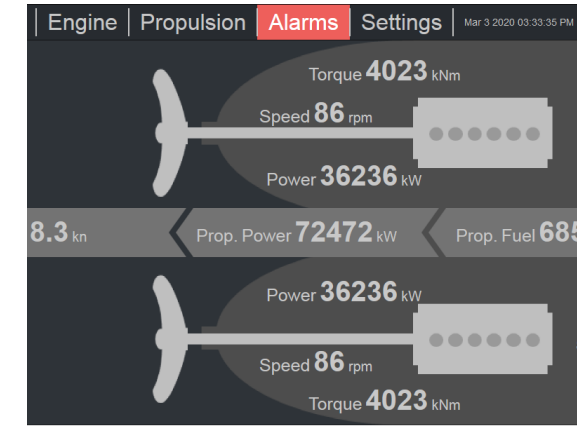
LEVEL 3 - Fuel Consumption + Engine Power Data

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LEVEL 3 - Fuel Consumption + Engine Power Data

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Additional insights with T-Sense© Torque Meter:

- Engine SFOC Measurements
- Speed – Power Curves
- Engine Load Curves
- Propeller Load Curves

LEVEL 3 - Fuel Consumption + Engine Power Data

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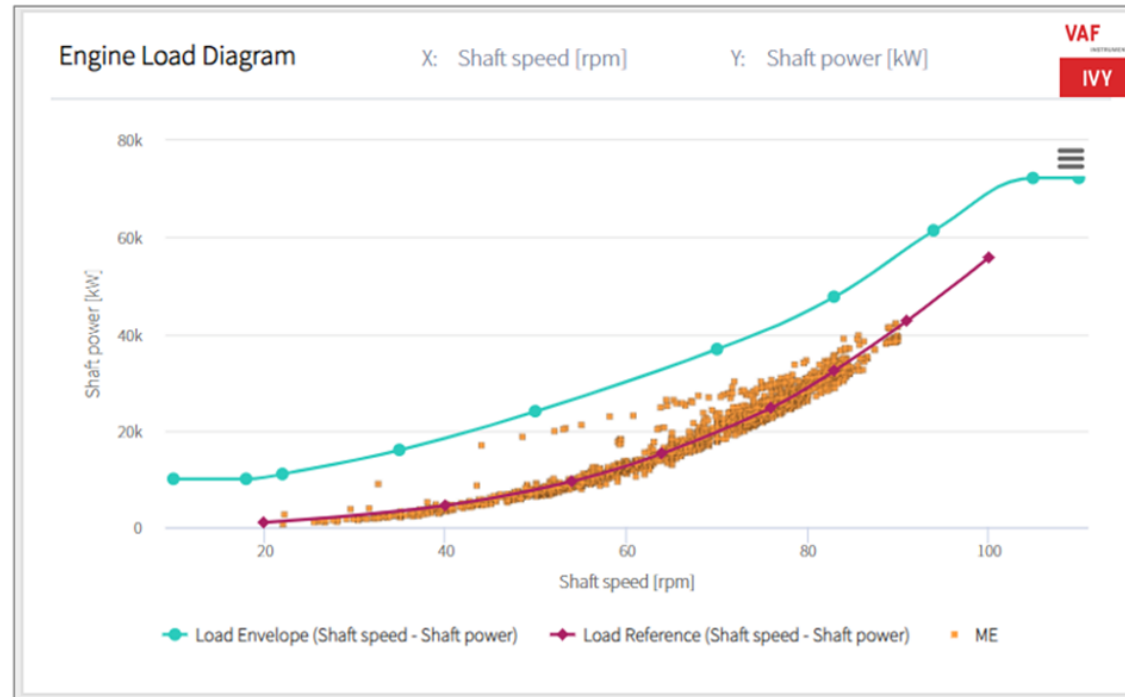
Engine performance:
Measured SFOC of 3 sister container vessels

LEVEL 3 - Fuel Consumption + Engine Power Data

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Propeller Load Reference Curve Large Container Vessel

