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New IMO carbon regulations on existing ships:
what MEPC 75 means for tanker operators

Contents

COVER IMAGE

Gagarin Prospect, the world's first Aframax tanker designed to run on LNG, is one of 40 dual-fuelled ships already delivered or under construction at Hyundai Heavy Industries Shipbuilding Group. The DNV GL classed vessel is owned by leading Russian ship operator Sovcomflot and was honoured, amongst others, with the Nor-Shipping 2019 Next Generation Ship Award (Image courtesy of HHI Shipbuilding Group).

What MEPC75 means for tanker operators

IMO's "MEPC75" meeting in November formally agreed requirements on shipping companies to report emissions, requirements to make an assessment scheme, where a rating of 'C', if achieved by all ships, will keep the whole industry on a trajectory to meet IMO's targets

Tanker operators will be keen to know exactly what they need to do to comply with MEPC 75 – if they will be able to keep a certain vessel in compliant operation until 2030 just through slow steaming, and when they need to consider switching to LNG fuel.

But the difficulty with answering these questions is that every case is a bit different, said Tore Longva, principal consultant, regulatory affairs with DNV GL.

He was speaking at a webinar organised by DNV GL about MEPC 75 on November 26, 2020.

Tore Longva, principal consultant, regulatory affairs with DNV GL

"You need to consult with your trusted classification society and see how they can help you with specific vessels. It depends on age, trade profile, investment willingness. There are a lot of factors playing into what is the most appropriate solution for each individual ship."

Although Mr Longva notes, "we think you can achieve 40 per cent improvement in efficiency with the toolkit we have available today. It won't always be cheap, but it can be done." In other words, we can manage until 2030 without new fuels.

"Getting to the absolute reduction levels of 2050 is a different ballgame - there we need other options."

MEPC discussions

The MEPC 75 meeting was held online over November 16-20. Because people were attending from their home countries, rather than travel to the IMO building in London, and all working in different time zones, the decision was made to restrict discussions to 3 hours a day, so 15 hours in total for the meeting.

The online format also did not allow as much interaction as usual, Mr Longva said. Many items were postponed to the next meeting (MEPC 76). Since the MEPC 75 meeting was originally planned for April 2020, it means some items are being postponed for a year. MEPC 76, planned for 2021, is also likely to be virtual, and so have a constrained agenda, and some issues may slide into MEPC 77.

A planned revision of guidelines for Exhaust Gas Cleaning Systems was pushed to MEPC 76. Correspondence groups have been established to look at licensing fuel oil suppliers, a shaft power limitation concept, and interim minimum power guidelines.

The work to agree a definition of Phase 4 of EEDI was "deprioritised". Phase 4 will apply to newbuilds of a number of ship types from 2022, and anticipated to come into force after 2025, so not considered urgent to discuss now.

Agreements at MEPC 75

At the November 2020 meeting, approval was given to the 4th IMO greenhouse gas study, by a consortium led by CE Delft, which counted emissions from shipping in 2018 of 1056 MT CO2 equivalent, up 9.6 per cent from 2012. Methane and nitrous oxide emissions were included (and converted to a CO2 'equivalent' amount).

This study says that shipping's share of global emissions was calculated to be 2.89 per cent in 2018, up from 2.76 per cent in 2012.

The study says that the overall "carbon intensity" of shipping decreased by either 21 per cent or 32 per cent over the period 2008 to 2018, depending on how it is calculated – 21 per cent if calculated by "capacity mile" or based on voyages, and 32 per cent if calculated by "tonne mile" (cargo carried). Carbon intensity is a measure of how much carbon is emitted per "transport work".

If no additional policies are adopted to decarbonise, emissions are projected to end up growing by between 90 and 130 per cent by 2050, relative to 2008.

The focus of the MEPC work is to get emissions to a peak as soon as possible, and then reduce "carbon intensity" by 40 per cent by 2030, compared to 2008. (Note, 21 to 32 per cent reduction has already been achieved).

On the technical side, MEPC75 approved plans for an EEDI (Energy Efficiency Design Index) rule on existing ships, known as the "EEXI" (Energy Efficiency Existing Ship Index). This is described in more detail below.

On the operational side, it approved plans to ask shipping companies to write a "SEEMP" (Ship Energy Efficiency Management Plan), showing how they will reduce their operational emissions. It is based around a Carbon Intensity Indicator – CII. This is also described in more detail below.

"You might as well learn these acronyms, it is hard to spell them out each time," Mr Longva said.

Each member state is encouraged to develop its own national action plan, an example being Norway's Green Shipping Program.

MEPC75 considered a proposal from a number of shipping industry associations, including the International Chamber of Shipping, World Shipping Council, Intertanko and the International Parcel Tankers Association, to raise money for research and development of fuels, levied on fuel purchases.

The meeting also did not discuss plans to set GHG / carbon intensity guidelines for other fuels, also including emissions made in producing

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the fuels and delivering them to vessels ("well to tank"), methane slip, nitrous oxides, and emissions from VOCs.

So for now, the regulations only relate to the amount of CO2 you emit per the amount of cargo tonne miles you make.

EEXI

EEXI is what will concern tanker operators the most.

It follows EEDI, the "Energy Efficiency Design Index", which says that new ships being built over 2025 to 2030 must have a 30 per cent improvement in energy efficiency compared to a baseline, calculated as the average efficiency for ships being built between 2000 and 2010.

Under EEXI, existing tankers need to achieve a "delta", or improvement, of 15 to 20 per cent, compared to the baseline, with the same time periods as for EEDI for achieving the improvement and the base line. The delta is different for different ship types. Cruise ships and LNG carriers must get 30 per cent, gas carriers must get 20 to 30 per cent.

So this should get existing ships "on par" with what is required for new ships, under EEDI phase 2 or 3.

Ships need to comply with EEXI by early 2024. Specifically, the deadline is the "first annual, intermediate or renewal IAPP (International Air Pollution Prevention) survey after 1 Jan 2023."

So by early 2024 - all ships which are in scope need to comply with EEXI.

The index is calculated by a complex formula which takes ship's emissions, capacity and speed into account, with the speed based on that calculated in the sea trial, after the vessel was launched, or by other methods.

The way to reduce the score involving the least financial investment is probably to reduce the speed. The engine can be "de-rated", so it operates at a slower speed, or you can set a "virtual" limit on engine power, basically an agreement that you will only operate the vessel with a certain power level. You are only allowed to exceed it in an emergency.

Shipping companies need to put all of this in a technical file, which is verified and approved in the first IAPP survey after Jan 2023.

SEEMP

All ships above 400 GT need to develop a "Ship energy efficiency management plan (SEEMP), by Jan 1, 2023.

A rating system will be designed by IMO so that if all ships are C or better, by 2030 shipping will reach its 40 per cent target of improving carbon intensity.

It will probably be calculated in emissions per deadweight mile. The threshold for reaching "C" will get more stringent in time.

Cargo and cruise ships above 5000 GT need to achieve rating "C" in their Carbon Intensity Indicator, every year from 2023, their SEEMP should show their plan to achieve this.

The plan should also have a continuous improvement focus.

Any ship scoring "D" for 3 consecutive years, or an E, will need to implement corrective actions, which will be included in their SEEMP, and need to be approved, for a vessel to receive its annual statement of compliance.

Offshore vessels, passenger vessels (not cruise ships or ROPAX) will not have any index. The reason is that these vessels are very diverse, so it is very hard to calculate how one vessel compares to others in its 'class'. Although they are still required to collect and report data.

The policy will be reviewed by Jan 2026, looking at strengthening the enforcement mechanism and corrective actions.

IMO's 2050 target is that CO2 emissions should be reduced by 70 per cent compared to 2008, counted as CO2 emissions per transport work, and total GHG emissions from the industry should be reduced by 50 per cent, compared to 2008.

The company's CII may become public, since it is included on the vessel's "statement of compliance", which is a public document in many jurisdictions. This means the data may be included in the various online vessel rating schemes.

The verification and audit will be done by the organisations accredited as "recognised" by flag states – mainly the classification societies.

IMRDB

There is a proposal from industry bodies, including ICS, World Shipping Council, BIMCO and Intertanko, to set up a research fund to develop zero carbon technologies, paid for with a levy per tonne of fuel purchased, proposed at $2 per tonne for all ships above 5,000 GT, building a purse of $5bn over the lifetime of the program.

A full day of the MEPC 75 meeting (3 hours) was taken up by discussing this.

IMO members were talking about it as a "market based measure", although the industry had been careful not to present it as a "market based measure", saying that the money would be for research only, not to make certain fuels more viable.

There were inconclusive discussions about whether IMO could take on the responsibility of making this a legal mandate, Mr Longva said.

"IMO agreed to invite further comment, so discussion will come back in MEPC 76."

Other amendments

Other amendments made by IMO are changes to MARPOL Annex VI stating that you need to have a sampling point in your fuel system, either fitted or "designated", for inspectors to sample and verify sulphur content. This needs to be approved by the first IAPP survey after April 2023. "There's either technical or bureaucratic work to take care of," Mr Nyhus said.

Eirik Nyhus, director environment with DNV GL

There are new verification procedures for how samples are to be analysed and what kind of bandwidth is acceptable on sampling results.

Also at MEPC 75 the International Convention on the Control of Harmful Anti-fouling Systems on Ships was amended to ban the biocide cybutryne.

There was a ban on use and carriage of heavy fuel oil in the Arctic from July 1, 2024, with exemptions for tanks with a double hull, or for Arctic coastline states which want to exempt their own ships in their own waters until 2029. This was a compromise agreed with certain Arctic states to get the ban passed.

Audience poll

Audience members were polled to find out what they anticipated their main measure would be to comply with EEXI.

21 per cent chose engine power limitation, 16 per cent retrofit energy efficiency devices, 17 per cent operational improvements, 25 per cent alternative fuels, 19 per cent said "I have not started looking into this."

DNV GL's Mr Longva noted that limiting engine power "is the simplest way of reducing EEXI to comply." He said he was surprised so many companies were considering alternative fuels – although they will be necessary to get beyond the 2030 ambitions.

"For those that haven't started looking into this - we are strongly recommending you are looking at this for your vessel. Within 3 years all vessels need to comply. That means 20- 30,000 vessels need to have done calculations and possible upgrades."

Eirik Nyhus, director environment with DNV GL, added that he was expecting more votes to go to engine power limitation. "It is the easiest way to go with it."

"The fact that people are going for alternative fuels tells me that people are thinking about this in an alternative context. I think that's good."

Older vessels

Shipowners will consider whether they can get the required 30 per cent efficiency improvement by 2030 on older vessels just by reducing the speed. But this is the only way they can do it, if they are unable to use different fuels or adjust the engine to make it more efficient.

For example, companies agree to reduce the power of the engine to 70 to 80 per cent of its "maximum continuous rating" (MCR).

"At some point the speed is so slow the ship is commercially unattractive," Mr Nyhus said. "Then it becomes a commercial decision [whether to scrap]. It has some impact on older tonnage."

