MARORKA

ascenz | GTT Digital

Better vessel performance

CASE STUDIES

Ship performance management

GTT Digital provides trusted solutions and services to optimise shipping operations, maximise fuel savings and minimise emissions. Over the years, examples of our proven track records are documented. Case studies of our hull and propeller performance, trim optimisation, and optimisation relating to LNG fuel transportation are shown. The success of the solutions are demonstrated and validated using validated real-time data from the vessels. These clear and actionable insights benefit different stakeholders as well as promotes a more sustainable shipping culture.

FEATURES

- **Real time recommendations to reduce resistance.**
- **Clear information on single vessel and fleet performance.**
- **Good breakdown overview of voyages and performance summary over time.**
- **Complies to ISO 19030 standard.**
- **Securely hosted in ISO 27001 certified environment with access to data strictly controlled.**
- **Robust and tested solutions.**

BENEFITS

- **Minimise emissions and maximise saving fuel.**
- **Improved fleet energy efficiency.**
- **Reduced OPEX.**
- **Better insight into performance level of fleet.**
- **Timely warning for performance improvements using real-time data.**
- **Promotes collaboration of different stakeholders.**

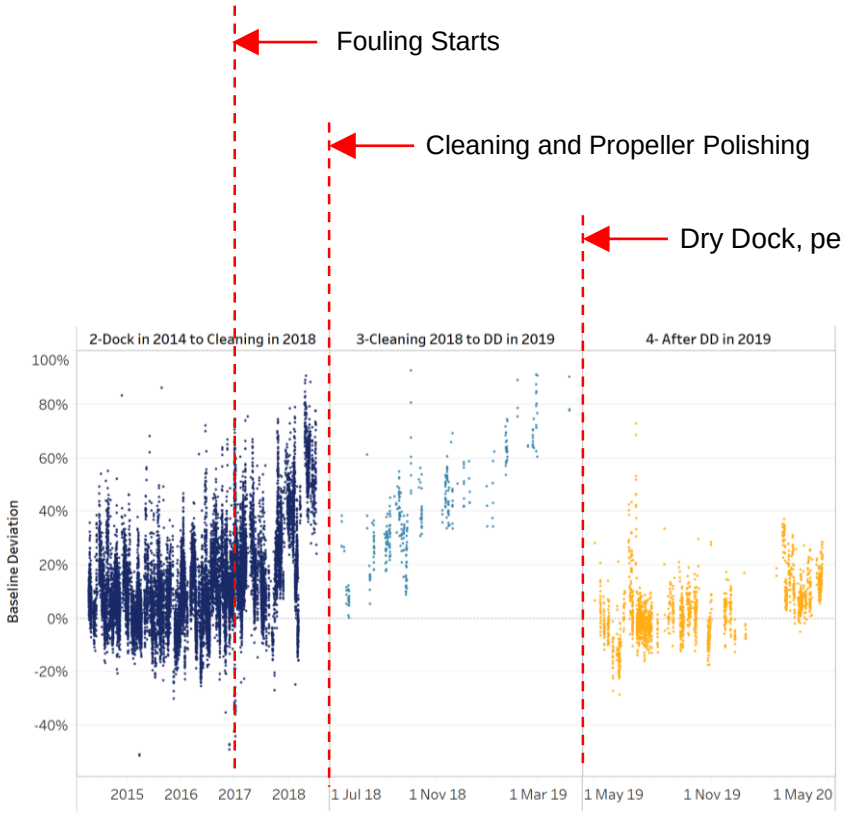
Hull and propeller performance

CASE STUDY: Coating performance analysis

A tanker came out of dry dock with new hull coating. The consumption was 60 MT/d @ 13 knots on laden voyages. The vessel performs very well in the first 3 years out of dock but in subsequent 2 years leading up to next dry dock the daily consumption increases to 85 MT/d @ 13kn. This result in charterer bearing the cost of resistance and higher emissions. The owner of the tanker decided based on data and analysis not to use the same coating again due to very poor performance just after 3 years of operation in warm waters.

Data shows that performance of vessel is far from baseline after cleaning.

Hull resistance on Tanker :



Measured hull resistance from vessel data allows data driven decision making on vessel coating.