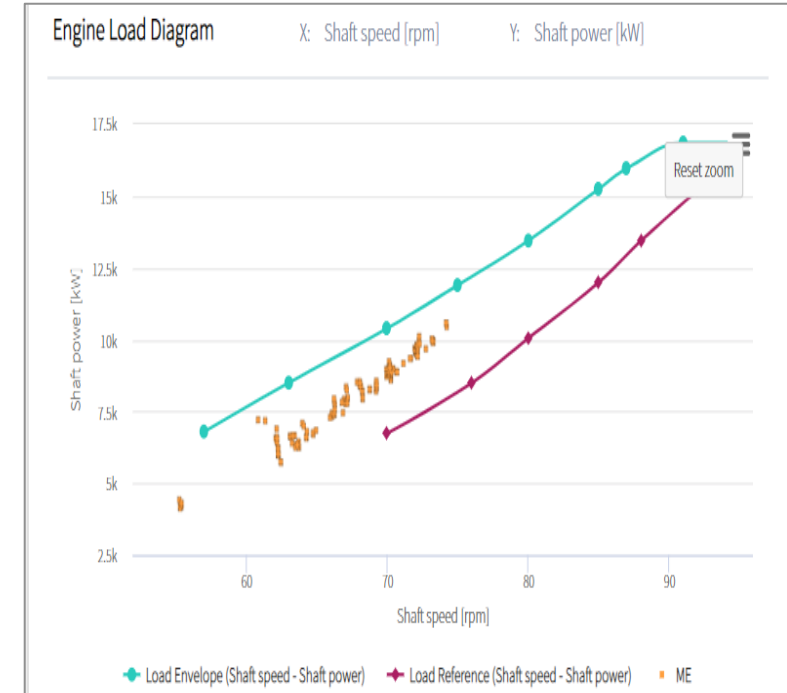
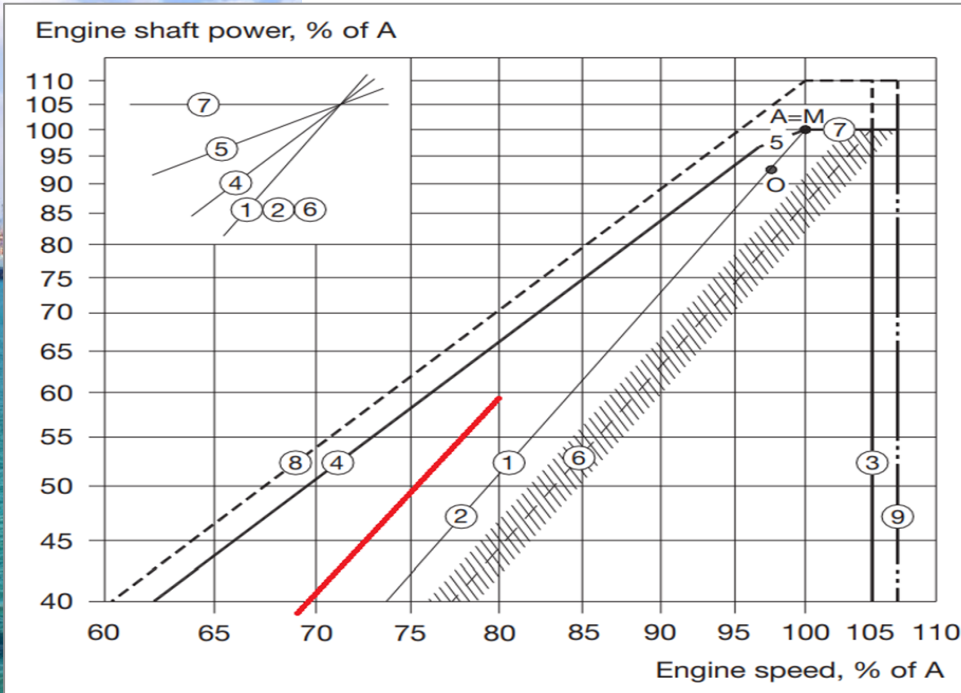


Propeller Load Curve by adding T-Sense[®] Torque meter:

- Compare actual propeller power absorption towards new condition
- Check propeller power absorption towards engine load limit curve
- Find possible heavy running propeller

LEVEL 3 - Fuel Consumption + Engine Power Data

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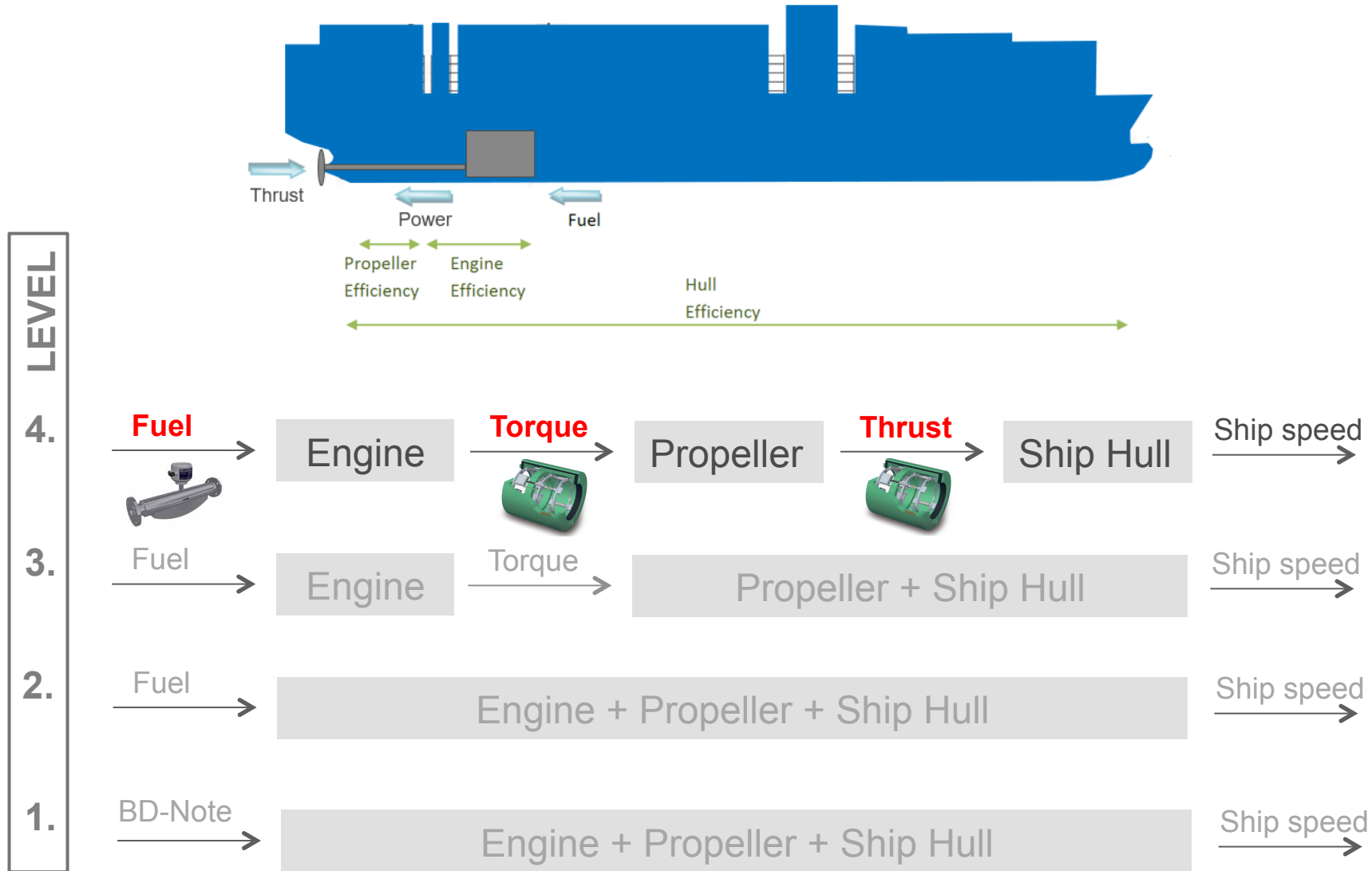