Other fuels

In terms of fuels other than oil, currently only LNG, LPG and methanol are included in the regulations, with a stated lower "carbon factor".

If you want to state that the vessel runs on LNG, you must have at least 50 per cent of your fuel tank capacity being LNG tanks. For methanol, it is not yet defined.

Operational improvements

Possible operational improvements shipowners can make include methods to improve efficiency of operations, including adjustments to the propeller, air lubrication under the hull, even wind power.

However this appears to only include hardware investments, not changes in how the ship is operated, such as optimising routing, speed and onboard power generation, apart from making an agreement to reduce the maximum power of the engine.

EU

Shipping companies also need to be aware of what is happening at the European Union. The 27 EU members comprise a big voting block at IMO. Also EU's own policy initiatives and regulations will impact IMO, in particular around the "European Green Deal" which aims to make Europe climate neutral by 2050, including shipping.

The EU is also considering tightening its 2030 targets for land based emissions, currently 40 per cent reduction in emission compared to 1990, to be increased to 55-60 per cent.

"It would be disingenuous to think shipping will avoid being discussed in this context," Mr Longva said.

There is a push from both the European Parliament (EP) and European Commission (EC) to include shipping in the Emission Trading Scheme (ETS), with EP saying 2022, EC saying 2024 may be more realistic. This would require shipping companies to buy carbon credits for the CO2 the vessels emit. There are disagreements on how the funds raised will be spent.

But the discussion is about "when" not "if" shipping will be included, he said.

Decisions are still ongoing about whether the ETS would apply only to the part of a voyage which is within European waters, or the whole voyage if it includes going to, or leaving, European waters.

We have seen that there are political implications of trying to levy carbon charges on transportation outside European waters, when such a scheme was introduced in aviation. "We don't know how that will play out, we expect to see more next year," Mr Nyhus said.

The European Climate Law, likely to be adopted in June 2021, will be a "key vehicle" for future actions.

There will be revision of the MRV regulation, covering "monitoring, reporting and verification of carbon dioxide emissions from maritime transport." This was originally based on IMO's Fuel Oil Data Collection System (DCS) requirements, but the regulations have now diverged.

Charterers

In terms of the involvement of charterers, Mr Nyhus said that he did not anticipate they would get very involved in IMO itself. "Charterers don't have a seat at IMO other than as Non-Governmental Organisations (NGOs)".

However, there are other mechanisms where charterers are engaged, such as the Sea Cargo Charter.

"Charterers seem to be moving quite proactively these days, I don't think they will wait, to be honest," he said. TO

DNV GL has a range of online resources about decarbonisation – see **www.dnvg.com/eexi**

www.dnvgl.com/decarbonization

www.dnvgl.com/eto

www.dnvgl.com/tecreg

You can view the webinar online here

https://www.dnvgl.com/maritime/webinars-and-videos/on-demand-webinars/access/MEPC-75-mandatory-CO2-reduction.html

OCIMF's new human factors orientation

OCIMF has released a paper about its plans to integrate human factors into its activities – helping companies set up their workplaces so they are less likely to support human mistakes

The Oil Companies International Marine Forum (OCIMF) has released a paper (October 2020) showing how it will "integrate human factors into its activities and contribute to making our industry progress on human factors."

The basic "human factors" philosophy is to go beyond the idea that "people cause accidents" - even if the incident is attributed to human involvement, it says.

"Most mistakes, actions and decisions are themselves the result of the way the workplace is set up, how work is designed, equipment and control measures, and how leaders influence the culture in an organisation," OCIMF says.

OCIMF defines human factors as "the physical, psychological and social characteristics that affect human interaction with equipment, systems, processes, other individuals and work teams."

"It is the people on our ships and in our operations and support teams who make safety work," it says.

"However, human error still occurs in interaction with conditions, systems and/or other people. By addressing these interactions, we can reduce human error, thereby reducing incidents and improving reliability and productivity."

Terminology

OCIMF saw a choice of three terms it could use - "human element", "human factors" and "human performance".

It thinks "human element" is a term which was initially used when the focus was on "changing the person" such as through training and motivation, and it is only used in the maritime industry.

But "human factors" would be a better term, since it is also used in other industries (oil and gas, nuclear, aviation, military), it recognises that human error can be caused by workplace factors, equipment, task design and organisational conditions.

It also considered the term "human performance", which seems to accept the idea that human variability is inevitable and normal.

Guiding principles

OCIMF set up some guiding principles for talking about human factors, based on those from oil and gas, aviation and nuclear industries.

The first principle is to recognise that people do make mistakes, their actions are rarely malicious and usually make sense to them at the time, and mistakes are typically due to conditions and systems which make their work difficult. So the important work is to understand the conditions in which mistakes happen. This leads to work to prevent or correct them.

Other principles are: that people know the most about their work (not their managers), and are key to any solution; plant, tools and activities can be designed to reduce mistakes and manage risk better;

Leaders contribute to shaping conditions that influence what people do; it matters how leaders respond when things go wrong and take the opportunity to learn.

Focus areas

OCIMF focusses on the biggest risks to ships and crew - loss of primary containment of the vessel (leaks and spills), fatalities and serious injuries.

It has five "focus areas" for looking at human factors.

(1) Leading and shaping the culture you want. The role of latent and organisational conditions in accidents; how leadership shapes culture; diverse cultures; industry-wide culture; workplace influence on crew wellbeing; people as a solution, not a problem; listening to the workforce; responding when things go wrong.

(2) Well executed tasks and procedures. Designing tasks to reduce error; effective control of work; effective procedures; the effectiveness of regulations; training and skill building; work as we imagine it, and as it really is; taking human factors into account in risk assessments; manning and workload management; selection and capability of individuals; fatigue; situational awareness

(3) Well-designed equipment and controls. Human–centred design of bridge, engine room, cargo, deck and terminal equipment; human-machine interfaces; the impact of automation and increased complexity

(4) Skills to respond to emerging situations. Building bridge, engine room and crew skills; situational awareness and recovery; team communications

(5) Learning before and after things go wrong. Effective human factors investigation; learning from the people who do the task, to get ahead of incidents

Strategic actions

Strategic actions OCIMF will take are to provide publications and training, make a development pathway to build capability in the industry, building human factors perspectives into OCIMF's inspection and self-assessment programs including SIRE, OVID and TMSA, and its publications like MEG and ISGOTT.

It will engage and collaborate with IMO and other industry organisations and institutions in key human factors issues, such as improving quality of marine incident investigations, skills and training.

New structure

The publication of the human factors paper follows OCIMF's announcement in September 2020 that it had "overhauled its committee structure", so it could better focus on identifying and mitigating issues of the highest risk.

It was setting up a new "risk advisory function", responsible for identifying risks most likely to impact activities of members. It will focus on fewer activities, but higher risk activities.

There are four "functional committees", providing specific expertise on legal, human factors, environment and maritime security, across all work conducted by the organisations. So they will all give input to the principal committees. This implies that these four areas are now the areas where OCIMF has the greatest interest.

Then there are three principal committees which will "drive the strategic priorities of the organisation and will convene specialist Expert Groups and Working Groups to deliver on specific outcomes".

The principal committees are publications and advocacy - tankers, barges, terminal interfaces;

publications and advocacy – offshore; and Programmes.

Explained simply, the "publications and advocacy" activity is about writing best practise publications and seeking input in development of regulations.

The "programmes" activity runs OCIMF's inspection and management self-assessment programs.

OCIMF was formed in April 1970 in response to the growing public concern about marine pollution, particularly by oil, after the Torrey Canyon incident in 1967. Today, OCIMF's membership includes every oil major in the world along with the majority of National Oil Companies.

The OCIMF human factors paper can be downloaded at **https://www.ocimf.org/media/167975/human-factors-approach.pdf**

Inchcape's perspective on crew changes

Shipping agency network Inchcape Shipping Services shares its perspectives on handling the challenges of facilitating crew changes during COVID-19

By David Barker, Global Marketing & Communications Manager Inchcape Shipping Services

Teafarers are invisible victims of COVID-19. Due to local restrictions and logistical challenges, hundreds of thousands have been stranded at sea, marooned on vessels for, in some cases, months beyond agreed contracts.

"In this global industry there's suddenly an explosion of local restrictions, complicating once relatively straightforward logistical operations or, in some cases, making them impossible," says Feizel Mohammed, Global Sector Head, Ship & Crew Managers with Inchcape, based in Singapore,

"You need the local knowledge to understand what you can and can't do, the global perspective to find alternative solutions, and the flexibility to adapt. It is very, very challenging."

Ports open and close for crew changes without warning. Those that are open have their own quarantine rules and durations, with a variety of routines for transit to and from vessels, and varying demands for PCR testing, hotel stays, and different crew nationalities.

Flight availability to and from hubs is, for the most part, radically different from pre-COVID times, making previously exceptional private charters a common, and expensive, solution. And a new breed of regulations has spawned an avalanche of paperwork.

"If we were facilitating a crew change of 10 people at the start of the year we'd use one minivan," Mr Mohammed says. "Now, due to safe social distancing and hygiene protocols, we'd have three, with a maximum occupancy of four per vehicle. It goes without saying how much more expensive that is."

"Crews are under extraordinary pressure at present, and that impacts upon them and their families, but also on our customer's shore-based staff that have to try and support them under exceptional circumstances," Mr Mohammed says.

"I may be going home late," he shrugs, "but I am going home. I want to make sure as many crews as possible round the world can do the same.

"There's still work to be done."

Manish Ranjan, Head of Vessel Supply Chain Hub with Inchcape, based in Mumbai, says that the company has maintained a strong level of activity in key hubs such as Fujairah, Singapore, Houston, Hong Kong, Rotterdam, Gibraltar, Panama, Egypt.

Annual crew change numbers were approaching a million in 2019. In 2020, he anticipates a fall of only around 20 per cent.

"We can see the big picture," he says. "If a crew change is impossible in one port we can advise and facilitate it in another that complements vessel schedules and operations.

"If there is a 14 day quarantine requirement in one location, incurring significant hotel costs and inconvenience, we can plan to deviate to another where, for example, there might only be a five or seven day isolation, or none.

"Because we have people on the ground worldwide we have relationships with port authorities to understand their individual needs, know exact documentation requirements and, where necessary, lobby for special considerations in extreme circumstances."

Mr Ranjan cites one case in July where several ship management customers joined forces in a bid to charter flights for 100 seafarers – from India and Sri Lanka – to fly into Gibraltar and relieve existing crews on numerous ships.

With only 48 hours notice, Inchcape conducted an operation that saw teams across continents facilitating a crew consolidation in Doha, an overnight stay in London (where a hotel was persuaded to open especially), multiple transfers, hours of immigration negotiations at several airports, and the eventual arrival in Gibraltar, from where the process started again in reverse with a number of off-signing crew travelling back to India.

"It wouldn't have been possible without the close internal collaboration of our international offices, using their physical presence and contacts on the ground to get things done. That kind of exercise build bonds, between us as a company, but also between us and the customers, as partners. It creates a deeper sense of trust."