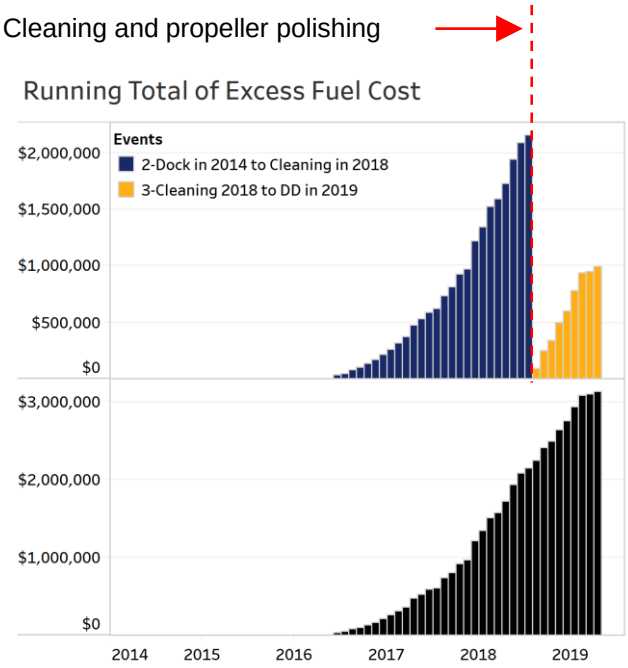
Data shows the changes in hull resistance.

Tanker propulsion performance

CASE STUDY: Financial and environmental Impact

Using the data available, the financial and environmental impact can be assessed. The total fuel consumption in docking cycle amounts to 72k MT of HFO, which at average bunker price totals to 17M USD. In which, the total consumption due to resistance is 12.5k MT of HFO. This is close to 18% of total consumption in docking cycle, which is about 3M USD. Cleaning and propulsion polishing in helps to reduce fuel consumption significantly and ultimately reduction of emissions during operations.

Measured excess fuel cost due to resistance.



Data shows the running total of excess fuel cost.

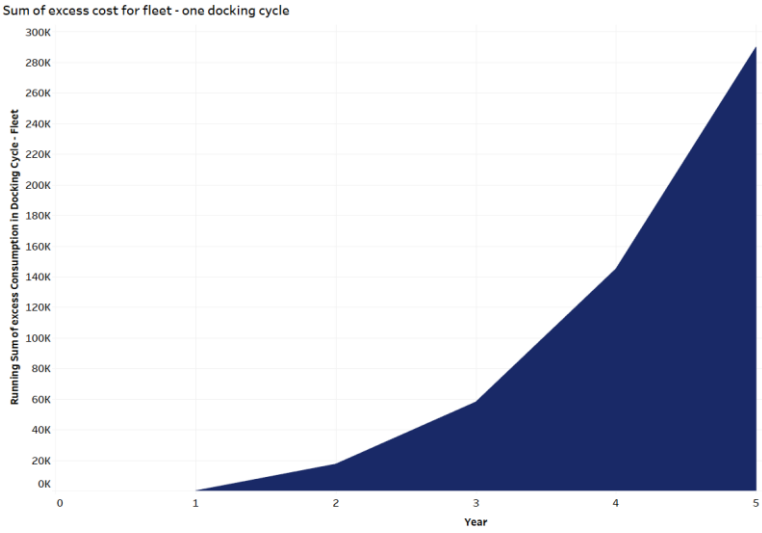
Cost of hull resistance 14.5M USD/year

CASE STUDY: Cost of hull resistance for entire fleet

Part of hull performance management is to understand the cost of resistance. This case study was conducted for one of our customer who is an oil major. From our case study, we observed steady low resistance in the first 2-3 years, followed by a sharp increase in subsequent years leading up to dry docking. Excess consumption of example fleet amounts to 290k MT HFOeq in one docking cycle (5 years).

Consumption of customer's fleet:
30 MR Tankers – 25 MT/d
20 Aframax – 40 MT/d
10 VLCC – 55 MT/d
10 LNG'c – 80 MT/d HFOeq

Average annual cost of resistance for this particular fleet amounts to 58,000 MT of Fuel
@ VLSFO 250 USD/MT – 14.5M USD
@ VLSFO 400 USD/MT – 23.2M USD

