DIGITAL SERVICES / MARINE & PORTS

# ABB MRV

## Software for the MRV imperative

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# With ABB Software, remote connections, and service built around the solution, we enable customers to digitalize their operations.

# The MRV challenge

Shipowners can have widely contrasting opinions on the priorities when it comes to vessel efficiency.

A Big Data-hungry maritime giant fully engaged with the Internet of Things and an owner haggling hard over connectivity tariffs worth less than one per cent of operating costs may feel equally entitled to offer efficiency as the justification.

But, whatever the business model, ship owners of all types face ever tighter environmental regulation, with new restrictions since the turn of the century covering not only sulfur and nitrogen oxide emissions, but ship waste, ballast water, and even hull coatings.

While the various rules have often been subject to qualification, phase-in or regional delineation, common to all has been that – one way or another – compromise has been reached allowing the International Maritime Organization to maintain its global oversight.

The European Union's new MRV (Monitoring, Reporting and Verification) regulation covering CO2 emissions is different. Its entry into force only 18 months after being agreed by the EU Parliament, is a direct result of a loss of patience by EU institutions at the pace of change being achieved at IMO on CO2 emissions.

Until last year, the IMO's broadly comparable Energy Efficiency Design Index for new vessels and its Ship Energy Efficiency Management Plan appeared to be leading shipping's regulatory timetable on greenhouse gases. However, lack of guidance for shipping from the United Nations Climate Change Convention was compounded when COP21 Paris Agreement commitments in 2016 omitted shipping. IMO has since approved a 2017-2023 'roadmap' for developing a strategy on reduction of GHG emissions from ships, which foresees an initial GHG strategy by 2018.

For EU administrations, all of this has come too late. Instead, the new MRV scheme will create a new kind of benchmarking system for any ship greater than 5,000 GT undertaking one or more voyages into, out of and between any EU port, irrespective of flag. The only exceptions are warships, naval auxiliaries, non-commercial government ships, fishing ships, wooden ships of a primitive build, or ships without mechanical propulsion.

By August 31st, 2017, shipowners must be approved by an accredited verifier as having plans in place to monitor and report their carbon emissions.

From the European perspective, the MRV is the regulatory response to an industry whose current contribution to GHGs is not otherwise mediated through an Emissions Trading Scheme (ETS) or the so-called Effort Sharing Decision on CO2. The company meeting MRV can be the shipowner or any other organisation or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner. MRV companies need to submit a monitoring plan for each of the ships operating under their responsibility to an accredited verifier.

In the months until August 2017 shipping companies therefore need to prepare plans to monitor and report their carbon emissions. These will consist of transparent and complete documentation of the monitoring method and procedures to be applied to each of their ships.

By January 1st, 2018, ship owners must be able to supply per-voyage and annual monitoring statistics. From 2019, a verified emission report will need to be submitted to the EC and the relevant flag state by 30th April each year.

From June 30th, 2019, all ships will also need to carry a valid document of compliance relating to the relevant reporting period. Furthermore, the EC will make each ship's emissions reports publicly available, including its fuel consumption, CO2 emissions, and technical efficiency (EEDI or EIV as appropriate).

MRV leaves shipping free to lobby to its heart's content for the compromise it finds palatable on CO2 at IMO - presumably building on the Energy Efficiency Design Index and Ship Energy Efficiency Master Plan (SEEMP) offered to the UN Convention on Climate Change. However, entry into force of the MRV means the regulatory action is happening elsewhere.

# Resetting the efficiency dial

Put another way, the SEEMP scheme developed by IMO recommends the Energy Efficiency Operational Indicator (EEOI) to quantify ship energy efficiency in terms of CO2 production per cargo tonne-nautical mile, as part of a self-evaluation and improvement process.

In contrast, the MRV offers owners a straightforward choice: a license signifying compliance vs. a financial penalty.

