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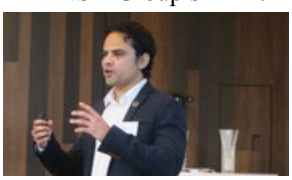

DECARBONISATION

SOFTWARE, DATA AND EQUIPMENT

News from OCIMF

A summary of OCIMF's November, December and January newsletters. SIRE 2.0 developments, publications, ship to ship provider assessment, data for FuelEU Maritime

OCIMF's VIP (SIRE 2.0) steering group met in London in January, and shared inspection statistics, the update on the 2025 inspector training schedule, a quality review of inspections so far, and an update on IT development.

In November, OCIMF hosted a webinar for its SIRE 2.0 inspectors to share early findings and lessons learned. The webinars had the aim of increasing consistency in the inspectors' approach, behaviours and reporting.

Inspectors were given feedback on "human factors, in particular selection of Performance Influencing Factors (PIFs) and the selection of response tools."

They also discussed feedback provided by submitting companies.

OCIMF joined a meeting of industry organisations in November for a third workshop on risks associated with enclosed space entry on ships.

They heard the latest incident statistics from InterManager. There was a discussion about using drones and remote operated vehicles in enclosed spaces. They also heard about how tank wash water can be tested using wash water analysis, so no-one needs to enter the tank to do a wall wash test. There will be a further workshop in Q1 of 2025.

Publication updates

OCIMF has published several information papers during 2024, covering the risks associated with engine power limitation, control of drugs and alcohol onboard ships, cyber security and conversion of tank-barges to closed cargo operations.

There were updates to the Barge Inspection Questionnaire and progress on the Global Barge Guide.

The Ship to Ship Transfer Guide has been comprehensively revised and is due to be published in 2025.

An OCIMF group is discussing a revision to its information paper "Manning at Conventional Marine Terminals (2008)."

A growing trend has been observed for terminals to "rationalise" their manning levels.

The information paper aims to help ensure terminal marine operations are carried out safely, whatever manning philosophy is adopted.

Issues include managing the ship-shore interface, conducting walkabouts, interactions with people and equipment, manning for security and emergency response, minimum training requirements for berth operators, impact of technology on manning levels, and issues with new cargoes and new fuels.

OCIMF has published a paper providing minimum requirements for applying Emission Capture and Control (ECC) technology, which can be provided by barges in ports to tankers at berth. It can be downloaded from the "Information papers" section of the OCIMF website (under 'publications and advocacy').

Staff and members

Alexys Nielsen has joined OCIMF as engineering adviser on a three-year secondment from ConocoPhillips. She has worked there for 19 years as an engineering officer on Polar Tankers, including sailing onboard as chief engineer and working as onboard quality assurance officer.

OCIMF has three new members, approved by the Executive Committee: Sinochem Oil Co. Ltd (PRC), Valor International Holding FZB (United Arab Emirates) and VAST Infraestrutura (Brazil)

STS provider forum

OCIMF organised a global ship to ship provider forum in November (in person and remote), bringing together providers from around the world to share best practises and incident learnings.

There were discussions about SIRE 2.0 questions relating to ship to ship transfers, and about personnel transfer baskets and mooring load analysis.

OCIMF is setting up a STS Service Provider Management Self Assessment programme, similar to TMSA, which it calls STS SP MSA.

Executive Committee

The Executive Committee, meeting in London in November 2024, agreed that after the focus on SIRE 2.0 over the past few months, it was time to 'champion' OCIMF's other programmes. In particular, Offshore Vessel Inspection Database (OVID), Barge Inspection Questionnaire (BIQ) and Barge Inspection Report Programme (BIRE).

The Committee said that big topics for discussion by the various OCIMF groups over 2025 will be ship-to-ship transfer, barging guidance, management of lifesaving appliances (LSA) on fixed/floating installations, dynamic positioning (DP) assurance, security, onshore power supply and human factors.

Events attended

OCIMF participated in a stakeholder event hosted by Aramco in Dammam, Saudi Arabia, in November. The purpose was to foster dialogue with Aramco Terminals stakeholders. There was a panel discussion about the terminal interface, covering jetties, pilotage, anchorage areas, and ship scheduling. There was a panel discussion on

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SIRE 2.0.

OCIMF attended an "International Maritime Human Factors Symposium (IMHFS)" at IMO in London in November, speaking about human centric design for mooring decks, including about human centric design in SOLAS and OCIMF's Mooring Equipment Guidelines.

OCIMF participated in monthly meetings of the European Union Monitoring, Reporting and Verification (MRV) and Emission Trading System (ETS) sub-group. This group advises the EU on data reporting requirements for EU ETS and Fuel EU Maritime.