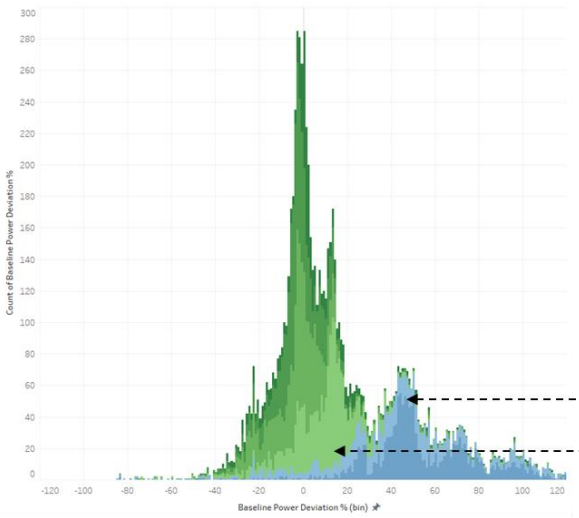


7000TEU Container ship

CASE STUDY: Advisory on vessel at anchorage

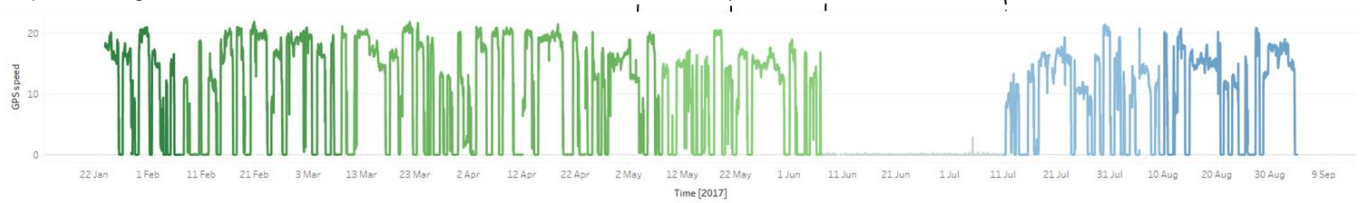
Hull fouling increases the power needed for propulsion greatly. In 3 months period the excess cost for an operator of container ship was over 300.000 USD. The histograms shows the expected performance in green. The blue columns show how performance has shifted due to fouling built up when vessel was at anchorage. Our system is able to provide actionable information to avoid drastic built up of hull resistance.

Power model baseline deviation



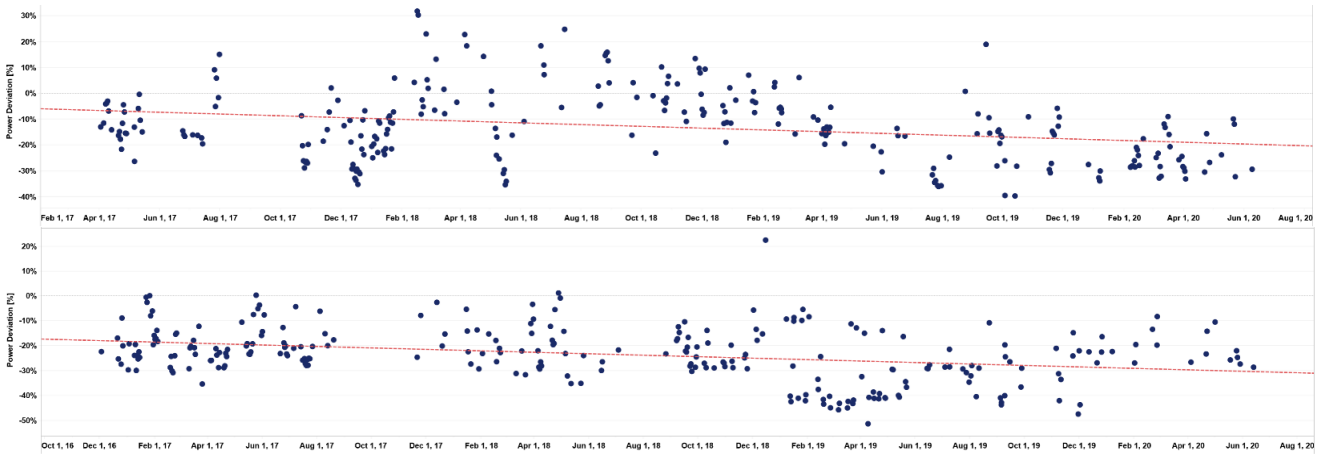
Vessel route

Speed over ground



CASE STUDY: Power deviation trending based on noon reports

As vessel spends more time in the water, hull fouling occurs and more propulsion power is needed to maintain speed. Manually reported data can be processed and used to provide indication of power deviation and speed drop. The data used for analysis has passed extensive data quality evaluation to ensure reliable outcome. The analytics provide a good indication on in service performance, maintenance effect, dry docking performance and general propulsion performance.



Data shows power deviation comparison of two sister ships.