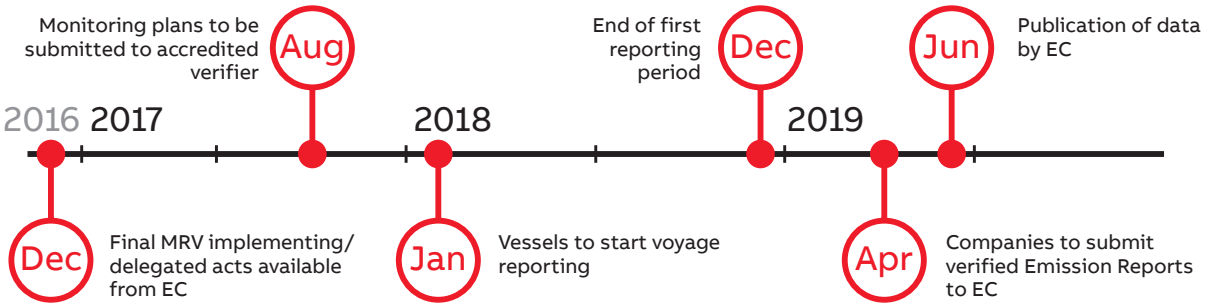
EU regulators also envisage the MRV as providing the basis for CO2 reduction targets. Some believe that today's monitoring will lead to a cap within five years. Ultimately, participating ship owners will share in an emissions database that can audit shipping's environmental credentials, but also act as a benchmark for individual ships and fleets against industry standards.

Meeting the MRV scheme's monitoring and reporting requirements is not in fact technically challenging, with the EC creating templates that model all mandatory items in the monitoring plan. Companies can decide how to organise the information to reflect their monitoring systems and procedures, but all owners need to go through the same formal accreditation process to comply, meaning that to some degree they face the same challenges or opportunities to automate the reporting process.

For the purposes of the scheme, MRV considers all participants equal, while participation entails the use of administrative software to be compliant. At the same time, the technical choices owners make today may need to be open-ended to accommodate the more far-reaching monitoring, reporting and verification schemes of tomorrow.

Owners should therefore see entry into force of the MRV as an opportunity to consider the role of vessels management software more generally, and how they can future-proof their reporting against future CO2 constraints. They might also note that comparing the fuel consumption of different vessels is a useful exercise which becomes more useful as the number of ships increases. If monitoring and reporting are no longer optional, should they therefore also explore whether a regulatory imposition can be turned into a performance advantage, and whether software can also help them improve the efficiency of their operating systems, maintenance, crew or even Masters.

MRV schedule of implementation



# The ABB MRV option

ABB's digital application is a full suite of advisory vessel management software that is currently installed on over 450 ships. It is, in fact, the maritime industry's most extensive suite of onboard digital decision-making tools, using the data generated by sensors and other inputs to feed analysis and enhance, planning, routing and the decision-making that optimizes vessel performance

Inputs include external information, such as weather or cargo load parameters, whose impact can be combined with propulsion and other systems information to yield rounded advice.
By collecting data in real time, including variations in speed, draft, water depth, wind and waves, the complete package harmonizes an unmatched range of datasets to support optimized decision-making for greatest net vessel efficiency.

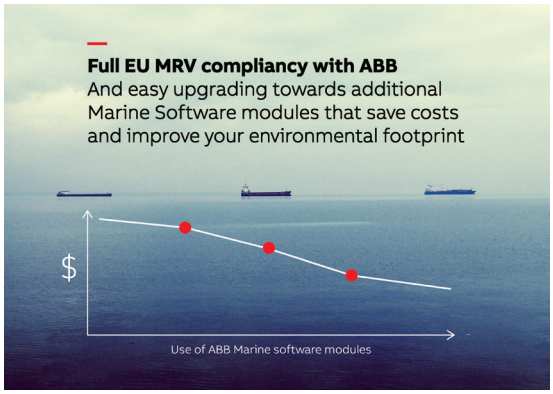
In April 2017, ABB received certification from EU-accredited verifier Verifavia covering their MRV module. This new software module within ABB's digital suite has been developed to help owners meet MRV requirements under EU regulation 2015/757.

ABB's MRV software relieves shipowners of the burden of preparing fuel monitoring, reporting and verification plans, offering an integrated software solution that enables input of fleet wide 'per-voyage' fuel consumption and CO2 emissions collection. The system incorporates a tool to deliver an annual emission report, as required within the MRV regulation.

Certification by Verifavia - better known for its work in the aviation sector - came after a two-stage assessment of ABB's MRV software by Verifavia. The appraisal took place over a six-week period, leading to final certification.

ABB's MRV technology has been structured as 'user-proof', with windows and prompts designed in a logical way to avoid reporting errors. It transforms the monitoring/reporting task into a straightforward data inputting procedure lasting minutes at the beginning of the voyage, and a similarly simple checking out routine at the end.