One change made by the group is that stops at offshore facilities are counted as an "MRV port of call" if the facility has an assigned UN/LOCODE or a permanent connect to a port. Two more guidance notes are being developed, on how national authorities should approve monitoring plans, and how accreditation bodies should be verified.

2024 piracy data

The 2024 Annual Report from the ICC International Maritime Bureau (IMB) recorded 116 incidents against ships in 2024, compared to 120 in 2023 and 115 in 2022. The 116 incidents included 94 vessels which were boarded, 13 attempted attacks, 6 vessels hijacked and 3 fired upon.

126 crew were taken hostage, 12 crew kidnapped, 12 threatened and one injured. In 2024, guns were reported in 26 incidents compared to 15 in 2023. Knives were reported in 39 incidents in 2024, compared to 42 incidents in 2023.

The ReCAAP Information Sharing Centre (ISC) issued its 2024 Annual Report on Piracy and Armed Robbery against Ships in Asia, showing 107 incidents reported in the 2024 calendar year, which is 6 per cent higher than 2023. Of these 107 incidents, 105 were armed robbery.

IMO award

The captain and crew of oil tanker Marlin Luanda were recognised with the 2024 IMO Award for Exceptional Bravery at Sea, OCIMF reported. The vessel had been struck by a missile while laden with naphtha cargo. Captain Avhilash Rawat successfully led fire-fighting efforts. TO

OceanScore: the biggest challenges with ETS so far

The pain points seen so far in how the shipping industry works with EU ETS are "system readiness, data anomalies, transparency and contractual responsibility," says OceanScore of Hamburg

Shipping companies are working hard with their emissions data verifiers to make sure their emissions data is coherent during the first quarter of 2025.

The EU Emission Trading Scheme (ETS) Compliance Cycle required shipping companies to submit an emissions report at the end of every calendar year, which must be verified by an accredited verifier by March 31 of the following year.

After it has been verified they must purchase and give to the EU the equivalent number of "EU Allowances" (EUAs) a form of carbon credits, by Sept 30 of that year.

So, shipping companies will need to get their 2024 calendar year emissions data checked by March 31, 2025, and buy the permits by Sept 30, 2025. They will only know the final first year impact of ETS on their business by September 2025.

Common technical problems seen by shipping companies include a lack of system readiness, gaps in automated systems to manage data, lack of harmonised data formats and standard APIs, says data analytics company OceanScore of Hamburg. There are also some errors in reporting systems.

Many shipping companies use emissions data management companies. There have been examples of such companies trying to charge shipping companies twice for the data - once for the service itself, and again for sharing it via APIs, OceanScore said.

"The industry has largely resisted this practice, curtailing most cases of double charging, but continued vigilance will be essential."

One cause of data problems has been that a voyage can be defined slightly differently in charter parties and in the reporting requirements. So, while a charterer may agree to pay the ETS costs for the 'voyage', it may not cover the shipping company's full costs.

Shipping companies also need to pay the ETS costs themselves for periods when the vessel is offhire.

Shipping companies have found that invoicing customers for EUAs is a labour-intensive task. Some customers have asked for data at different frequencies, or for interim statements, and asking for data in different formats. This adds to the admin burden.

It can be difficult tracking whether invoices have been accepted, if the EUAs have been delivered or payments made, without a centralised system.

OceanScore has developed a software tool to do this, which will be rebranded "Compliance Manager" in January 2025.

There are some non-European shipowners who are reluctant to accept responsibility for compliance, OceanScore says.

If they work with third party ship managers, this means the ship managers struggle to get compensation for the extra workload, and protection against counterparty risks, if the charterer ultimately does not pay for the EUAs.

Some companies have had challenges opening Maritime Operator Holding Accounts (MOHAs). They need a MOHA or a Union Registry Trading Account in order to receive EUAs from charterers or to purchase their own EUAs.

There had been concerns that non-compliance for one vessel could cause problems for the whole fleet, which led some companies to set up MOHAs for individual vessels. But this meant a lot more administration work, OceanScore said. TO

WiseStella's customers share SIRE 2.0 inspection experiences

In 26 SIRE 2.0 vetting inspections by WiseStella customers, a number of deficiencies were seen relating to rectifying defective equipment, knowledge of enclosed space procedures, permits to work

Maritime learning company WiseStella has released data from 26 SIRE 2.0 vetting inspections conducted by its customers.

There were 197 deficiencies across the 26 inspections (so average of 7.6 per inspection).

44 of the deficiencies related to hardware; 78 related to processes; and 75 related to human factors.

The majority of new questions are being directed at officers, but there are more ratings being interviewed, WiseStella said. They may have difficulty understanding the question, acronym or terminology, due to language differences.

WiseStella offers software to help train crew for SIRE 2.0 inspections, including making a special focus on areas where crew on past inspections have been given observations.