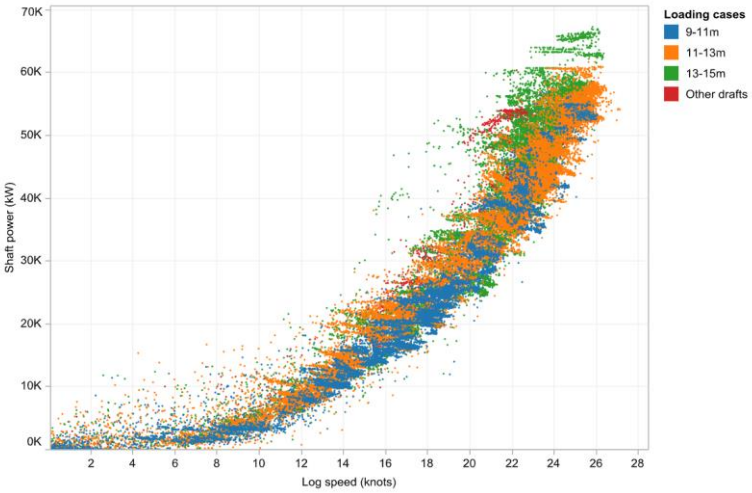
Trim otimisation

CASE STUDY: Coating performance analysis

A container ship with fixed 20MW shaft power travels at about 18 knots at draft range 11m – 15m. The results indicate that savings close to 1% can be achieved by operating at an optimum trim. In a year, the vessel operates 250 days at SFOC of 200g/kWh.

Average annual cost of operation at optimum trim for this vessel amounts to 200MT/year of fuel.

@ VLSFO 250 USD/MT – 50,000 USD
@ VLSFO 400 USD/MT – 80,000 USD

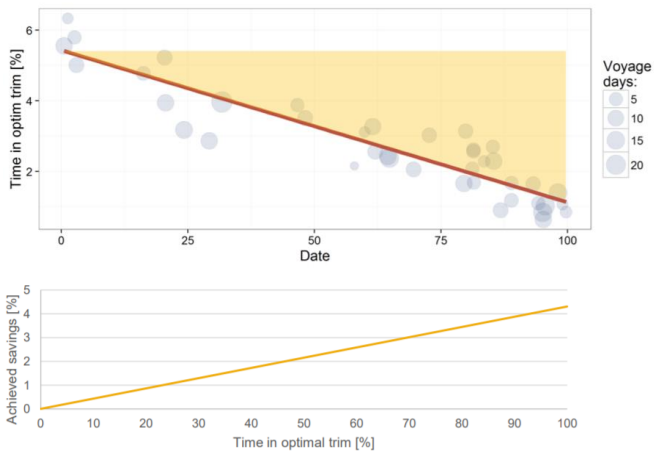


Data shows propeller shaft power as a function of speed through water for different load cases.

CASE STUDY: Trim optimisation of 2 vessels under the same charterer

Two ships chartered by the same charterer, with real time onboard advisory system of trim optimisation solutions shows a collective fuel savings of 2.4%. The two vessels completed 40 voyages within a year, with each voyage range between 5 to 20 days long.

Average annual fuel savings based on optimised trim for both vessels amounts to 885MT/year of fuel.
@ VLSFO 250 USD/MT – 121k USD
@ VLSFO 400 USD/MT – 354k USD

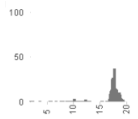
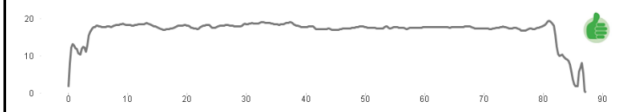
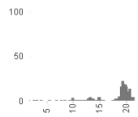
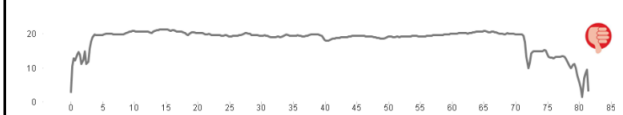


Vessel	Consumption savings (MT/vessel/year)	ME consumed (MT/vessel/year)	% savings
1	158	10127	1.56
2	727	23209	3.13