By making the MRV process part of everyday crew routines, ABB's MRV Software approach also creates awareness the figures which need to be reported are of significance to improving both the efficiency and environmental performance of the vessel.



# Open-ended system

Today, management software is used everywhere in shipping: the proliferation of app-based tools alone has made IT solutions as familiar at the sharp end of inspection and maintenance as they are in purchasing ships supplies.

However, it is also fair to point out that, when driven by regulation, shipowners will often only make minimum investments in new technology, especially when their entire fleet is concerned.

In the case of IT investments, a pause for reflection is nonetheless necessary: often, for example, function-based software proves to be either a dead-end or is quickly superseded - whether due to lack of flexibility or poor interface capability. Naturally, owners must ask if a software solution meets immediate compliance needs, but they should also be asking whether it provides the platform to meet future regulatory developments. In short, they should consider whether a minimum investment now will come to represent a stored cost for the future.

In 2017, shipping in remains in a negative phase; analytics, and by extension management software, have been identified as keys tools in realizing cost savings. Whether by obligation or not, a newly formalized or modernized fuel consumption monitoring and reporting procedure should be seen by owners at the outset as a new opportunity to keep track of one of their key costs. Put another way, despite the looming MRV deadline, rather than feeling under pressure to choose off-the-shelf software quickly to comply, solutions should be considered for their ability to perform as a building block for greater ship efficiency. ABB's MRV software is notable both for is standalone functionality that has been certified to ensure compliance, but also for its potential to be integrated into the wider vessel management software from ABB.

If every shipowner must meet the same conditions to comply with MRV, but it is also fair to point out that each will set out from a different starting point. ABB's digital application is completely scalable, meaning that owners can make an initial installation to cover fuel monitoring without compromising potential to add modules that cover other functionality.

Selecting ABB's MRV application means that a company is immediately compliant with the EU MRV scheme, whether or it decides to upgrade to other software modules within ABB's digital application designed to improve vessel efficiency immediately, or later. With no obligation, the customer's path to a full vessel management package that can optimize trim, bunker transfer, fuel consumption, power plant, electricity use, routing and speed advice, propulsion power analysis and hull cleanliness remains open rather than being slammed shut.

ABB suggests that, in being tailored to individual vessels and taking account of conditions such as the wind, currents and swell and their effects on a ship's behavior, one 'good' routing decision taken using ABB's digital application could pay for itself in fuel savings.