Benefit of finding **Heavy Running Propeller** by adding T-Sense[®] Torque meter:

- Prevent Engine running on its load limit
- No full Engine RPM / Power possible
- Prevent Engine wear, high temperatures and additional fuel oil consumption

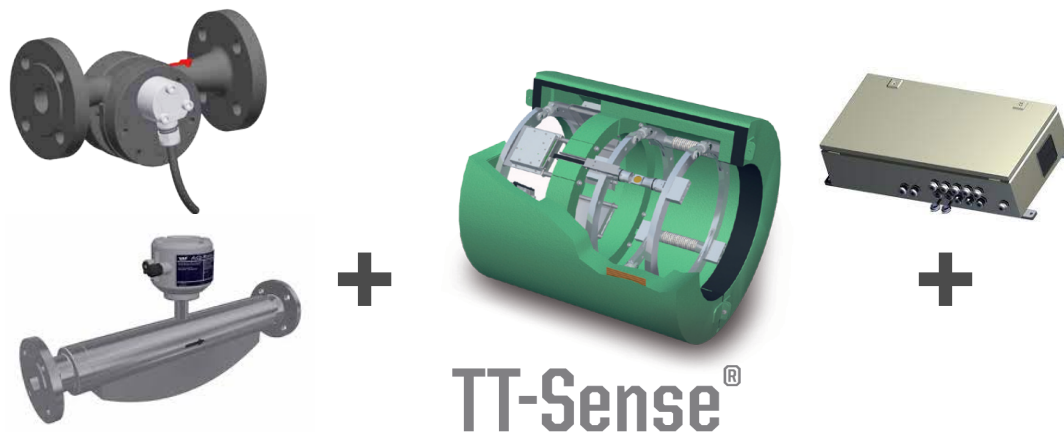
LEVEL 4 - Fuel + Power + Propeller Thrust Data

VAF

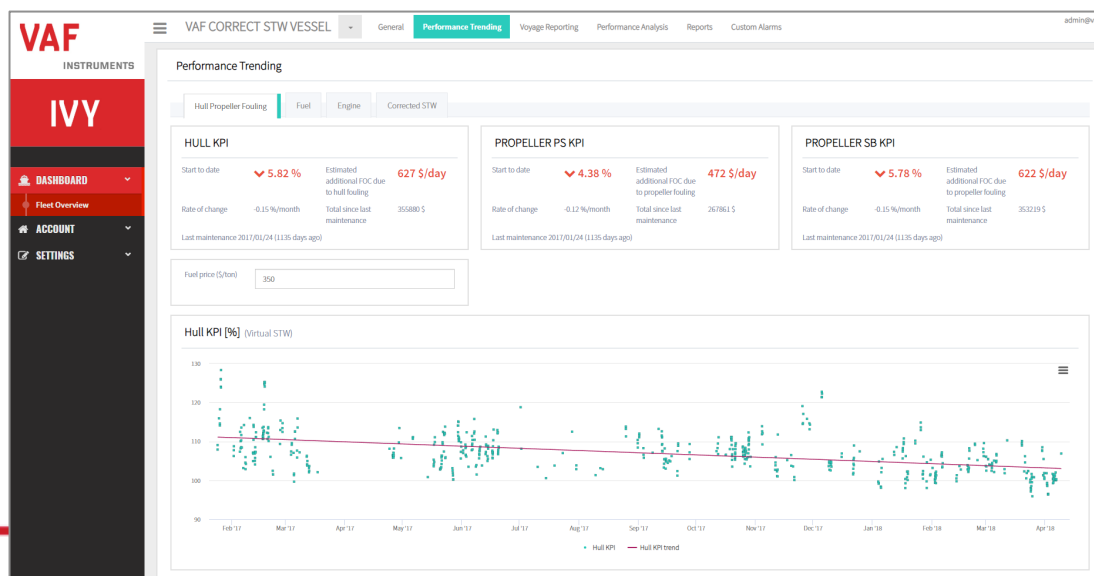
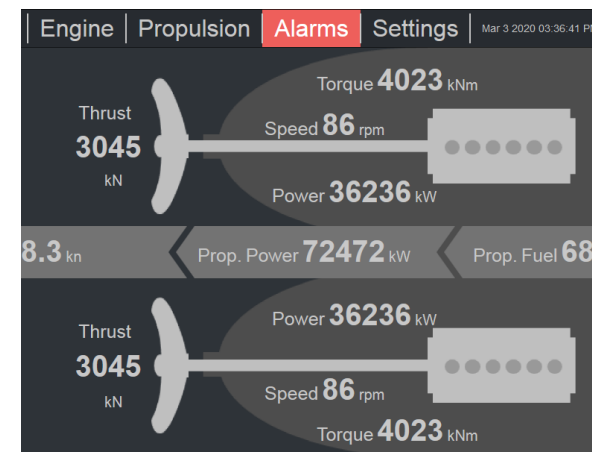