Speed optimisation

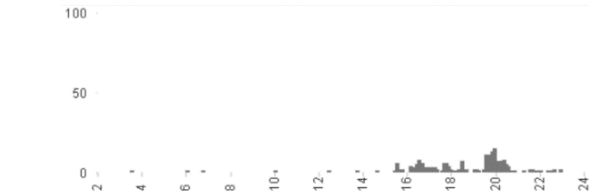
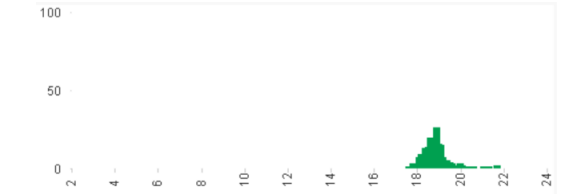
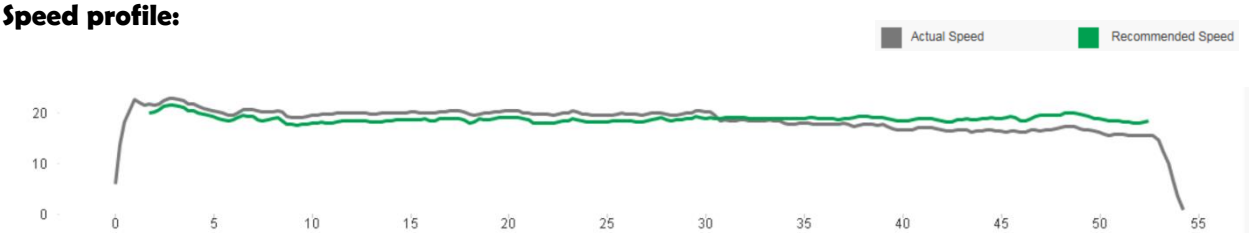
CASE STUDY: Savings of 21.2% when vessel operates at different speed

Operational profile and fuel consumption of two similar voyages of a container vessel were compared. The weather condition of both voyages were comparable to mild sea conditions. The vessel was operating at lower speed during voyage B, this result in a difference of 32.6 MT/day. In this situation where the time constraint was slightly flexible, the saving of fuel was 21.1%.

Voyage	Average daily consumption (MT/Day)	Histogram	Operational speed over time
A	158		
B	727		

CASE STUDY: Recommended speed to avoid sprint-loiter behaviour

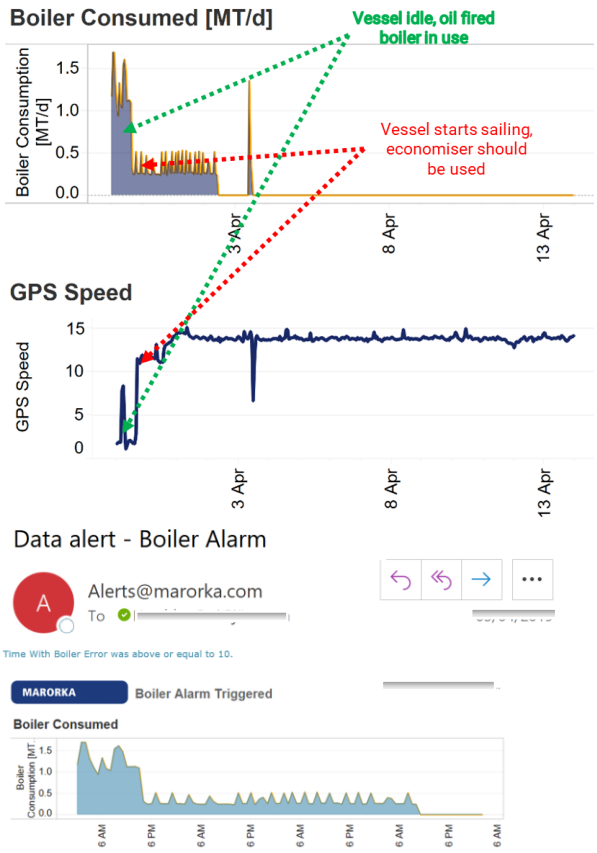
A container vessel having a habit of sprinting at the beginning of the voyage and subsequently slowing down half way through the voyage. The recommended speed was modelled and proposed with the purpose of maximising fuel savings and minimising emissions, whilst keeping the constraints of departure time and arrival time. The recommended speed presents a potential saving of 15.3MT/day which is about 13.2%.

Actual speed	Recommended speed
Total consumption: 247.4 MT **Average daily consumption: 116.4 MT/day**	**Total consumption: 214.8 MT** **Average daily consumption: 101.1 MT/day**
Speed distribution: 	**Speed distribution:** 
Speed profile: 	

Optimised machinery usage

CASE STUDY: Oil fire boiler fuel savings of 25k/vessel/year

Energy saving on individual machinery might be relatively small compared to the energy usage of the entire vessel. However, the accumulative savings could be significant. Data usage alert is set on one of the container ship, to measure and address the use of oil fired boiler in sea passage when economiser should be in use. In this case the vessel is idle in the beginning and usage of oil fired boiler is as expected. When the vessel starts sailing, the consumption is reduced but the boiler is still consuming 0.4 MT of fuel per day. The owner is monitoring closely to ensure minimum excess consumption. An automatic alert is triggered when such situation arise, and operators on shore are notified so that timely action can be taken.