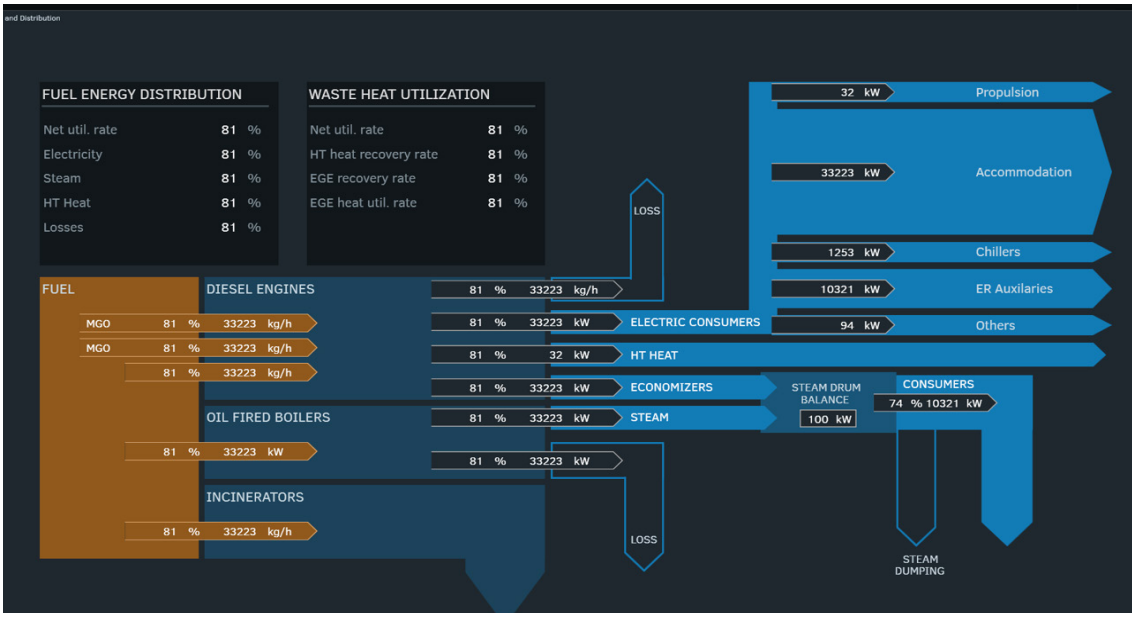
# Other outputs

## Crucially, users can select the scale they want, based on different parts of the full functionality palette

Looking beyond the MRV software for example, Torvald Klaveness recently installed a SE-EMP-compliant digital management solution to measure and display fuel consumption and torque. These Key Performance Indicators are shown in real time to the operating crew and are available for analysis onshore, using ABB's fleet portal. In addition, however, the fleet management tool uses historical data to create benchmarks for future performance, working in combination with a new Torvald Klaveness special operations center using ABB's digital application to monitor ship performance.

Looked at more generically, ABB's Energy Management System is a decision-support tool to minimize the overall energy costs for individual vessels and whole fleets. It compares and analyzes historical and operational data, then calculates and advises on improvements using easy-to-understand displays. Just recently MR Werften ordered the Energy Management software as part of a comprehensive package including ABB propulsion and automation for five cruise vessels for Genting Hong Kong brands Crystal Cruises and Star Cruises. Meanwhile, the Power Plant Optimization module helps the operator to control and manage the optimum energy balance by calculating the optimum load sharing between the various producers such as diesel generators, shaft motors, main engine, waste-heat recovery and batteries.

Ultimately, ABB's decision support software can combine wave measurements, weather forecasts, and navigation data like speed, course, RPM and the voyage plan, with ship characteristics, loading conditions, and motion sensor measurements. This facilitates continuous monitoring as well as forecasting of the ship responses and performance. As a result, the system makes the main tasks of the officer on watch easier, supporting safe and economic navigation, damage avoidance and route planning. ABB's decision support software also acts as a hub for vessel data that can improve efficiency across a whole fleet.

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The Energy Management System minimizes overall energy costs. It compares and analyzes the historical and current operational data of the vessel, then provides decision support on where to focus energy efficiency efforts. The solution consists of onboard & onshore modules for energy monitoring and optimization.

# Software outreach

Overall, ABB’s experience is that when an owner makes an initial commitment to ABB's decision support software for specific reasons, far-reaching adoption of the software follows. When that happens, owners reap the full benefits, as their ships skirt adverse conditions and arrive on-time at optimum cost, with their cargoes delivered safely and in good condition.

In fact, the modular nature of the software suite has proved to be one of its most compelling appeals.

Part of the suite is a state-of- the-art modular ship motion monitoring and decision support system, with around 80-90% of the heavylift ships in the world now including ABB’s maritime software onboard. It was recently adopted by Greenland Heavylift Holdings for four semi-submersible heavy lift vessels being built at CSBC Corporation in Taiwan. The software will respond to the hydrodynamic properties of the vessel, loading parameters and the ship’s onboard weather forecasting to create a polar chart that maps the safest and most efficient voyage route, allowing ship’s officers to update course or speed decisions continuously during the passage.

When shipowners choose ABB's decision support software, they can also choose the modules most relevant to their operations. For example, an owner of an LNG carrier would plan routes to avoid in-tank sloshing, basing its decisions on the limits set by motion measurements and LNG storage tank sloshing modelling provided by cryogenic specialist Gaztransport & Technigaz (GTT). Similarly, the system functionality designed to optimize trim is of particular use in ferry operations, while a cruise ship owner might want to monitor vessel motions using the parameters that best ensure passenger comfort.

Meanwhile, an offshore vessel owner might want to make precise predictions for dynamic positioning, with vessel motion parameters set to make the most of a safe time-window for weather-sensitive operations, in this case based on data drawn from thrusters plus the environmental and weather forecasting conditions that are integral to ABB's decision support software.

Initial interest from Maersk, meanwhile, focused on the use of ABB's decision support software as a support tool to avoid the type of weather that risked containers falling off ships. Today, 140 Maersk containerships use motion-monitoring, forecasting and decision-support software with SPOS Seakeeping plug-ins from weather forecasting specialist MeteoGroup to optimize routing.