LEVEL 4 - Fuel + Power + Propeller Thrust Data

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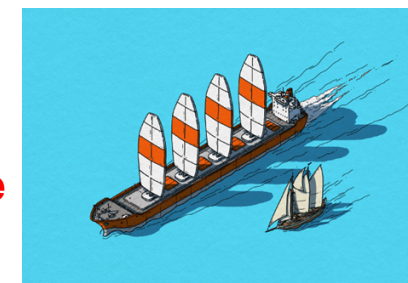


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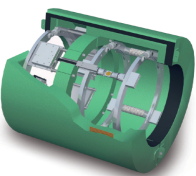
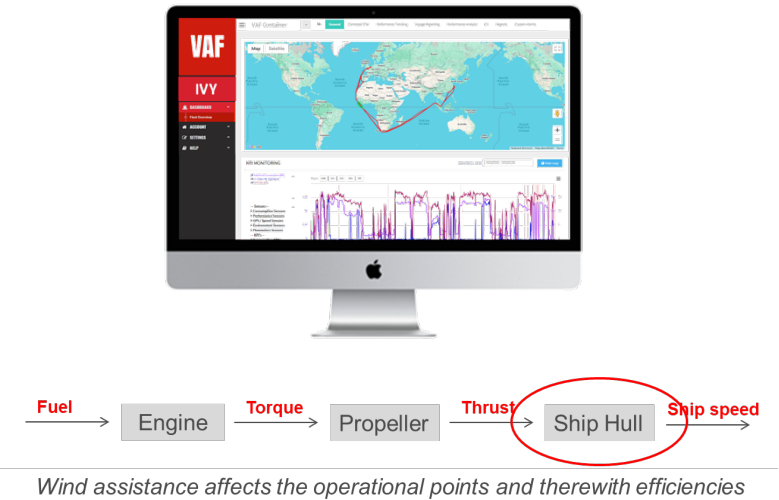
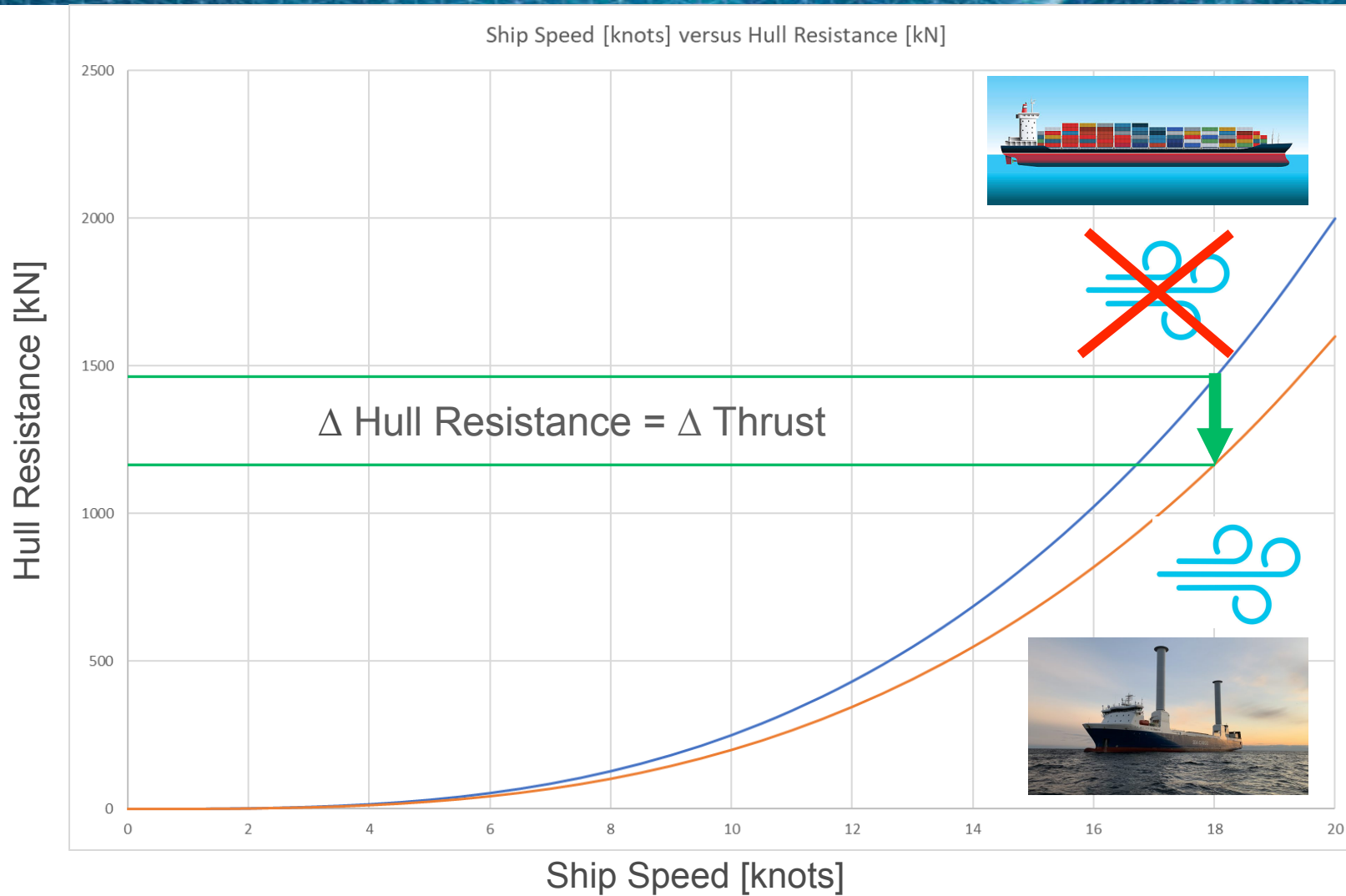
Additional insights Propeller Thrust measurements:

- Propeller Fouling
- Hull Fouling
- Hull Coating
- ESD's
- **Wind Assistance**



LEVEL 4 – Wind Assistance Performance

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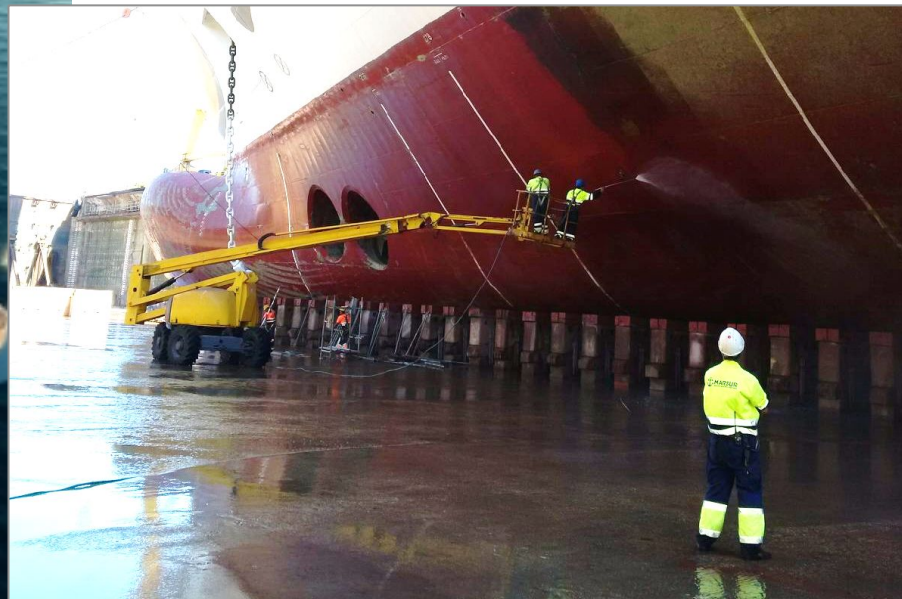
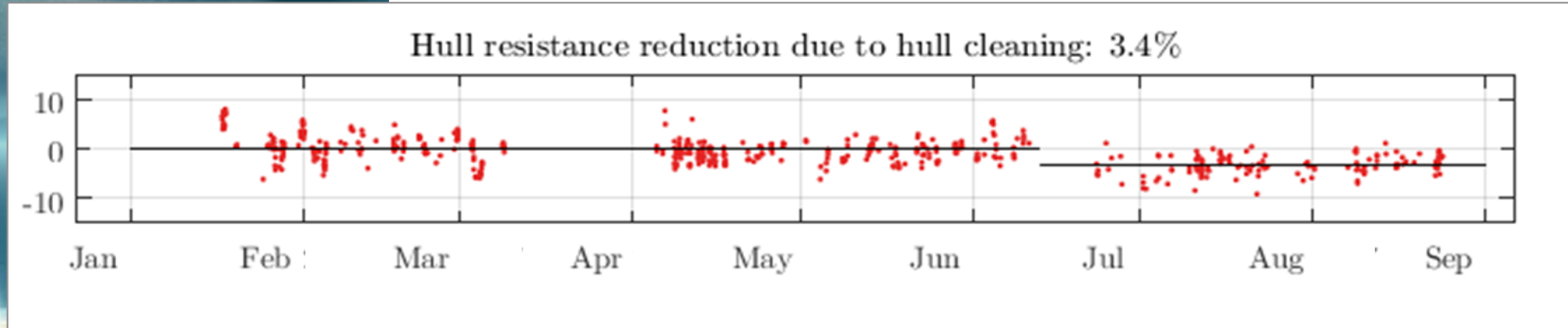
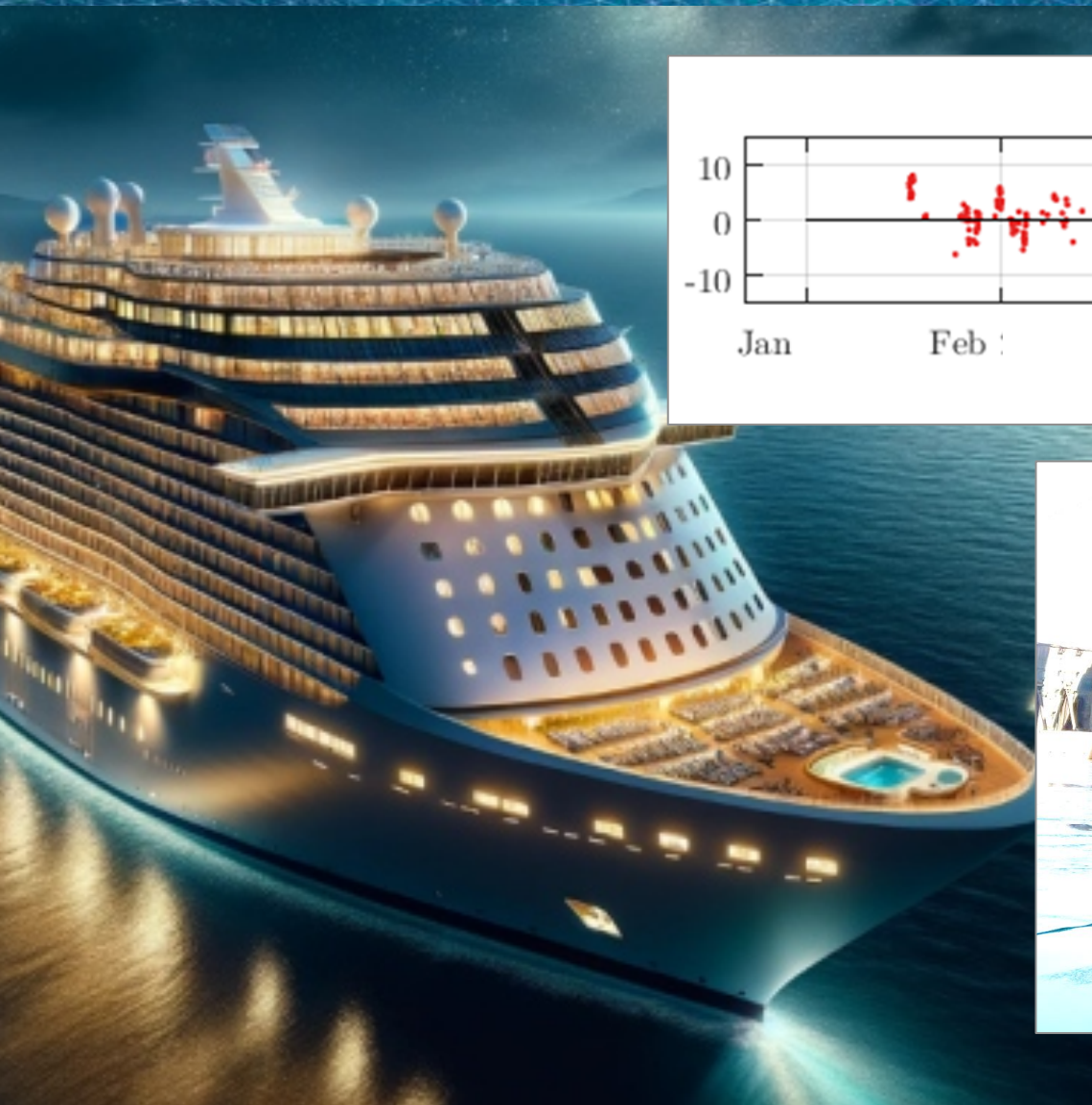