An easy alert trigger to address oil fired boiler usage was able to provide annual savings of fuel up to:

@ VLSFO 250 USD/MT – 25k USD

@ VLSFO 400 USD/MT – 40k USD

CASE STUDY: Power plant management savings of 18k/vessel/year

A quick win in managing an efficient ship is by monitoring generator usage and number of generators in operations. This maximises fuel savings as well as reduces maintenance management by reducing generator running hours especially at low load. Running a single generator at efficient load cost 20-30% lower fuel than running two generators at low loads.

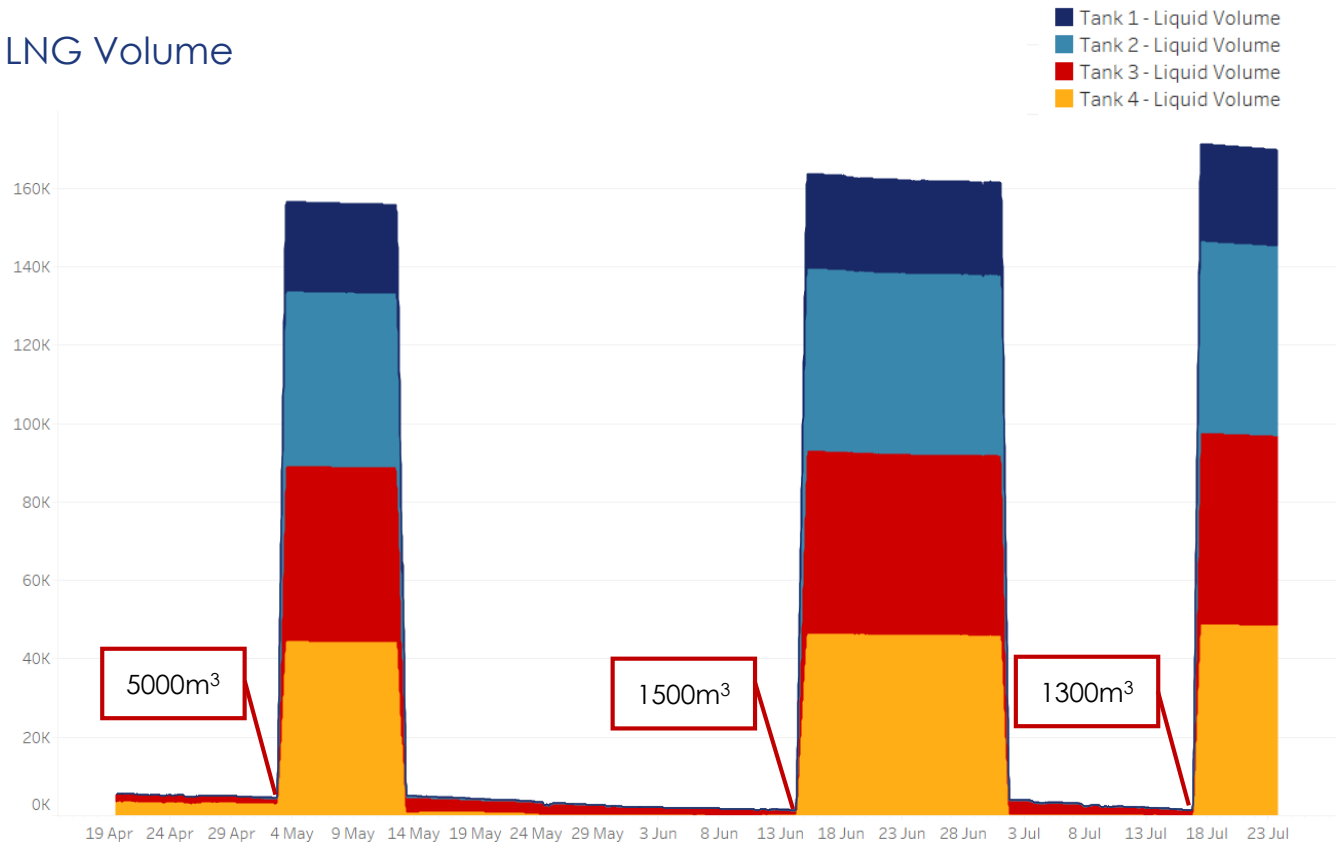
A tanker with three 900kW generators was monitored for a month. Red indication on map indicates duration when two engines are running at low loads during sea passage. This result in an excess consumption of approximately 6MT. Which could result in an annual potential savings of 18k USD/vessel.

Heel management

CASE STUDY: Potential savings of 1.05M USD in 3 months

The online advisory on heel management provides clear actionable information for crew to achieve heel target in terms of remaining on board (ROB) at the end of the ballast passage.