COVID tracker

In March 2020, Inchcape launched a 'COVID-tracker' on its website, delivering an in-depth overview of evolving restrictions at major ports around the world. Combining official notifications of regulations with insights from local Inchcape people on the ground, alongside proprietary data, the tracker gives users a constantly updated picture of exactly what rules, restrictions and paperwork are relevant in any given location.

"The real-time nature of the tracker gives key decision makers, both on the bridge and on shore, the ability to understand detailed requirements and, if necessary, alter operations to best meet objectives," Mr Ranjan says.

Inchcape Shipping Services has 240 offices in 68 countries, covering around 2,500 ports, with approximately 3,000 staff. Services include full cargo agency, dry-docking management, survey and inspection, financial management and bunker calls.

Port+ improving the efficiency of tanker port calls

Antwerp based port call information provider Port+ is helping improve the efficiency of port calls, including reducing waits at the pilot station and delays in berth activity

Antwerp based port call information provider Port+ is helping improve the efficiency of tanker port calls, including reducing time waiting for berths, and improving the efficiency of work done at the berth.

It has developed an online platform which acts as a 'single source of truth' for companies working in the port, including cargo owners / charterers, terminals, surveyors, ship agents, ship operators and port authorities.

The platform, branded "Qronoport", is currently being used in the Port of Antwerp, but is also available for use by, and in, other ports.

In Antwerp, the port authority gives the solution its support, but the driving force behind implementing it comes from cargo owners / charterers, ship operators, surveyors and terminals.

Port+ has been in business since 1905, when it was signalling the arrival of ships by radio, as an independent maritime information provider working for Belgian port communities.

It has been providing a range of information services to port users since then, including information about vessel arrivals and departures, gathered with radar, and now focussing more and more on digital methods.

A platform like Qronoport would be useful in any port around the world. The main issue, says Hans De Hondt, digital solutions manager at Port+, is that nobody has overall control of all of the port processes, and not all parties have the same incentive to reduce delays.

For example, if the charterer is paying for the vessel by the day, the shipowner does not get any benefit if the port call is made shorter. A surveyor does not get paid more from doing something which might help reduce delays, such as proactively informing someone else of a change which may impact them.

Stakeholders do not all have contractual relationships with each other, or may not even know each other.

The people involved spend a lot of time chasing information with multiple phone calls and e-mails, including e-mailing spreadsheets, and do not necessarily inform each other when the information changes.

And from a technical perspective, it is quite a challenge to gather and combine data from the computer systems each company uses, plus information shared in phone calls, e-mails and shared spreadsheets. Standards for data description and exchange would be helpful, but very difficult to get agreement on within the industry.

And with each tanker operator and charterer having activities in many ports around the world, it may seem too much trouble to develop digital integrations between its internal planning computer system and a system for just one port.

The operations in the terminal for tankers can be more complex and less predictable than for other vessel types, Port+ says. There are more stakeholders involved, which means more communication needed between partners, and more difficulty to get a complete overview.

Mr De Hondt describes the current situation as "the path of lowest resistance, but definitely not the most efficient path in the long run."

Port+ is not advocating any changes which would put seafarers under more stress or push them to work faster, because it is looking at improving the efficiency of the sequence of operations, not the speed of the operations themselves, Mr De Hondt says.

It tracks how long individual operations take, so it can indicate possible delays for the next activity, not to evaluate whether they are taking too long. For example, if the terminal indicates that operations were planned to start at 1400 and will take 6 hours, but they actually start at 1530, it can estimate the new time the work will be completed.

The system could actually reduce crew stress levels, by ensuring operations take place at their planned time. If one task is delayed, that can create pressure for a subsequent task to be done faster, to make up for lost time.

Wastage

According to the company's analysis, tankers going into Antwerp spend 73,900 hours per year waiting at a pilot station for clearance to sail into the port. There are 5,300 port calls a year from tankers, so an average wait of 14 hours. 62 per cent of vessels are waiting on arrival at the pilot station.

25,850 hours of this waiting was because the destination berth was not available at the time of arrival.

Tankers (product and parcel tankers combined) spend on average 2.5 days in Antwerp. While vessels are at berth, Port+ calculates that 25 per cent of the time is wasted, defining waste as time where there are no operational activities taking place.

The main gaps are between "gangway down" and "surveyor on board"; between "lab results received" [for testing cargo prior to loading] and "cargo arm connected"; and between "completion of operations" and "actual time of departure".

Predictability

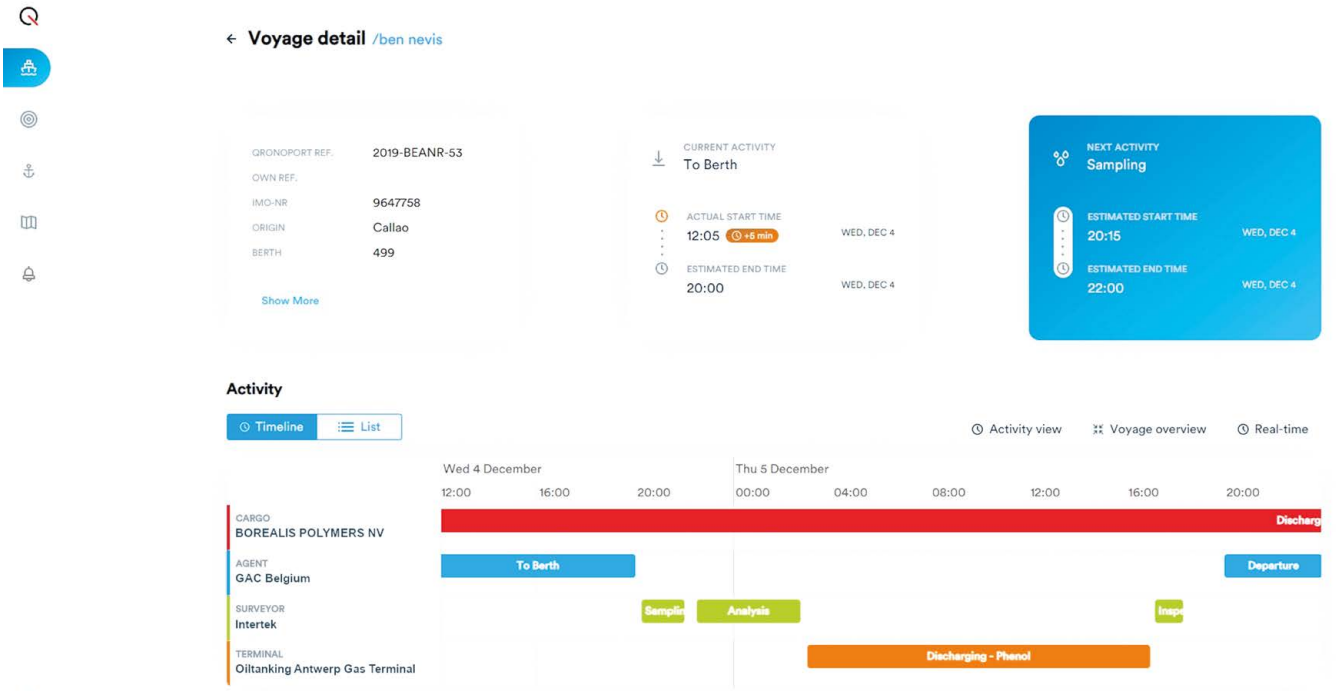
A compounding factor is the lack of predictability. The estimated time of departure for a tanker gets changed on average 3 times per port call, Port+ says. 86 per cent of tankers leave the port more than 2 hours delayed. And of the vessels with a delay of more than 2 hours, the average delay is 9.6 hours.

There are many factors which can cause the changes, including changes in operational plans, delays by any of the stakeholders, unavailability of locks, pilots or tugboats.

If the port calls could be more predictable, there would be less need to build in 'buffers' between shipments, port calls and berth calls.

Formula 1

The company takes its inspiration from the way that Formula 1 pitstop times have decreased



The Qronoport software helps everyone involved in a port call understand what is happening right now, what will happen next, and what the expected activity schedule is

from 67 seconds in 1950 to 2 seconds now.

In a Formula 1 pitstop, all of the processes have been optimised, including individuals optimising their own processes, and taking each other's processes into consideration. All possible preparations are made beforehand.

Where in 1950 the pit crew had to wait till the car actually entered the pit lane to see what needed to be done, nowadays the pit crew has all the information it needs digitally and in real time. The driver does not have to explain anything to anybody.

There is better structured communication and good access to data.

Different roles

In improving efficiency of port calls, it is helpful to look in detail at the roles, goals and incentives of the main players involved – the cargo owner / charterer, the terminal, surveyors, ship agents, ship owners and authorities.

The cargo owner has a key role in the port process, being the first to know how the cargo will be moved from one place to another. The cargo owner endures the cost of delays, so has the most to gain from reducing them. If the vessel is waiting at the pilot station before entering the port, that will nearly always count as demurrage, paid for by the cargo owner. So the cargo owner has the biggest incentive to share data with other companies.

The terminal has a key role in optimising port processes, since it has the data about the operational plans and the execution of operations. Many other stakeholders depend on information provided by the terminal, including surveyors and ship agents. The faster ships can be 'processed' by the terminal, the more vessels the terminal can handle during the year.

Surveyors take a critical role, doing sampling and analysis of cargoes. They usually get paid for by each job. It would be useful for other organisations to know what the availability of the surveyor is, when the surveyor will be at the terminal and for how long, and how long an analysis will take. Surveyors themselves are often contacted at the last minute, which makes it hard for them to do good operational planning.

Ship agents are a hub of information between parties, but they often have to chase it from everybody, while the information itself is changing. The agent has to constantly assess the situation and make estimations or decisions about what information might be wrong or outdated.

Ship operators have an incentive to get the vessel in and out of the port as fast as possible, if the vessel is on a voyage charter.

Port authorities are involved in planning pilot boats, pilots, tug boats and locks, which can also be a cause of delays. While it is easy to just blame port authorities, there is also more shipping companies can do to help them to plan, Mr De Hondt says.

"The terminal doesn't exactly know when the barge for barge-to-ship operations will arrive, the surveyor doesn't exactly know when terminal operations will be done, the ship agent often waits till the last moment to order a pilot because he's not sure when inspection by the surveyor will be done."

Qronoport

Port+ has developed a data sharing platform called Qronoport which can be made available to other ports around the world, so they can have the same service it has developed for Antwerp. Either a port authority, or private companies using the software, could take on the role of implementing the service.

Qronoport can be set up to gather data from software systems of different companies, and also take data from AIS systems, and also to be updated directly.

There are two main offerings – a central data exchange platform, where you can share and receive operational planning data with other stakeholders, and an online solution for visualizing the data, showing the difference between planned times and actual times.

It enables participants to get an accurate overview of the activities planned, currently taking place and completed.

The company is developing algorithms which can analyze the data and improve predictability (perhaps to be similar to the services which tell you "this plane is usually 10 mins late").