Defective equipment

A number of vessels obtained a deficiency relating to human factors because crews did not know they should create a requisition for spares after being aware of defective equipment, WiseStella said.

There were also human factor deficiencies when crews did not say they would do a risk assessment after identifying defective equipment that could not be fixed immediately.

On some of the vessels, the responsible officer did not know how to produce a defect report according to company procedures.

On three inspected vessels, faulty smoke detectors were found, but there was no record of a defect report or risk assessment.

The relevant questions are in SIRE 2.0 chapter 2 and may appear to relate to hardware rather than defect reporting, said Ferhat Abul, WiseStella's Managing Director and co-founder.

Enclosed space

A number of companies had deficiencies on crew familiarity with enclosed space entry procedures (SIRE 2.0 Question 5.5.1), and inspectors also found gaps in the procedures.

With water ballast tanks fitted with electrochemical ballast water treatment systems, there needs to be a certain amount of time between checks of the air in the tank and for crew to enter it, something crew did not know about.

Ferhat Abul, WiseStella's Managing Director and co-founder

Some companies had deficiencies relating to issuance of Permits to Work, suggesting crew could end up allowing the wrong person to enter an enclosed space at the wrong time.

Some crews received deficiencies for believing that a single permit could be used for multiple tank entries.

An inspection of ship records found that only one person had entered a ballast tank, rather than two people as required by the permit and company procedures. TO

The product tanker market outlook

The global product tanker market will see a big impact from Nigeria's Dangote refinery. Next year, newbuilds will put pressure on rates. Analysts from consultancy company Drewry shared perspectives

A major factor on the product tanker market is an enormous new Dangote refinery planned to be built near the Lekki Deep Sea port in Nigeria, said Rajesh Verma, Deputy Director, Bulk Shipping with maritime consultancy Drewry.

He was speaking at a webinar "the product tanker market outlook", organised by Drewry, held in November 2024.

Dangote is expected to be the largest single train refinery in the world when it reaches full capacity, processing 650,000 barrels of Nigerian oil per day, to make gasoline, diesel and aviation fuel, about half for export.

When the refinery reaches 85 per cent of full capacity, Nigeria will no longer need to import any diesel, jet fuel and gasoline, according to Drewry's modelling. Before the refinery was in operation, it was importing 100,000 barrels a day of diesel and 270,000 barrels a day of gasoline.

This is equivalent to 18 gasoline vessels and 11 diesel or jet fuel vessels being no longer required.

But there will be a surplus of 150,000 barrels a day of refined product available for export.

All of this surplus may move to Europe and displace Middle Eastern cargo, which has to take the longer route around the Cape due to the problems in the Red Sea. This would reduce global demand by five vessels.

So, in total, global vessel demand would be reduced by 34 vessels.

However, if the refinery is not able to meet European fuel standards, it will have to export to some other parts of the world. The next closest market is in Latin America. But customers here can also access US output. So, the surplus from Nigeria may go to Asia, displacing Middle East diesel.

This would add 8 LR tankers to the demand. So, the net change in demand would be 21 (18 + 11 – 8).

There is also another state-owned refinery planned, which could process almost 100,000 barrels a day. If that happens, it will mean further drop in refined product trade to West Africa and further surplus to export, he said.

Product newbuilds

In 2025, we can expect to see a strong growth in supply of vessels with an increase in deliveries, all putting pressure on the rates, he said.

There was a significant increase in orders made over 2023-24, with increased availability of slots in shipyards. This resulted in a surge of the ratio of orderbook to fleet, now about 20 per cent. The vessels will be delivered in 2025-6.

This oversupply means that "the long-term outlook for demand for product tankers is not very bright," he said.

There is a surge in vessels reaching scrapping age in 2028-29, but ordering replacement tonnage will continue. It means that tonnage supply will increase significantly.

This means there could be a significant decline in charter rates, he said. But it won't happen immediately. "The next couple of years will be healthier compared to historical standards."

Another factor is that there could be improvement in the Suez Canal situation in 2025, so vessels feel safe transiting the Red Sea. This would decrease demand for tonne miles.

Cargo factors

Global oil demand rose by 0.9m barrels per day in 2024 and is expected to rise a further 1m barrels per day in 2025, leading to increased demand for tankers to carry oil and its products.

However, the rate of growth is expected to slow, as customer demand for gasoline and diesel will decline in the US and Europe, as drivers move to electric vehicles. "Slowing demand will eventually translate into significant slowdown of seaborne trade in clean petroleum products," he said.

Demand for jet fuel is expected to keep growing.

In 2025 there will be more refinery 'runs' in countries which import petroleum products, meaning that they will not need to import so much, he said. This includes in Nigeria (as discussed earlier) and Mexico.

The 2024 picture

The product tanker market was very volatile in 2024, Mr Verma said.