There has been a tendency to over estimate heel needed for transit and tank conditioning. The cost per 1000 cubic meters of extra heel is 130,000 USD at 6 USD per MMBtu.

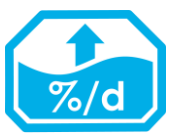


In a little more than 3 months, a LNG carrier performed 3 voyages in ballast condition, the cumulative potential savings of ROB of 7800 m³ of heel amounts to 1050k USD.

System with heel management module pays back multiple times if one inefficient voyage is avoided. LNG for propulsion, BOG in ballast and required LNG for Cooling Down are all taken into account.

For a 600 m³ ROB reduction per voyage on average, this module could lead to (for 6 ballast trips per year, and 6 USD/MMBtu), to a cargo savings of 408k USD per year.

LNG for propulsion



BOG in ballast

Cooling down

BOG Optimisation

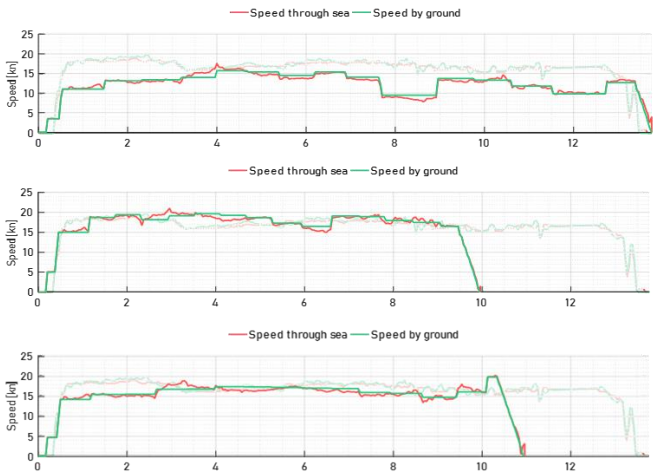
CASE STUDY: Potential savings of 39% on single laden voyage

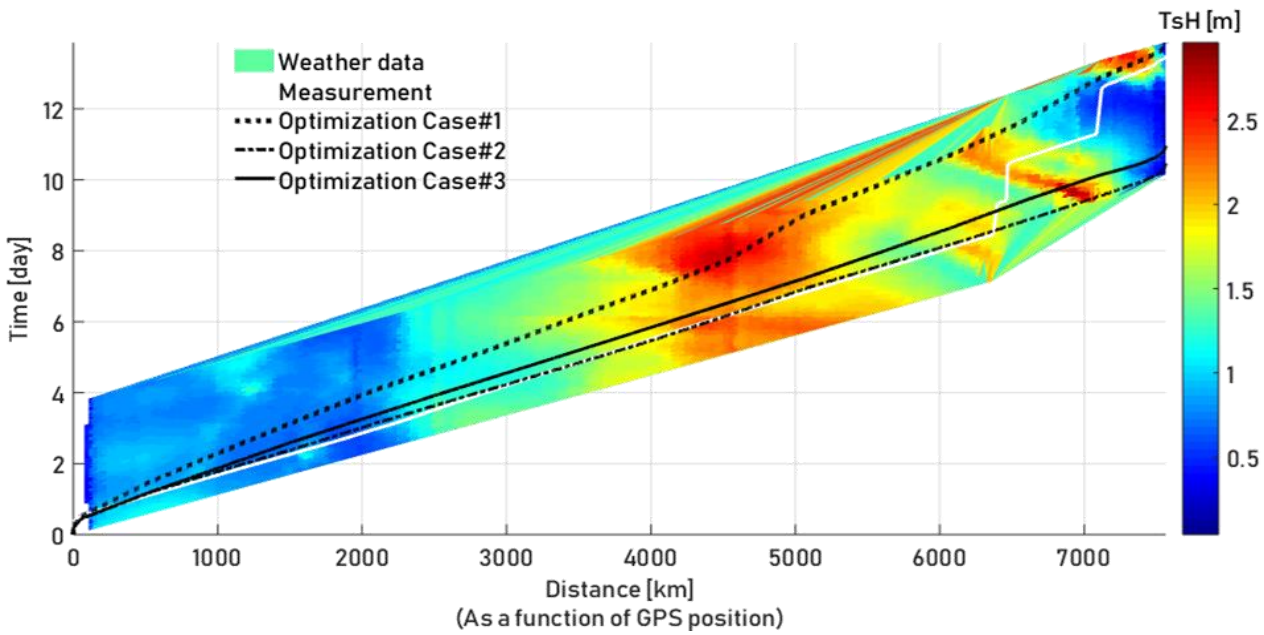
Our LNG monitoring tool provides visual insights on ship motion and natural boil-off. It is clear that composition, ageing and operating constraints imposed by the terminals are of a major importance to BOG generation during the laden voyage.