Each company's data is placed into its own "digital vault", and only available to another company where it has provided authorisation, and this company is linked to the port call.

If the system covers more ports, then the data integration effort would be lower for subsequent implementations – for example, a tanker operator which has integrated with Qronoport for its Antwerp port calls could also easily integrate with Qronoport for any other port in the world. TO

BAR and Cargill - yacht technologies for wind powered tankers

BAR Technologies has a project together with Cargill to bring wind propulsion technology to tankers, building on work done for yacht racing

BAR Technologies of Portsmouth, UK, has partnered with global food corporation and tanker operator Cargill, and naval architecture firm Deltamarin of Helsinki, Finland, to bring "cutting edge wind propulsion technology" to tankers.

Cargill plans to install a bespoke wind propulsion technology, named "WindWings" by BAR Technologies, on a run of medium range (MR) product tankers by the end of 2022, followed by installations on dry bulk vessels the following year.

Wind power on merchant vessels has been increasingly discussed in recent years as the shipping sector looks to decarbonise, but so far, there has been no breakthrough solution. But before you turn to the next article, consider that the BAR in BAR Technologies stands for Ben Ainslie Racing.

Sir Ben Ainslie, a shareholder and director of BAR Technologies, can claim to be the most successful sailor in Olympic history, with golds at Sydney, Athens, Beijing & London (2000 to 2012) and silver in 1996 Atlanta.

BAR Technologies was founded to commercialise the maritime design technologies and technical skills developed by Ben Ainslie Racing, a team formed to compete in the America's Cup of 2017.

The team competed in the AC45 class of the 2011-2013 Americas Cup World Series, and the 2014 Extreme Sailing Series, where it set a multi-hull record for the Round the Island Race. They then went on to win the 2015-2016 America's Cup World Series and reached the 2017 America's Cup semi-finals.

Simon Schofield, now CTO of BAR Technologies, was chief engineer for that team.

BAR Technologies' team includes naval architects and engineers, fluid and aero dynamicists, composite and structure specialists, control and simulation engineers, with experience working in a highly competitive environment. It leverages this skillset to deliver innovative solutions for high performance / super yachts, leisure marine, heavy marine, and renewables.

John Cooper, CEO of BAR Technologies

On yachts, BAR Technologies has worked with sails as big as 45m high, the approximate size it has designed for tankers. One of the key differences is that the sails for tankers will be multi-element, using solid composite materials rather than fabric and are built for longevity and robustness rather than pure performance.

BAR Technologies has also developed sophisticated weather routing applications which take wind patterns into account when planning the best route for its vessels. Its bespoke toolset ShipSEAT will also control the flying shape of the WindWings through the voyage. It has used trained neural networks to design the accompanying hull form to take most advantage of the thrust from the WindWings.

"We've spent the last 8 years predicting the performance of wings in design and on the water," Mr Schofield says of his previous career in the America's Cup). "When we talk about simulating the performance of a wing, we're comfortable with the predictions we're making."

John Cooper, CEO of BAR Technologies, is a former commercial and finance director of McLaren Racing, where he worked for 14 years on its Formula 1 racing programme. He joined BAR Technologies in October 2019.

Martin Whitmarsh, chairman of BAR Technologies, is a former Team Principal at McLaren.

30 per cent CO2 reduction

On tankers, a 30 per cent reduction in carbon emissions from a tanker voyage on Cargill's normal routes is a realistic expectation, the company says. This is based on simulation of real tanker voyages in standard weather conditions with no cherry picking, and covering both the laden and ballasted legs of the voyage. This average also takes into account the negative effects of head winds, and where the WindWings are de-powered in wind conditions that are too strong to fully control leeway.

"The 30 per cent is based on solid statistical analysis," says John Cooper, CEO, BAR Technologies. "We'll simulate 450 or 500 years' worth of virtual ship voyages with differing start times and average those results."

"Even though a key motivator for owners and charterers is reducing CO2 emissions, set to be mandated in future via the IMO rules, WindWings still presents a compelling business case."

Although he wouldn't be drawn on the exact payback time while WindWings are still in the final stages of the cost tender exercise, Mr Cooper says that the payback time of investing in the technology for tanker operators will surprise owners even when compared to relatively low heavy fuel prices, and a carbon price".

"The payback period is very low, and looking to the future, will become lower when the industry switches to the more expensive zero carbon fuels, which could be $1000 a tonne", he says.

"There are occasions with these wings, where you can theoretically turn the engine off at sea and do 13-14 knots under wind power, but of course in reality the engines will either charge or run hotel loads instead of using auxiliary gensets," says Simon Schofield, CTO of BAR Technologies.

Technology

Simon Schofield, CTO of BAR Technologies

Close up of a "WindWing"

The sail proposed for tankers, which the company calls a "WindWing", is rectangular.

The first configuration being tested involves wings 40m high, with three separate elements, a large one 10m across, and two which are 5m across, all rectangular. These three elements together act as one sail. Then there are three such sails on the ship, making for nine elements in total.

One of the biggest challenges of the project is ensuring navigator's sight lines, which the tall sails obstruct. The modern solution is to use cameras and radar. The project team is also building extending the vessel's bridge to the port and starboard, so it is possible to have a forward view which is not obstructed by sails.

The sails are designed so they are strong enough to withstand any weather conditions while upright. The sails can "feather" – spin around vertically 360 degrees. In a storm, they will align with the wind flow, and at this angle they produce very little drag.

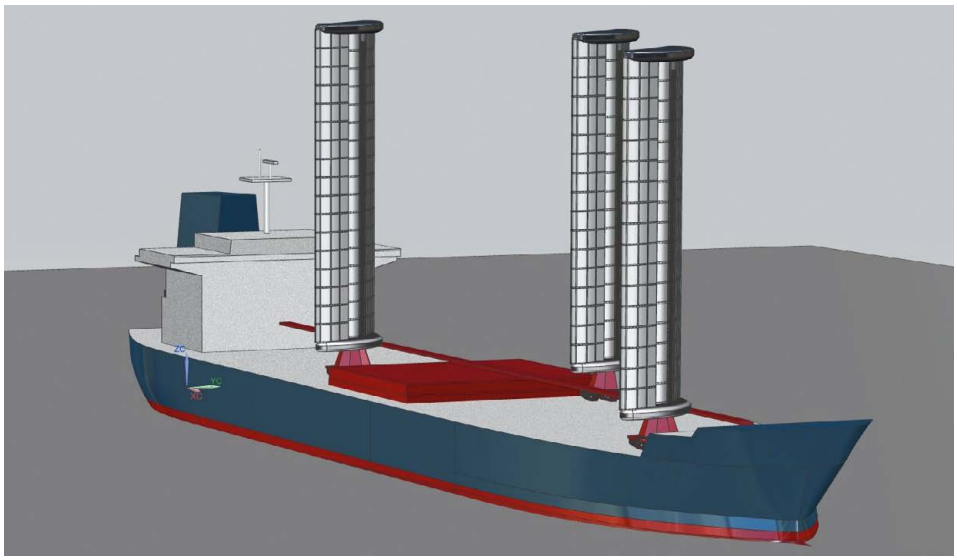
"Part of the work we did with class was ensuring that we had considered all the [possible] environmental conditions," Mr Cooper says.

The WindWings are also designed so they can be folded down flat on deck, which would be done pre-storm. They would be folded for going under bridges, and to avoid the sails causing complexities during manoeuvres in port operations, with pilots onboard or when tugboats are used.

The folding gives the sails a structural and cost advantage over a inwardly collapsing design, which other companies had considered for wind propulsion of vessels.

"We've done computer simulation on the effect the wing has on the turning circles and minimum [engine] power requirements," Mr Schofield says.

The second challenge is ensuring structural integrity. While ships have a long history of using masts and sails, these vessels will have wings made of solid composite materials, and masts made from steel.



The arrangement of WindWings on a tanker

Fixing sails on bulk carriers has additional complications compared to tankers, because the sail assembly cannot get in the way of opening bulk carrier hatches and loading and unloading operations.

Seafarers will need a small degree of training to use the system. But all WindWings' settings will be entirely automated, so it just needs to be turned on and off.

Seafarers will also need to set the best rudder angle, but the system will also advise on the optimal action. As with any sailboat, the power of wind propulsion will depend on the angle the vessel and therefore this automation is key.

The company is looking at improved hull designs together with naval architect firm Deltamarin, because with wind power, the vessel slides sideways as well as goes forward, "With minor manipulations to the hull you can provide better efficiency," Mr Schofield says.

BAR Technologies designs the wind propulsion system and controlling software in house.

Cargill project

The project with Cargill and Deltamarin was announced in October 2020 although the parties had been working together for a period prior to the announcement.

"Through this partnership, we will bring bespoke wind solutions to customers who are actively seeking to reduce CO2 emissions from their supply chain," said Jan Dieleman, president of Cargill's Ocean Transportation business in a press release quote.

"With the WindWings technology, Cargill will be able to offer customers a solution that improves vessel efficiency, independent of the fuel or type of engine used."

As of January 2020, the project is being assessed for a class Approval In Principle (AIP) process. Mr Cooper is unable to reveal the name of the class society involved due to confidentiality agreements, but says they are "well known for wind propulsion systems".

One oil and gas company and another big tanker company have participated in the workshops, but Mr Cooper is unable to reveal their names at this point, as they wish to make a separate announcement regarding them becoming a full participant in the project.

Wärtsilä – virtual fuel flow

Wärtsilä has developed a modelling approach that helps to measure fuel flow without a flow meter. This is valuable for shipowners, operators and technical managers who are looking for transparency without costly investments.

Shipping companies are increasingly having to make difficult decisions to increase efficiency. Most companies are still doing this based on noon reports.

It is difficult to achieve much of an understanding regarding the relationship between fuel consumption and speed using only data from noon reports. Until now, the only alternative option has been to install a flow meter, which gathers data about how much fuel is flowing to the engine. This comes at a high cost, not just in its installation and maintenance, but in managing the data streams it generates and establishing how it can be utilised in the decision making process.

Maritime technology company Wärtsilä understood long ago that, in order to help shipowners optimise fleet performance, it had to develop an alternative approach. By fusing manual reports and automatically gathered data from the on-board navigational equipment a vessel's fuel flow can be modelled.

The techniques behind the model are a combination of naval architecture and the latest statistical methods. This allows the model to be fine-tuned using operational data, making it self-adapting and vessel specific.

The model begins with a generic model based on vessel particulars. The model quickly learns from operational data, producing reliable results after one laden and one ballast ocean leg. As the performance of the vessel changes over time, so does the model. This allows the user to quantify effects like hull fouling.

The model can be used in multiple ways to improve operational performance. This breadth is highlighted in the software modules developed by Wartsila, covering aspects ranging from voyage and fuel optimisation to improving safety or monitoring emissions.

Another benefit of the system is that it enables companies to easily compare performance across their entire fleet, even if the vessels have different equipment installed on them.