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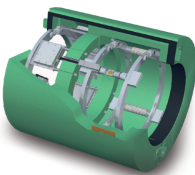
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LEVEL 4 - Hull & Propeller Performance

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Effects of hull cleanings



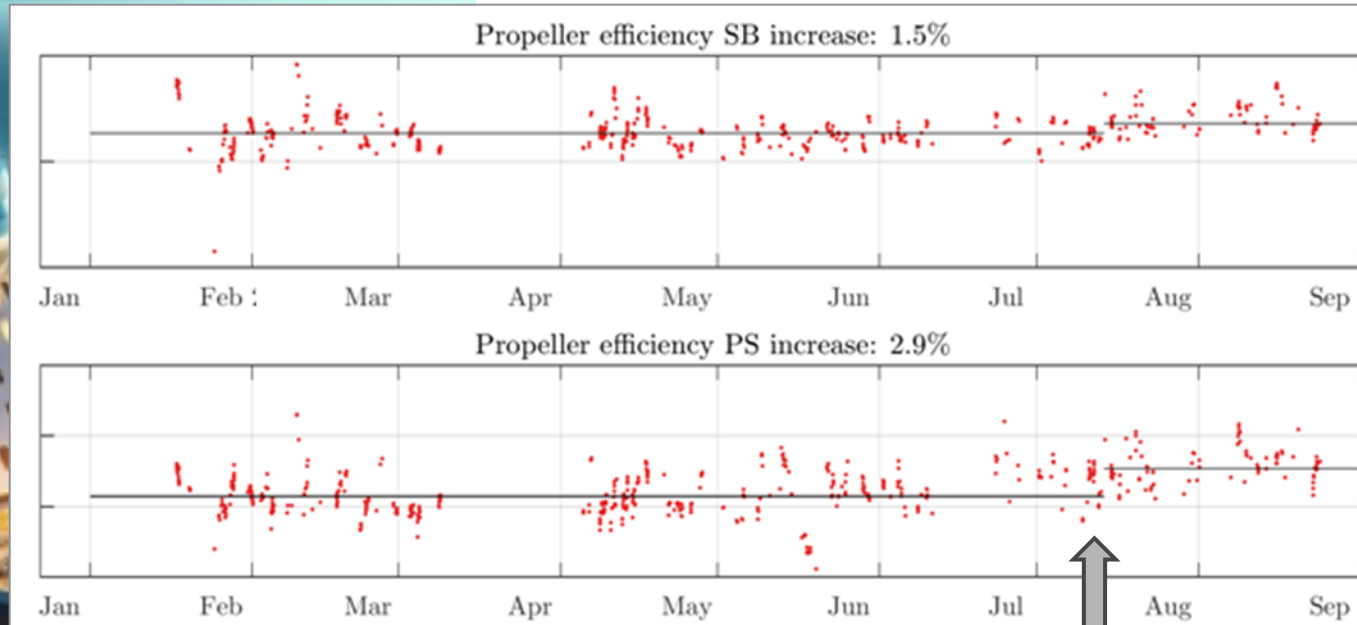
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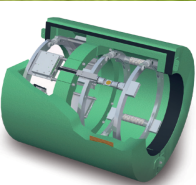
LEVEL 4 - Hull & Propeller Performance