Our simulator tool coupled with digital twin allow prediction of savings of each laden voyage taking into account forecasted weather conditions. Crew are able to refresh constraints of LNG arrival temperature and ETA to achieve best savings.

On an LNG tanker with 160,000cm Liquid Gas capacity on an approximately 14 days journey from Gladstone to Ningbo, the saving potential on this single trip is up to 39%, which amount to 441T. Breakdown on savings depending on constraints:

Constraints		Savings	
Temperature	**Time**	**%**	**MT**
Fixed	**Fixed**	**5.8**	**66**
Fixed	**± 5 days**	**28**	**325**
± 0.2°C	**± 5 days**	**39**	**441**





Savings potential up to 1M USD/vessel/year

Years of experience allows us to deliver out solutions and services with confidence, Conservative estimate of savings potential for an LNG vessel is ≈ 1M USD per year for vessel performance solutions and ≈ 4500 MT CO_2 reduction by addressing both general vessel performance aspects and LNG cargo specific.

Feature	% energy saving potential	fuel savings (USD/vessel/year)	CO2 reduction (MT CO2/vessel/year)
Hull and propeller monitoring	~10% (LNG fuel)	~300k	~2750
Trim optimisation	1% to 3% (LNG fuel)	30k – 90k	275 - 825
Speed optimisation	5% to 25%	150k – 750k	1375 - 6875
Minimise base load / Optimise generator usage	5% to 10% (MDO)	65k – 130k	600 – 1200
Weather routing	2% – 5%	59k – 150k	550 – 1375
Heel optimisation	0,3% to 2% (LNG cargo)	480k – 3M	Not applicable
Boil off gas management	3% to 10%	90k – 300k	825 – 2750

Subscriptions (OPEX)

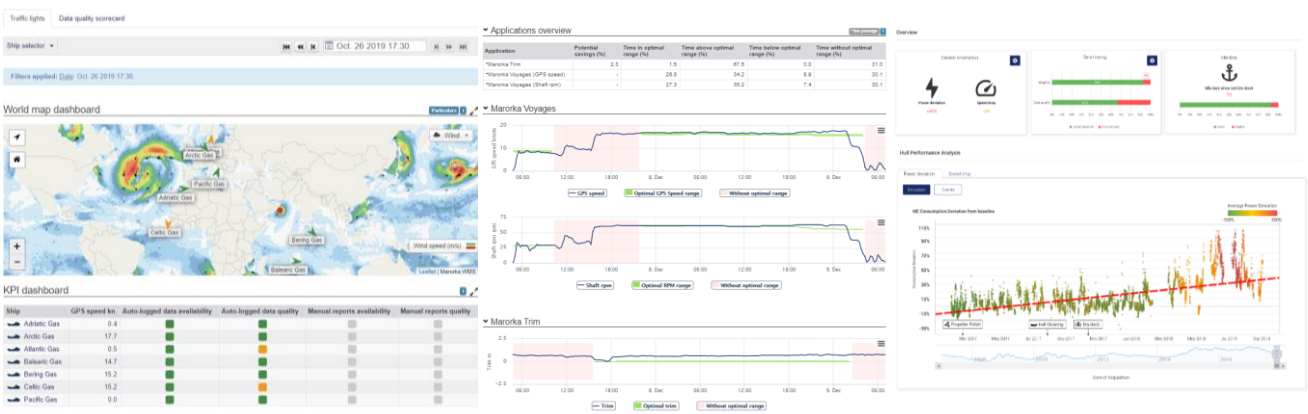
Base subscription for performance monitoring ➔ 3,000 USD/vessel/year

Option: Extended SLA + performance experts hotline ➔ from 2,000 USD/vessel/year

Option: GTT Exclusive LNG Cargo Management modules ➔ starting from 5,000 USD/vessel/year (depending on the scope)

Web interface

Access to real time view of all assets and operational information from anywhere through online web portal, along with clear and actionable KPIs. Our advisory feature provides clear visualisation of optimum operation that can be seen in real time onboard the vessel.



Ship performance Management

GTT - Gaztransport & Technigaz - is a technology and engineering company specialised in the design of containment systems used to transport and store liquefied gas, in particular LNG. The company has developed a strong network with the stakeholders of the shipping industry and the Oil & Gas sector.

As a key partner, GTT assists ship-owners and shipyards to manage the current LNG transition. Its experienced team of engineers develops and provides solutions dedicated to the use of LNG as a marine fuel, LNG-fuelled vessels and the associated supply chain.

Find out more at

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