The model can be used to identify differences between very similar ships. This enables investigations into optimal paint selection or maintenance schedule.

This modelling technique can only be used for ships where there is a direct relationship between speed through water and fuel consumption. It won't work if you have a complex propulsion systems, where there is not a constant relationship between power and speed.

Gathering data

Noon reports are a key input for the model. Gaps and errors in reporting are minimised by the model's ability to predicts the reported consumption before it is even submitted by the crew. Any errors in noon reporting can easily be discarded.

"There should not be any additional work for the crew in gathering data to feed the system. If there was, that might make the system harder to implement. The work of seafarers is already complex enough," says Carlos Losada, Solutions Manager at Wärtsilä Voyage.

An aggregated fuel consumption measurement is obtained via Wärtsilä SmartLog, an application designed to collect all the necessary data. SmartLog is readily available as part of Wärtsilä Fleet Operations Solution.

Comparing modelling techniques

Mr Losada shows three different examples of speed-fuel data. One solely based on noon report data, a second one based on a high-end auto-logging system, and a third one based on the Wartsila Virtual Flow Meter approach.

The noon report data alone just shows a few points with similar speeds and does not easily fit into a curve. Additionally, the accuracy of the reports adds uncertainty to the analysis.

The data from the auto-logging system shows an instance where the fuel flow readings became static. This shows potential challenges in maintaining the quality of the data and in processing it.

The Wärtsilä model output is similar to the output using the flow meter data but does not require any flow meter. Simplifying the setup and allowing the users to focus in making the right decision based on the results of the analysis.

So, the Wärtsilä model gives a similar result to the flow meter data-based model, but for much lower cost. The flow meters themselves

have costs of installation, calibration and maintenance, and the data streams they generate need to be processed, filtered, analysed and allocated to the right part of the voyage. "You cannot use this data without going through some heavy processing of it," he said. You also have no back-up if the flow meter fails.

"It is not necessarily true that the more we invest in data accuracy, the more we reduce the costs of running our business," he says.

Using it

Typical goals for shipping companies are to understand how much fouling is affecting performance, better plan voyages to reduce fuel consumption, ensure fuel consumption is in accordance with the charter party (contract with customers) and understand the total cost of running ships.

"Each of those areas requires a different level of granularity [of data]", Mr Losada says.

There are the many ways in which the model can be used to analyse and improve operational efficiency of a fleet. Some examples of these include optimising Charterparty descriptions, evaluating the efficiency of past voyages or improving the accuracy of commercial voyage planning. The solution is scalable, working immediately with standard equipment and processes.

By digitalising the process and making it a bit smarter, Wärtsilä takes the burden off the crew and the office. It helps to avoid 'death by spreadsheet'. If it's something you need to monitor periodically, there's a dashboard for that. If it's something that you could do with interfering there and then, there's a notification on your tablet or phone.

Auto-updating

The model does not need to go through any specific calibration process. It is "self-calibrating", in the sense that it is being continually improved over time.

The system becomes very hard to fool. For someone to be able to tweak the system, for example for it to believe the vessel had received more fuel than had actually been loaded, they would need to know what fuel consumption the computer system is expecting, then provide something slightly different to that. "You'd have to be a naval architect with a lot of free time," Mr Losada said.

The approach has the added benefit of reducing the complexity and cost that can come with recording, storing and processing vast quantities of data. Wärtsilä's aim with FOS is to give much of the value of a total fleet performance management system – one that relies on collecting and transmitting data continuously from every sensor of the ship - for a tiny fraction of the cost.

There may be shipowners that prefer the comprehensive data solution, but for many a light, cost-effective installation that yields good results without requiring an army of analysts will be the most attractive option.

There is a point at which more investment in vessel performance only leads to relatively small marginal savings, making it not commercially viable. Wärtsilä Voyage aims at the sweet spot between the level of such an investment and the associated commercial benefits.

This article is based on a Digital Ship webinar with Wärtsilä which is online here **https://youtu.be/3kIGiAjOgdQ**

A more technical webinar explaining how the system works is online here **https://www.wartsila.com/insights/webinar/virtual-fuel-flow-meter**

TO

FUELSAVE – dynamic hydrogen + methanol injection to improve engine efficiency

FUELSAVE GmbH of Germany has developed a technology which injects hydrogen, oxygen, water & methanol into the engine in a specific way. The company claims to reduce OPEX costs by 10% – and has done a successful trial on a heavy lift vessel.

FUELSAVE GmbH of Walldorf, Germany, has developed FS MARINE+ to improve the thermal & volumetric efficiency of an engine by dynamically injecting hydrogen, oxygen, water & methanol into it.

To understand one part of how it works, consider how you can make a campfire burn more strongly by blowing on it.

The fire already has access to air but by being able to condition the combustion by optimizing the air/fuel ratio for an optimized stochiometric mix makes a big difference to how it burns, and the temperature of the combustion flame, i.e. with more oxygen available.

Similarly, on a ship engine, it is possible to make the engine fuel burn cleaner and more efficiently, by changing the conditions.

By adding hydrogen, the gases entering the engine have a higher energetic state and will ignite earlier without the risk of knocking. The hydrogen & oxygen acts as a catalyst for the combustion of the main fuel, not a fuel source itself.

By adding oxygen, you make the gases burn better, but also hotter, which increases certain emissions, such as NOx emissions.

If you also add liquid methanol, it will extract heat from the engine as it evaporates, cooling the combustion, countering the increased temperature from adding oxygen & hydrogen. This will counteract the formation of NOx emissions while you still get the benefit of the cleaner, more efficient combustion. The cooler air will also be denser, so it increases the efficiency of the turbocharger and increases the thermal and volumetric efficiency of the engine.

The cleaner combustion with less soot & deposits, as reported by the engine service company and the customer, in turn, means that the wear on the engine is reduced for the same amount of 'work' as well as a longer lube-oil lifetime.

The fuel-saving effect is something similar as it happens with "premium fuels" available for your car, which achieve the required combustion pressure in the cylinder for ignition, with less fuel being used than with less good quality fuels. Therefore, you can achieve the same power output with less primary fuel.

By using the optimum amounts of hydrogen, oxygen, water, and methanol injected in different locations of the ship engine, FUELSAVE has shown on the MV Annette 25% in gross savings in primary fuel and over 16% in NET cost savings from the achieved fuel economies, while the company claims an average Co2 reduction to be around 8-15%

It has also reduced particulate emissions by 40 per cent, reduced NOx by 30 to 80 per cent, reduced engine wear by 50 percent, and reduced lube oil costs by 33 percent.

It means that the investment in the system on a tanker can make a payback in 2-3 years, the company says.

Also, having the system means it may be possible to replace some of your primary fuel with an alcohol distillate / methanol, which may be less expensive and is currently available in 90% of the top 100 major ports.

The system may have additional benefits if the vessel is running on biofuel, which can emit 60 per cent more NOx than conventional fuels, the company says.

But there does need to be careful modelling of the combustion process to work out how much hydrogen, oxygen, and liquid methanol to inject.

The injection process is called "dynamic load-based injection" and the overall process is called "combustion conditioning".

The hydrogen is generated on-site by electrolysing water.

The inventor of the technology, Dirk Hoffmann, who currently serves as CTO, originally conceived the idea as a way to make truck engines more efficient with hydrogen and ethanol injections and has been working on the technology for the last 15 years.

Commercial arrangement

The biggest areas of capital expenditure are the methanol tank, the electrolysers, control cabinets, and a water treatment system.

FUELSAVE prices its technology and service based on the aim to ensure companies get a return on their investment within three years. It is so confident in the financial benefits that it is willing to sign contracts with tanker operators that guarantee a certain level of return on investment.

Due to the capital costs of the equipment, this ROI is easier to achieve the more hours per year the engine is running, and the more fuel is being consumed by an engine

Another possible business model is to lease the equipment to a customer, with capital costs paid for by companies & funds seeking to make an environmentally friendly investment. It means the shipping company has no CAPEX. "This is something we hope we see more in the future," says Marc Sima, CEO, and co-founder of FUELSAVE.

FUELSAVE started to commercialize the technology for 4 stroke engines and will validate the technology as well on a testbench in 2021 with the latest generation dual fuel slow speed 2 stroke engine.

Implementation

The system is packaged as a retrofit

solution, which can be installed by a team of 3 people over 3 weeks, including while the vessel is sailing.

It needs about 24 hours when the engine is not operating to connect the system to the engine, which can be done in a port or on anchorage, Mr. Sima says.

The liquid methanol is stored in a separate tank, which might be easier to install in a dry dock but is possible to install as well under voyage.

FUELSAVE would work together with the engine manufacturer on the project implementation, to help do a risk assessment for that particular engine, as well as to provide engine manufacturer approval and result validation.

SAL Heavy Lift project

So far, the technology has not been tested in tankers, but it has been used for 2.5 years on a heavy lift vessel with a 4-stroke engine. The vessel, MV Annette, is operated by German shipping company SAL Heavy Lift, part of the Harren and Partner group

SAL had temporary approval from DNV GL for the project, as the solution featured a non-permanent storage tank for the pilot phase. After its successful completion, FUELSAVE was awarded a Eur 5M contract to install the system on 6 ships with 93 MW combined engine power.

The performance of MV Annette's engine and the findings was thoroughly analysed by class (DNV GL inspectors) as well as the engine service company (Carl Baguhn Hamburg), Castrol, and the customer SAL Heavy Lift

FUELSAVE has secured EU funding to test out the system on a 2-stroke engine and has a test bench slot with one of the world's largest engine manufacturers. Additionally, the company has an LOI from "one of the world's largest independent container ship operators," to deploy the FS MARINE+ solution on a 70MW slow speed 2 stroke main engine, Mr. Sima says.

Letter of appreciation

A "letter of appreciation" from a SAL engineer to FUELSAVE is published on its website, stating that the system ran for around 4,000 hours on MV Annette between May 2016 and March 2018, and achieved 25 per cent gross fuel savings.

Chief engineer Janusz Rut states:

"From the vessel side, the handling and attendance of the plant was easy and not bothersome. The service needful was limited to the minimum. The big screen gave an excellent view on all parameters.

"The engine condition: The engine examination carried out by the Carl Baguhn Company revealed that the engine components (piston, piston rings and charge air cooler) are much cleaner than usually. That was confirmed at the end of the test by the endoscope inspection.

"Lube oil running hours: As a result of the engine examination, it was decided to extend running hours of the lubricating oil. The samples were sent regularly every 250 hours for analysis and proved the oil running hours may be extended till almost 2000 hours.

"Air pollution: it is well known that not 100 per cent of the injected fuel is burned inside engine's cylinder. The hydrogen plant increases this value significantly giving cleaner exhaust gas and less primary fuel consumption.