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Effect of Propeller Polishing



Propeller polishing

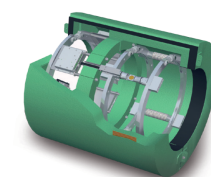
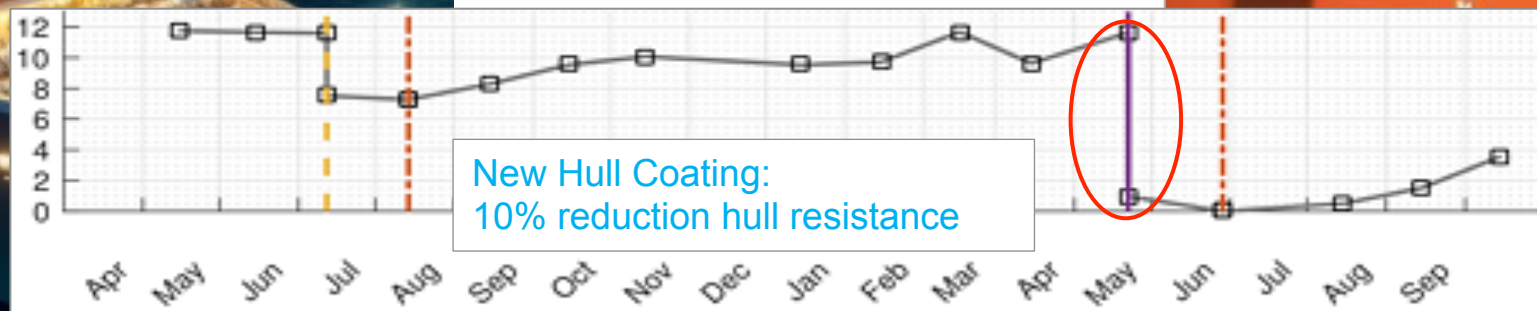
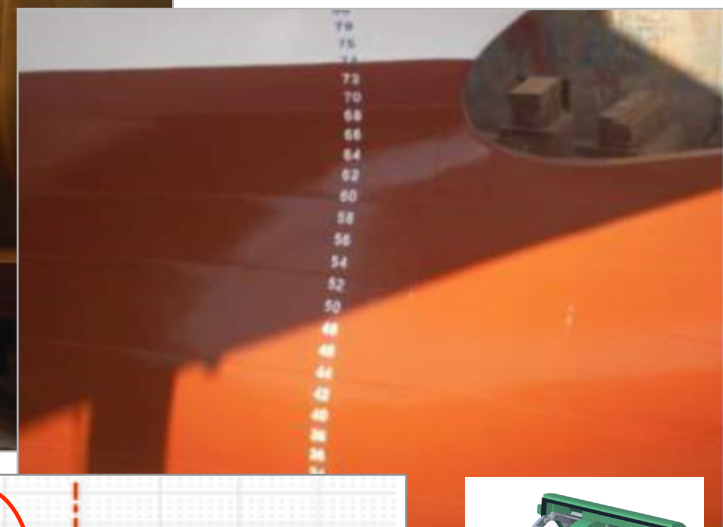
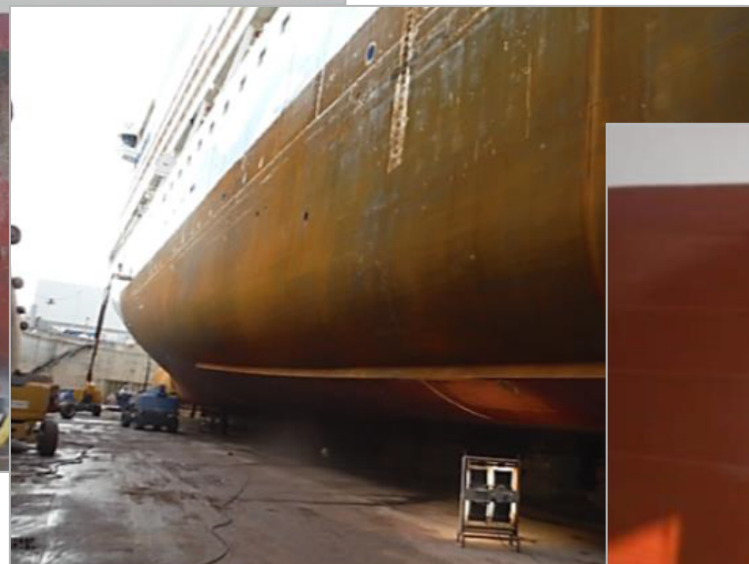
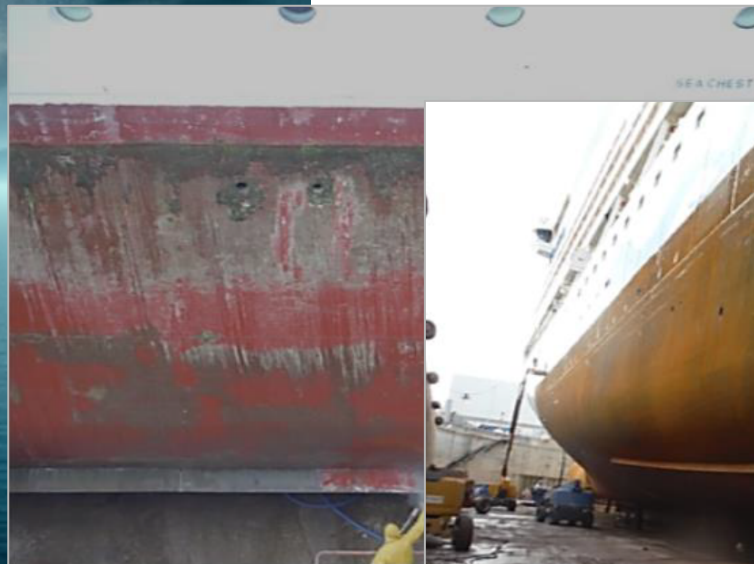
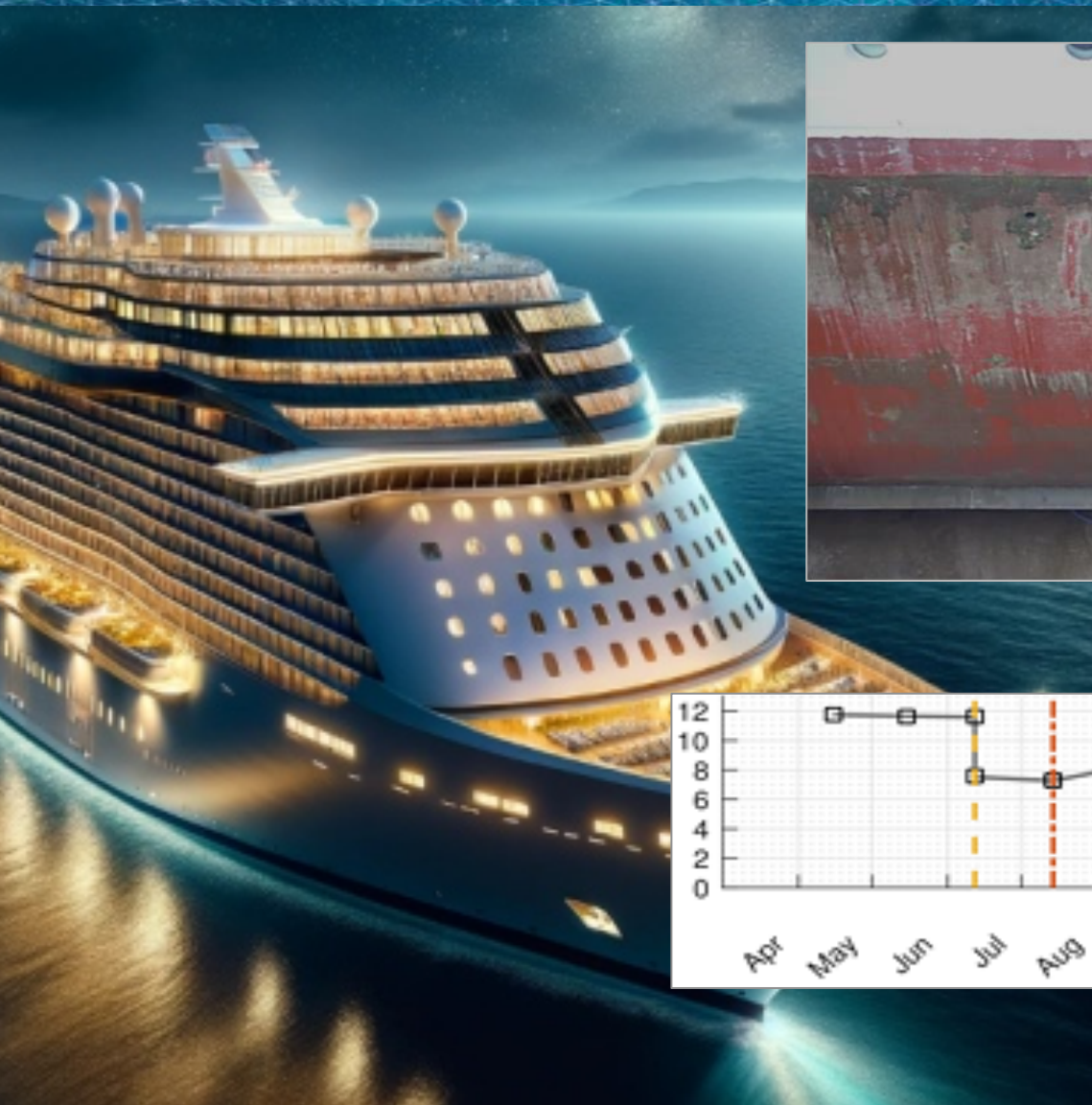


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LEVEL 4 - Hull & Propeller Performance

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To conclude

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Digitalisation in ship propulsion performance monitoring is **ESSENTIAL**

- Fuel efficiency
- Environmental compliance
- Remote diagnostics

**DECARBONIZATION
BY
DIGITALIZATION**

Thank you



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