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Today, ABB lays out the usefulness of its decision support software for vessel efficiency optimization package as threefold:

Benefits for ship managers
- Information applied in real time, as opposed to traditional post-voyage analysis
- Receiving advice on the optimum trim in any weather condition
- Optimized propeller speeds for significant savings, factoring in intended route, required ETA, weather forecasts and vessel characteristics
- Reducing maintenance and delays
- Fleet manager access to data about fuel consumption, speed advice, propulsion power analysis and hull cleanliness
- Recommendations for current and future voyages

Benefits for captains and crews
- Improved voyage and route planning
- On-ship advice optimizing navigational decision-making
- Reducing maintenance and delays
- Crew instructions that are clarified and sped up

Benefits for fleet controllers everywhere
- Onshore management obtaining full visibility of fleet-wide energy consumption
- Up to 5 percent reduction in propulsion energy costs
- Reduced CO2 emissions for a smaller carbon footprint
- Energy loss due to propeller RPM fluctuations being reduced to as low as 1 percent
- Simulations that can be run for future design improvements

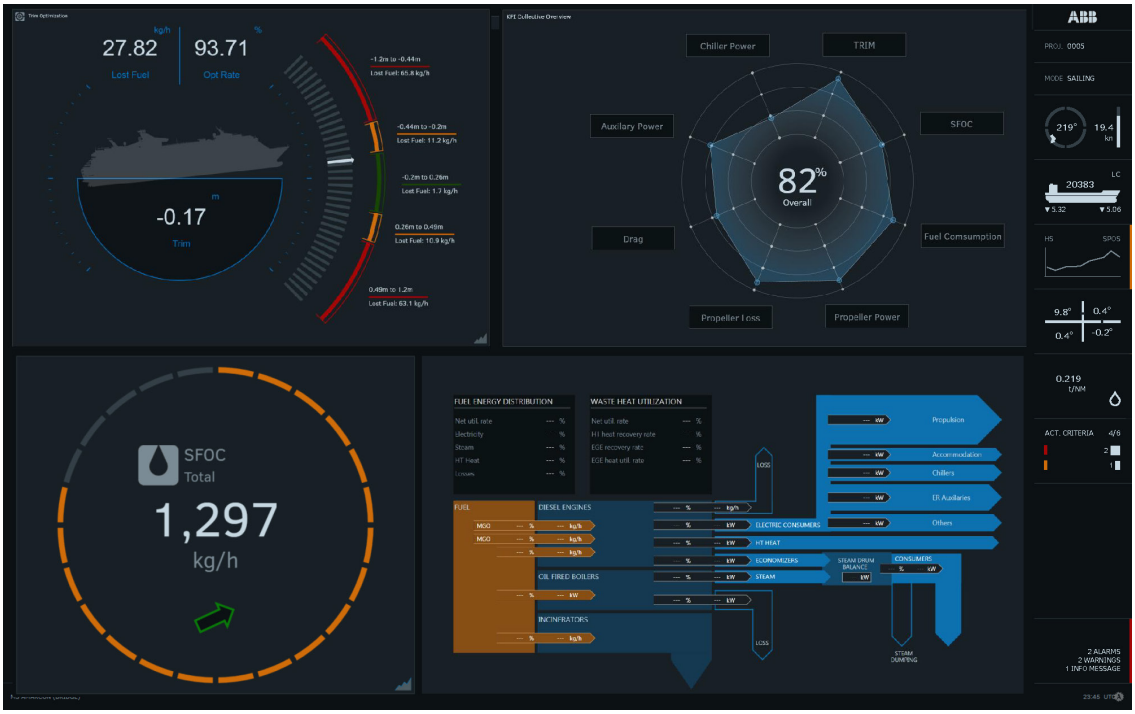



ABB offers the maritime industry's most comprehensive software suite for performance monitoring and onboard decision support

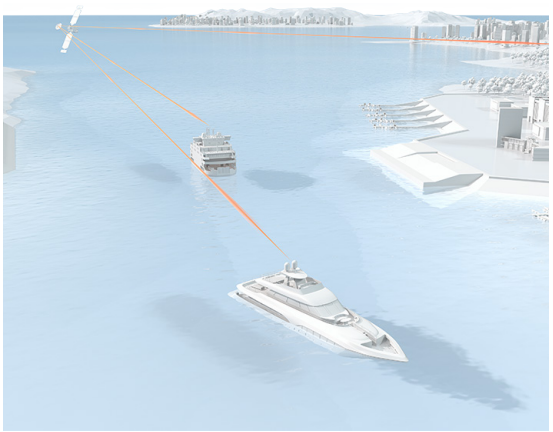
# The bigger picture

ABB consistently extend their use of the software's vessel management functionality over time, but it can be difficult to find a 'typical' pathway through which extension has taken place. However, ABB believes that her MRV option offers a gateway, through which an off-the-shelf compliance tool with ABB's fleet portal reporting can be the first step towards optimized vessel efficiency.