"Summarise the hydrogen & methanol injection solution which was installed on MV Annette is worth consideration as future solution for an air pollution reduction giving the profit for the owner at the same time."

https://fuelsave-global.com/

Solving the commercial challenge of decarbonisation

The challenge of decarbonising shipping is more about figuring out who will pay for it, or how it will be made fair on companies which spend money on zero carbon fuels – one of the conclusions from an ABB webinar on decarbonisation

The biggest question in maritime decarbonisation is probably who will pay for it, or how companies will be able to justify the expense financially, not how we do it, said Lars Robert Pedersen, Deputy Secretary General, BIMCO, speaking at a webinar organised by ABB.

"That's probably the real question we have to answer, how will we make this possible from a commercial standpoint."

Ships operating with decarbonised fuels will have "a very different cost basis".

Since requirements to decarbonise are unlikely to apply to all ships at the same time, there will be a time where some ships are using zero carbon fuels and some are not – and so the ones using zero carbon fuels will be at a commercial disadvantage. In a competitive market, this will make zero carbon fuels very hard to commit to.

"There has to be some measure that can somehow equalize this [commercially] between operators, such as from regulators imposing a cost on emissions. We don't know how to do this yet. That's a big question we have to answer."

IMO's goal is to reduce total emissions from shipping by half, but that does not mean every ship will halve its emissions. "Of course it entails that some ships do more than others."

"I'm quite sure we need regulations to assist this, the market itself will not solve it."

It would help push things in the right direction if the costs of running a low emitting ship could be equalised with a normal ship,

"We often hear shipowners have deep pockets, but they do actually have a bottom. There's no way the industry can fund this."

The webinar was organised as part of the "ABB Industry Expert Day" on October 21, 2020. ABB Turbocharging is a leader in the manufacture and maintenance of turbochargers for 500 kW to 80+ MW diesel and gas engines.

Speakers on the ABB webinar: Lars Robert Pedersen, Deputy Secretary General, BIMCO; Christos Chryssakis, business development manager maritime with DNV GL; Kang-Ki (KK) Lee, senior vice president AVL List GmbH and Christoph Rofka, Vice President – Head of Technology at ABB Turbocharging. Moderator (left) Désirée Duray

Audience opinion

The audience was asked twice, at the beginning and at the end of the webinar, "do you believe it is possible for an ambitious deep sea shipowner to decarbonize completely before 2050?"

At the beginning, 49% said yes, 29% no, and 22% not sure.

At the end, 56% said yes, 26% no, 18% not sure.

So the webinar managed to change the minds of 7% of the audience.

Commenting on these results, BIMCO's Mr Pedersen said it came down to the word 'possible'.

"Because it is possible doesn't mean that it gets done. We can definitely not say it is impossible."

AVL

Kang-Ki (KK) Lee, senior vice president of engine testing company AVL List GmbH, said that with a mixture of regulation, public attention, technology and research, "I'm confident [decarbonisation] can be done at the end of the decade."

"Fuel suppliers are very well understanding that the solution needs to be found. The pressure from the regulator is now bigger than ever."

AVL says it is the world's largest independent company for development, simulation and testing of all types of powertrain systems (combustion engine, transmission, electric drive, batteries, fuel cell and control technology) with over 11,500 employees. Mr Lee is responsible for "High Power Systems" at AVL.

"From my perspective [I see] a few high profile owners who are really concerned about [their] public image will be first to attempt this goal."

Shipping is still a very fragmented business, he noted. In some areas, "it's a big challenge for regulation to be enforced."

"Incentives in the way of subsidies may help a little bit, but usually they are not in the order of magnitude [needed] to make the fundamental change."

There is "a large group of conservative owners in the maritime industry" who will delay investing in zero carbon ships "until there are no other ways to avoid."

So we'll need rules. "The rules should apply

for everyone. No exemptions, no last minute uncertainties. Be quick, be clear, be consistent."

It may be very difficult to make it worthwhile to make a business case for converting an existing vessel to dual fuel, since it has less operational years left to payback the investment than a new vessel, he said.

In terms of the type of propulsion system we might expect, Mr Lee believes the internal combustion engine is likely to remain the major power source for ships. Other solutions (such as batteries) will be only for near sea and coastal shipping due to limitations in the range, he believes.

BIMCO perspective

"We need to have ships probably by the end of this decade, on the surface of the oceans, with zero emissions," said BIMCO's Lars Robert Pederson.

The shipping industry carries a wide range of products, from raw mineral cargo to very expensive product cargoes, and correspondingly there is a diversity between companies in the desire to decarbonise, he said.

Mr Pederson noted that in the decades leading up to 2009, the amount of trade carried by ships, and the emissions from ships, went up at the same rate. But after 2009, emissions and trade decoupled, with trade continuing to grow, but emissions not. The emissions for 2018 are actually slightly below 2008, although not a big enough drop to achieve the desired carbon ambitions.

For further decarbonisation, "the framework is there, the world is tuned into doing this," he said. "[but] it is not something which will come about tomorrow. We are looking at a very long haul effort."

Mr Pedersen is not an enthusiast of the European Union's plans to include shipping in the European emissions trading scheme. "We need to address this at the IMO," he said. "we think the EU actions are something which might have a negative effect. It might derail what goes on at IMO."

Mr Pedersen is pleased to see charterers getting involved in driving lower emission shipping. "[For them to] take upon themselves the responsibility for decarbonizing the ships they operate is hugely welcome for the shipping industry. Charterers are an integral part of the solution – they are in charge of the operational emissions from the ship."

DNV GL

Christos Chryssakis, business development manager maritime with DNV GL agreed that it is possible to decarbonise shipping from a technical point of view, but commercially there is much more to be done "developing the right conditions and right regulations to encourage and incentivize."

"It is possible to decarbonize your fleet, but it is going to be a very expensive exercise if you do it by yourself."

For today, "We have LPG and LNG available. We know this is not going to be the final solution, they are still fossil fuels, but we should take a pragmatic approach and use what is available today.

"If we look further into the future, we need carbon neutral fuels. The technology is there, we know how it works."

If we are agreed that we will stick with internal combustion engines for shipping, it means that the "energy transition" can only happen in the fuel supplied to the engine.

"Hydrogen as a zero carbon footprint fuel is a good starting point. But it is still practically hard," he said.

The remaining options are "blue LNG" (made from hydrogen and re-used CO2), biofuels and ammonia, all of which can be burned in a combustion engine. The combustion engine will need continued development for fuel flexibility.

We can make natural gas or diesel using CO2 which has been claimed from being emitted elsewhere, so overall the maritime usage of the fuel is carbon neutral, he said.

"The main challenge is that these fuels will be much more expensive than their fossil equivalents. This makes them very unattractive," he said.

The same with biofuels. "You cannot use them in large amounts because you will not be able to compete."

Also, the infrastructure to create the fuels is needed. "This is something shipping cannot do by itself."

Mr Chryssakis was asked why shipowners should invest in LNG fuelled ships now, if the greenhouse gas benefits are "marginal" and they might be able to just use "clean fuel" in their existing engines later when it becomes available. He replied that LNG is something we can start using today, and we do not yet know what we will be using in decades to come.

LNG and LPG can offer 15 to 20 per cent reduction in carbon emissions today. "We think that this is an urgent problem, so we need to start doing something today."

All the other low carbon options might be a decade or more away. "Any low carbon solutions we know of today – biofuels, synthetic fuels, hydrogen, ammonia – are [either] not available in large volumes or technology is not mature yet. We think we cannot wait until 2030 or whenever these fuels start becoming available."

"If and when new low carbon fuels become available, we can start gradually replacing fossil fuels with low carbon equivalent. LNG / LPG will help us to do something in the meantime."

ABB Turbocharging

Christoph Rofka, Vice President – Head of Technology at ABB Turbocharging, believes it is important that the industry decides now what options to go for, and "gets a lot more vocal" in pushing for synthetic fuels "at the right amount and right places at acceptable cost."

"There is an increasing understanding that these fuels will mostly be derived from hydrogen, blue [from fossil fuel with carbon capture and storage) or green [produced from renewable electricity)" he said.

"I think there's a broad consensus that the piston engine will stay but it has to burn fuels with a very low net carbon footprint.

There are a number of pathways starting from hydrogen. "Some are very easy to take for shipping," he said.

For using pure hydrogen or ammonia, "the industry still has to make some efforts to get confidence these are alternative fuels we can cope with. There's no winning solution yet," he said.

We will need to use decarbonised fuel based on fossil fuels rather than renewables, because there won't be enough renewable energy available, he said. EU's "Green Deal" ambition is for 40GW of renewable power in the EU, and a further 40 GW imported. But that would only provide 10 per cent of what global shipping needs, even if shipping was given all of the 80GW – and the Green Deal does not consider global shipping. Industries which operate entirely within a country, such as chemical and steel, would have a higher priority.

"It will be a challenge for shipping to have access to fuel [from renewables]."

"It will require private investors to invest in specific countries."

Mr Rofka was asked where else shipping companies should be seeking to improve their technology. He replied that overall energy efficiency will be very high on the agenda, including optimising the voyage and the port calls. "It will be increasingly supported by data," he said.

In terms of the oil and gas companies which would need to provide the decarbonised fuels, Mr Rofka said, "I see them or perceive them more in [saying] 'tell us what you need, and we will make it'. I would like them to be more pushy and say, 'we do this'. They are too passive for me at the moment."

The webinar this article is based on is online at **https://youtu.be/LMzqplPRRiw**

Optimarin – UV "definitely" for medium size vessels

Using a UV ballast water system has clear advantages over an electrochemical system for tanker operators with sufficient power to run it for the amount of water they need to handle, such as medium size product and chemical tankers says UV supplier Optimarin

"What we see, if you have enough power to use a UV system, you should definitely use it," says Tore Andersen, executive vice president sales and marketing with UV ballast water equipment supplier Optimarin.

"It is easier to use, it is harmless, you have no chemicals to carry around. It is much cheaper to install."

Using UV, you are not restricted to only using water with a certain salinity level – which can be a challenge for systems utilising electrolysers.

"On the other hand, if you have a huge tanker with limited power, bigger flow, bigger volume, there's no choice, you have to go for an electrolyser."

Within the tanker sector, Optimarin focusses on medium and small sized ships, not VLCCs. A medium sized vessel may need 500 KW of power to run a UV system.

Optimarin system

Optimarin has been developing systems for over 25 years, and has around 800 systems on vessels sailing today.

Current Optimarin customers include Utkilen, Trafigura, Hapag Lloyd, Fednav, GulfMark, Hapag Lloyd, Matson Navigation, McDermott, the Danish Navy, MOL, Seatruck and Technip.

The company's systems are installed on about 100 tankers, including product tankers and smaller chemical tankers.

"It is a proven system, especially on the tanker side," Mr Andersen says. "Owners are talking to each other, saying, 'this is a good system, this is reliable, we try to meet on delivery time, the service they offer globally is good'".

As a UV system, "the running cost is quite low, not too much spare parts to be changed, the system is very stable, it is easy to use, there's not many mistakes [by crew]," he says.

When it comes to choosing a system, tanker operators choose Optimarin because they know "you should choose a system that is proven and we know will work," he says.

"And also we have a good enough service network, people who can assist you if something goes wrong."