As one of the most active technology companies supporting sensor-based ship and marine equipment management, ABB sees advisory software as a vital in the industry's journey towards remote diagnostics, maintenance planning and performance monitoring. It also sees shipping's future as lying in greater connectivity and more automated processes supported by shore-based engineering and maintenance staff able to respond to data gathered from vessels and optimize fleet efficiency.

But ABB never forgets that owners need to see these efficiencies at the level of the single vessel, as well as fleet-wide. Maritime software is a critical component in ABB's strategy to combine platforms into a single interface, leverage the Internet of Things, Services and People (IoTSP), and support the real-time decision-making by engineers and ships officers that enable safer and more efficient ships.

For owners, bringing external factors such as weather into the decision-making process that considers vessel loading computer parameters and propulsion data allows shore staff to assess the safety and full cost of future charters, as well routing options and delivery dates. Historic voyage data can also feed the analytics software that raises efficiency across a whole fleet, or at the individual ship level.



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With our ABB AbilityTM Collaborative Operations Centers now open in Singapore, Norway, and USA, we cover the world with up-to-speed support for any issues that might occur whilst at sea.

Increasingly, better connectivity between ship and shore means that monitoring and maintenance, and even operational decision-making can be coordinated in real-time. ABB has invested heavily in shoreside expertise, analytics firepower and engineering availability to provide 24/7 support from Remote Operations Centers that support troubleshooting, maintenance planning, benchmarking, and interventions based on predictive diagnostics.

At group level, ABB frames its solutions to digitalize the maritime industry within ABB Ability™, supporting fleet-wide intelligence gathering to reduce costs and an owner's environmental footprint. As a technology developer, ABB is also continuously improving its offer, as witnessed by the newly-launched Torductor torque measurement system, which uses contactless sensors facing the propeller shaft to send information to the digital onboard application.

But the group also never forgets that the journey towards all of these things can start with a single ship. Tallink Megastar, for example, is one of the most advanced ferries in the world, operating on the Helsinki – Tallinn route. The 212.2 m long ship carried about 2,800 passengers and is the shipping company's first ship operating on liquefied natural gas (LNG).

ABB has supplied the power production, electric propulsion and energy management system on board, and offers support to the vessel from its Helsinki Remote Operations center. Tallink Megastar also benefits from vessel management software from ABB, which is being used to monitor the use of energy in the entire ship in real time, focusing specifically on fuel consumption.

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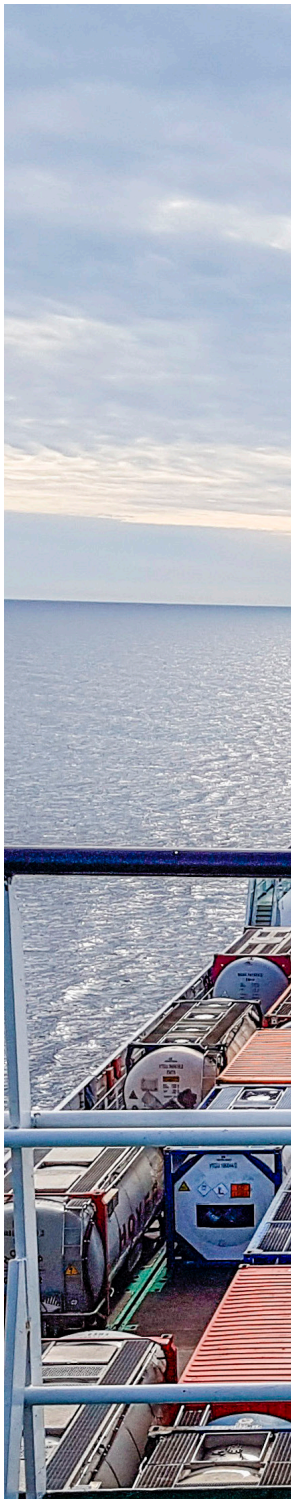

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