Installations can cost between half a million dollars to a million for a large vessel.

"It is important not to pick a system because it is $10,000 cheaper, have a look at what you can get for your money, ask for a reference, so you can talk to some other user," he said.

Approvals

In October 2020, Optimarin received a revised IMO G8 certificate for its ballast water management system.

The revised IMO G8 guidelines came into force on 28 October 2020. All systems installed after that date must meet the new, stricter criteria to comply with IMO's Ballast Water Management convention.

(For systems installed before this date, the existing type approval remains valid).

By October 2020, only a small number of suppliers had the approval.

"I expect quite some few will get the certificate in the coming months," he says. "My message is, make sure that when you choose a maker, they have those certificates ready."

"All of us had to go through quite some extensive testing – it costs money."

As of December 2020, Optimarin was the only UV supplier to be approved by USCG with a choice of two filter manufacturers – Filtrex or Boll, in this case.

The system also has certification from classification societies ABS, BV, DNVGL, LR, CCS & MLIT Japan.

It has ATEX and IECEX approval from USCG and IMO for the system to be used in hazardous areas.

Remote support

Optimarin's systems have a remote monitoring and support option.

The system can be configured to send a wide range of data to Optimarin's cloud server for access by its customers, such as about power consumption and water pump rates.

Shipping company staff can connect to the system and try to diagnose problems or alarms, or update the software. Optimarin has a 24 hour service desk.

The system can connect to the vessel's computer network, so it is possible to control the ballast water system from anywhere onboard, if there is a network connection.

Delays to installation

The Covid period has been difficult for ballast water suppliers, with an increase in the number of ships being sold to new owners, delays of installation and also difficulties finding dry dock space for installing systems.

Tight finances mean that shipowners have been seeking to delay installation for as long as possible. But they don't have unlimited flexibility here, the deadline is their first renewal date for an International Oil Pollution Prevention Certificate after Sept 7, 2017, and certificates need to be renewed every 5 years.

Leaving it too late may leave companies with reduced options for a supplier.

"That's my biggest fear, that shipping companies, tanker owners included, are dragging their decision very much out, ending up with a challenge to get proper engineering done, supply systems in time," Mr Andersen says.

About 2 years ago, all system suppliers were specifying a 6 month delivery time for a system, but now they are under pressure to reduce that, he says.

The market is also becoming more price competitive.

"It is not a good situation for any of us [suppliers]. It could be avoided with having the market slightly different," he said.

Water quality

If you operate a UV ballast water system, you need to consider what kind of water you are using for ballast. It will be harder to remove the microbes with UV if it has a lot of sediment in it, because this is harder for UV to penetrate. This could apply if you are taking ballast in a river or a challenging harbour.

Companies can plan for this, such as by loading some of the required ballast water on their way into the harbour, rather than when they are in the harbour, Mr Andersen says.

The ballast water system has input-orientated sensors, which measure the opacity of the water (how hard it is for light to penetrate), and will reduce the water flowrate accordingly to ensure compliance. This will mean that high sediment water takes longer to treat.

In an extreme situation, the system will sound an alarm saying that the water is too opaque for the UV system to work.

Testing

In terms of testing, there are US rules saying that ships going to the US need to do bacteria testing once a year. Companies can do it themselves or hire a company to come to the harbour to do it, Mr Andersen says.

One challenge with testing is if the tanks contain a lot of sediment, so when you pump water in the tank, and then it mixes with the sediment already in the tank, the system can fail because the water contains sediment.

"To avoid this you need to make sure the tank is clean," he says.

"When you do the test as we have described in our manual it is not a problem."

"The testing for type approval is much tougher than the tests you do on ship."

TO

The aft peak tank – ballast water challenges

Tanker operators are struggling to treat ballast water from the aft peak tank, as the water cannot be mixed with the main ballast cargo, so it needs a separate system and there is not much space

By Kevin J. Reynolds, managing director, oneTank

Handling ballast water in aft peak ballast tanks on tankers is a challenge. By regulation, the water can't be mixed with the cargo body ballast water, due to the risk it gets contaminated by oil from an adjacent leaking cargo tank. This would be an explosion risk. So it needs a separate ballast water treatment system.

Aft peak ballast tanks typically hold just 5 per cent of the total ballast water volume on tankers and have a volume flow rates of around 200 cubic meters per hour.

This tank is very different than the cargo body ballast tanks that are filled and emptied in coordination with cargo operations.

The aft peak tank water is used for purposes such as cooling the stern tube bearing, dampening propeller vibration in the stern, ensuring propeller immersion. More recently it has been used as salty feedwater for electrolytic based ballast water treatment systems, where the salt is used to generate sodium hypochlorite as the ballast water disinfection chemical.

To comply with ballast water regulations, tanker operators face a choice of decommissioning this ballast water tank and losing these important functions, or installing a ballast water treatment system dedicated to the aft peak tank.

The oneTank equipment, including a circulation pump, bulk chemical drum containing bleach, and a small neutralizing tote containing sodium thiosulfate

There is not usually much space available for a system near the aft peak tank. Companies will often select a smaller version of the same ballast treatment technology selected for the cargo body ballast tanks. This is not often the optimal decision in terms of arrangement, operations, or cost.

Such systems have features that are not needed when treating only the aft peak tank, for example filters for pre-treatment, which then require backflushing pumps, flow monitoring, and flow regulation.

If the disinfection uses UV bulbs, the system additionally needs protective sleeves, careful cooling considerations, and a means of wiping or acid cleaning the sleeves.

oneTank ready for installation on a fishing vessel, the same size unit as used in tanker and bulker aft peak tanks

If it uses electrolytic systems, the cells require cleaning, and the generated hydrogen gas requires dilution and venting to a safe place.

Both approaches also require a final step, either a second UV disinfection stage on discharge or a neutralization stage for the electrolytic systems.

A smaller system

My company, oneTank, has developed a low-cost, compact, easy-to-install system that is IMO BWMS certified and US Coast Guard type approved. It is designed specifically for the aft peak ballast water tank, treating tank volumes of up to 4,000m3. oneTank is intended as an add-on, complementary to the cargo body ballast water treatment system, but a smaller, simpler, and lower-cost solution.

oneTank was designed to keep the aft peak tank installation simple. There is just one assembly to install which minimizes the number of foundations and components to handle. The unit itself has a small 559 x 604 mm footprint which is very helpful in a busy and crowded engine room, particularly the lower aft engine room space near the aft peak tank.

The onboard computer performs all operations automatically, including regulatory required records.

The unit requires a single 120 VAC feed at 15 amps, or 220 VAC feed at 7.5 amps, to power the onboard computer and dosing pumps.

The circulation pump creates a circulation loop from the aft peak tank through the oneTank unit and back to the aft peak tank. oneTank automatically calculates the amount of bleach needed, applies it, and measures the result.

A twenty-four hour hold period is required between the disinfection and discharge to the sea. A neutralisation process is also required before discharge to the sea, with a one hour cycle of adding sodium thiosulfate into the ballast tank. Afterwards, the system verifies that the water is ready to discharge.

The typical tanker aft peak installation requires a 120 m3/hr circulation pump. Usually, an existing general service or fire pump can perform this. Alternatively, oneTank can supply a new dedicated circulation pump.

The system is offered in a standard, off-the-shelf package for USD 65,000, which can be shipped anywhere in the world.

With some variation depending on labour rates, the installed cost of a oneTank system is estimated at USD 95,800 if using an existing pump and USD 118,000 if installing a new, dedicated pump. These estimates are as much as USD 100,000 less than some recent installations we have seen for tankers with a filter and disinfection solution.

One barrel of bleach typically costs USD200 and can treat more than 1,000m3 of ballast water, adequate for most aftpeak tanks. A 20-litre pail of neutralizer chemical typically costs USD25 and will neutralize more than 1,000m3 of ballast water.

oneTank announced in December 2020 that it had won a contract with Overseas Shipholding Group (OSG) to provide an aft peak ballast water treatment system for a tanker.

oneTank was founded by marine engineers. It builds its treatment system in its main facility in Seattle, and offers applications engineering, installation and commissioning support, and a robust spare parts and service program. The company is a wholly-owned subsidiary of marine consulting firm, Glosten.

Hiring ship armed guards – beware race to bottom

Cost pressures on tanker operators, and increased operating costs of running security companies, has led to shipping companies hiring security companies which cut corners, warns security consultancy Dryad Global *By Dryad Global*

Ship operators hire armed guards to countenance the potential use of lethal force to defend a vessel in extreme and proscribed circumstances.

It's a serious business and has potentially significant consequences.

However, there continues to be a trend within some quarters of the industry that devalues the importance of armed guarding through low prices and loose guidelines.

The costs of placing armed guards has risen considerably since the disruption caused by COVID-19 took effect.

But this does not mask the relentless downward pressure on prices [for security companies] over the previous 24 months and barely alleviates the financial pressures of increased operating costs and reduced business volume induced by the pandemic.

In response, this precipitated a race to the bottom price war amongst some providers looking to retain market share at all costs.

To achieve rock-bottom prices compromises have been made, short-cuts taken, standards lowered, blind-eyes turned, ignorance and indifference ingrained on both sides of the supply and demand equation.

However, failing to understand and assess the threat for each specific transit, ignoring and failing to interrogate financial substance, capability and operational standards of the private maritime security company (PMSC) is a dangerous game and has serious consequences.

The impact of Covid-19 on the movement of personnel between vessels and ports, the extended levels of isolation at sea, poor working conditions and financially struggling PMSCs mean there are a number of significant factors that vessel operators need to consider.

Due diligence in terms of SOLAS and financial viability are of paramount importance to safeguard cargo, crew and reputation.

In light of operational difficulties an increasing number of operators are failing to carry out due diligence on the armed guards they use, opting for the cheapest options to ensure they meet the minimum requirements of their insurance providers for transits through high risk areas like the Gulf of Aden and Indian Ocean.

When it comes to hiring personnel with designated security duties including armed guards, vessel operators will invariably get the service they pay for and thus are liable for the associated heightened risks of dealing with such providers.

Vessel protection and armed guarding should be defined by the highest of standards and needs to provide vessel operators with quality assurance at its best.

In a commoditising industry we aim to stand out for our refusal to cut corners.

For each voyage, the decision to engage a PMSC is an operational one, which should be based on a bespoke voyage-specific risk assessment.

Due diligence in the selection of a private maritime security company (PMSC) is indeed able to be conducted upstream of such a requirement but should be thorough and potentially revisited in part if their engagement is deemed necessary.

Ukranian dispute

In two separate incidents in July and August 2020 a Ukranian private maritime security contractor working for private maritime security company Alphard hijacked two vessels and their crew in a dispute over working conditions and pay.

On July 21, the Jaeger bulk carrier embarked three security guards in the Indian Ocean before sailing towards the Red Sea, a transit through the High Risk Area (HRA) that the Eagle Bulk company has completed for all transits for over ten years.

Reports say that once onboard, one of the guards took control of the vessel, asking it to deviate from its course, while voicing grievances and demanding compensation for late salary payments.

On August 21st, the same Ukranian, still working for private maritime security company Alphard, broke into the armoury onboard research vessel Golden Palm and took the crew hostage again in his fight over back pay.

The Ukranian guard had been stuck at sea for over 5 months, without pay and with no prospect of relief. Although a grievous criminal act, the circumstances drove him to desperation.

The Eagle Bulk and Golden Palm incidents aren't isolated, they are just underreported in the public domain.

What the PMSC's are facing is a pressure cooker of factors that are putting unacceptable levels of pressure on crew and guards.

The incidents onboard the Eagle Bulk and Golden Palm shine a light on the desperate working conditions faced by some private maritime security personnel.

PMSCs continue to offer dangerously low prices for the contracting of their guard services which has a knock-on effect for its employees.

Ship operators have a duty of care to ensure that the PMSC they select to contract for their transit security requirements maintains the highest standards in relation to seafarer's welfare and industry best practice.

TO

Dryad Global acts as a broker to supply embarked security teams. It conducts thorough due diligence checks, and ensures the correct vessel protection measure is contracted for the specific risk of the ship operators' transit. Further information about this story is online at **https://channel16.dryadglobal.com/hiring-ship-security-personnel-and-armed-guards-what-you-need-to-know**

Gulf of Guinea – understand changing risk patterns

The risk patterns in the Gulf of Guinea are changing on a weekly basis and it is worth tanker operators keeping up to date in how they are changing, says Max Williams, COO of maritime security consultancy ARC

"When shipowners are looking at routes into the Gulf of Guinea ports they should take into account the current situation, and constantly look at that," says Max Williams, COO of UK maritime security consultancy ARC.

Mr Williams notes that while West Africa piracy got a lot of attention during 2020 due to a number of high profile incidents, the number of incidents and kidnappings were actually less in 2020 than in both 2018 and 2019.

In 2018, most of the attacks were south and south-west of the Bonny River area of the Niger Delta, south of Port Harcourt.

In 2020, there were attacks across the region, including in Nigeria, Benin, Togo, Ghana and the islands of Sao Tome and Principe. In November 2020, more attacks were seen offshore Benin to the west of Nigeria. "We saw attack after attack," he says.

A risk assessment done at the time the voyage is fixed may need to be changed at short notice, along with passage plans, he says.

Company security officers and masters should not believe that the risk suddenly changes when you cross a line in the sea. "That's wishful thinking," he says.

Mr Williams believes that the majority of attacks are piracy groups trying to make money from kidnapping. The general model of piracy is to try to get onboard, quickly grab crew members and get off within 30 minutes.

Cash is still the preferred means of paying a ransom.

In October 2020, the Lloyds Joint War Committee expanded its Gulf of Guinea risk area – it previously covered the waters of Nigeria, Benin and Togo, now it covers the waters of Equatorial Guinea, Cameroon, São Tomé, and the northern waters of Gabon. It does not include Ghana, which has seen a number of incidents, Mr Williams says.

Security options

Carrying private armed guards with their own weapons in the Gulf of Guinea is not allowed, as it is in the Indian Ocean. "The only permitted armed weapons are those of local navies."

The reason is that the governments have concerns about armed foreigners coming on land in the region. Indian Ocean vessels, by comparison, typically pass through the seas but do not call at ports in Somalia and Ethiopia.

It is possible to arrange for a navy team to be onboard your vessel, or in an escort vessel. The vessel itself is privately owned, but must be approved by the Nigerian navy and painted navy grey, and be Nigerian flagged, with gun mounts to the fore and aft.

ARC is able to assist arranging such a vessel. The company provide security escort vessels depending on the speed and type of vessel requested by the client. Many of our clients will request a 'Tier 1' escort vessel which is capable of achieving speeds up to 16.0 Kts, but we have others who have slower speed vessels and will accept a 'Tier 2' which can transit between 10.0 to 12.0 Kts," he said. "ARC has built its reputation in West Africa with the quality of delivery, which we deem to be critical, and not low value services. It is a recommended, frequently used option by tankers in Nigeria," he said.

This vessel is not able to go outside the Nigerian EEZ though, something pirates are aware of, leading to attacks on the edge and outside the EEZ.

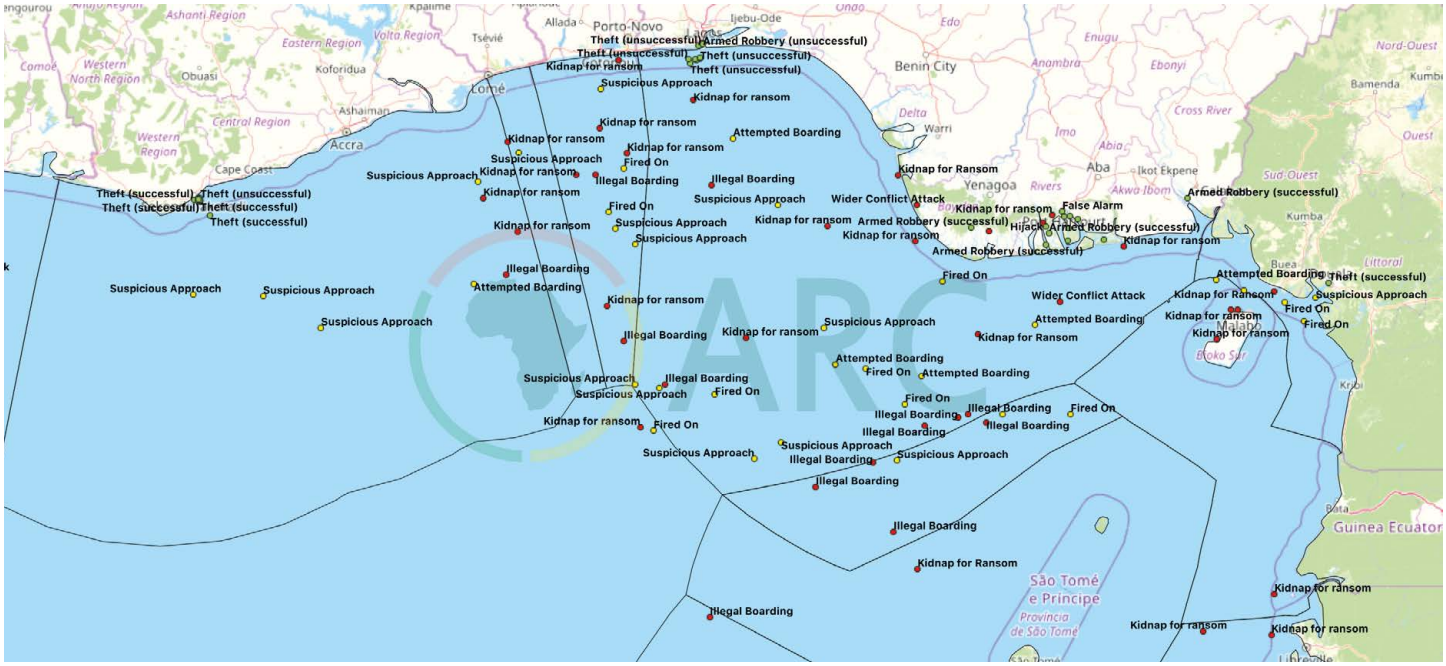
A vessel calling in a Nigerian offshore terminal would typically have an escort vessel meeting it at the edge of Nigeria's EEZ, escorting the vessel into port, waiting just outside the terminal while terminal operations are taking place (2-4 days), then escorting it back out.

Crew training

There have been several incidents of ships defending themselves – with no [external] security onboard, he says. "Crew training is a valuable thing to put time and effort into."

"If you have crew trained and well drilled in

A Togo Navy RHIB (rigid hull inflatable boat) providing security to a tanker, arranged by ARC



Piracy incidents offshore West Africa during 2020, mapped by ARC

what they need to do in an event of an incident, crew will feel more confident going to an area like West Africa where there's a threat."

The highest risk is omissions in watchkeeping, so pirates manage to come onboard without being noticed.

Citadel

If the crew are unable to stop pirates getting onboard, but detect them in time when they onboard, crew may be able to get to a citadel. This is a place crew can lock themselves inside, where they are safe from pirates, although often unable to operate the vessel.

For a shipowner, "building a citadel is a very effective and long term cost saving measure," Mr Williams says.

With crew in the citadel, you can only wait for pirates to leave, or rely on navies to rescue the vessel. There have been cases of vessels in international waters in the Gulf of Guinea which have been rescued by navies from Italy, Spain and Portugal. But "it can be a very slow response time," he says.

If you are in national waters and near the coast, the response should be faster.

It is important to have satellite and VHF communications from the citadel. A satellite phone can be used for communications with the office, but the local navy may expect to use VHF.

"If they can't communicate with you onboard, the navy probably won't board," he said. "They don't know if any crew have been taken. Or the crew can come out, and they don't know who is a pirate and who is not. It can result in a dangerous situation."

In one case, ARC was asked to liaise with the a local Navy on behalf of a vessel with pirates onboard, where there crew were in the citadel. The crew were able to speak to the company by satellite phone, but not talk to the navy directly.

Long term solution

The only way to resolve the problem at its root is to resolve the conflicts in the Niger delta, which have been going on for decades, since oil was first produced in the 1950s.

"Unless those problems are solved the issue will continue to run and continue to affect shipping," Mr Williams says.

But it is not the only conflict the Nigerian government has on its hands. There is the Boko Haram war in the north with roots in Islamic fundamentalism and the economic situation; a conflict in Nigeria's Middle Belt, the dividing line between the Muslim North and the mainly Christian South; and the Niger delta. There are also refugees coming from Cameroon; public protests against police brutality; and Covid-19 demanding the government's attention.

An ARC security adviser on board a tanker in West Africa

Perhaps oil companies operating in the Niger Delta are able to play a bigger role in combatting piracy. "They have quite a crucial part to play, they know the area very well, they are very powerful in the area," he says. "If there's buy-in from them to improve the security system, there will be buy-in from the federal government."

One difference between western African piracy and Somalian piracy is that it is proving much harder to identify where the attackers are based on land. "Pirates move around a lot in the Delta. You can't say 'this village, this area'. We know that from reports of crew members that had been kidnapped."

"The situation in the Delta is very fluid, it is a very difficult area to map and patrol and increase security in. It is very underdeveloped, with very few roads. It is very hard for law enforcement to secure the region."

About ARC

ARC has been specialising in maritime security in the Gulf of Guinea since 2016.

It has UK offices in London and Exmouth, and African offices in Togo (Lomé), Benin (Cotonou) and Nigeria (Lagos and Port Harcourt). Its local staff give it a good ability to follow local issues.

The company provides its own advice to clients and passes along relevant advice from port authorities and regional authorities such as MDAT-GoG, (Maritime Domain Awareness for Trade – Gulf of Guinea), a cooperation centre between the Royal Navy (UKMTO) and the French Navy (MICA-Center).

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