In the first part of the year, rates surged due to voyages being stretched by the Red Sea Crisis (Houthi attacks). It mainly affected cargoes going from the Middle East and Asia to Europe.

There was also a slow fleet growth, so supply was tight, he said.

It follows product tankers enjoying high freight rates for the last 3 years, he said, following a decline in newbuild deliveries over 2023 and 2024.

The rate started "normalising" downwards towards the end of 2023, but the Red Sea crisis pulled it back up.

In the second half of 2024, we saw crude tankers being brought into the product trade, so inflating supply of vessels. It was linked to the normal seasonal (winter) slowdown of oil demand. This "eventually resulted in softening of rates," he said.

Newbuild tanker prices were high, increasing from $62m for an LR2 in January 2022 to $77m in September 2024, he said. They are not showing any signs of flattening.

Second hand values also surged in the past 3 years, with some sign of slackening by November 2024.

Ammonia turbines for shipping?

Energy technology company Baker Hughes enters partnership with shipbuilder Hanwha Ocean to develop small-size ammonia turbines for shipping – here is how it would work

If companies utilise engines to generate electricity onboard and subsequently drive propellers via electric motors, rather than directly coupling them with the engine's shaft, it opens up new opportunities for incorporating gas turbines as a propulsion system.

Gas turbines need virtually no maintenance, typically 36-48 hours work every 35 000 operating hours to replace the engine module, says gas turbine manufacturer Baker Hughes.

The turbine can be housed anywhere on the ship, since it connects to a motor (which is connected to the propeller shaft) with an electric cable. So it can be placed on the deck of the ship, where it can be much more easily accessed, and it can be removed and replaced.

So rather than do complex maintenance tasks on the turbine while it is on the ship, just the engine module could be replaced with another one (turbine's engine swap), while maintenance is done more conveniently on shore.

Gas turbines have not traditionally been used on ships until now, mostly because they don't work with heavy fuel oil, even if they can operate with diesel.

But they do work with natural gas, which enables about 25 per cent of CO2 emission reduction compared to liquid fossil fuels.

As gas supplies become more widely available in ports, shipowners may be more willing to consider this propulsion typology for decarbonization purposes.

Making gas turbines which are used for power generation is of course a mature industry.

If a gas turbine could be produced which runs on natural gas, hydrogen or even ammonia, that would open the door to operating ships on clean fuels (with low or no direct carbon emissions coming from propulsion system).

Baker Hughes and Hanwha Ocean

Energy technology company Baker Hughes announced a joint development and collaboration agreement (JDCA) with Korean shipbuilder Hanwha Ocean in February 2025 to develop such an ammonia turbine for ships, capable of generating 16 MW, enough for propulsion for a large ship.

The two companies target to complete the full engine test with ammonia by the end of 2027, after which the turbine will be commercially available for orders.

It will be able to run on 100 per cent ammonia, 100 per cent natural gas, or anything in between.

Hanwha Ocean is one of South Korea's leading shipbuilders, and has expertise building ammonia carriers. It plans to use the system for propulsion on its future newbuild vessels. Its parent company Hanwha is the 7th largest business in South Korea and a Fortune Global 500 company. It also has a power systems division.

The agreement was signed during the Baker Hughes 2025 Annual Meeting in Florence in February 2025.

A proof of concept for the ammonia combustor has been tested successfully, and Baker Hughes has completed its initial turbine feasibility studies.

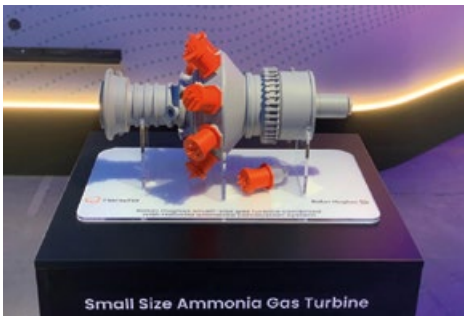
Baker Hughes has proven expertise in adopting clean fuels and its NovaLT™ gas turbine can start-up and burn gas blends up to 100% hydrogen, it can also switch from natural gas to blends of 100% hydrogen while maintaining performance and with no hardware changes: it represents the commercially available solution for maritime gas turbine propulsion system, ready for zero CO2 direct emissions when 100% H2 is used as fuel.

Advantages of turbines

There are other advantages of turbines over combustion engines.

A turbine makes less noise, and the noise is at higher frequencies and hence easier to attenuate than a combustion engine, meaning increased comfort for crew. A combustion engine on a ship produces high intensity, low frequency noise.

The typical gas turbine configuration adopted so far for propulsion is with direct connection to the propeller shaft, with the efficiency limited to 36-38% being the gas turbine operating in simple cycle, leading many people to believe that such technology is not convenient for marine propulsion.



A model of the Baker Hughes / Hanwha Ocean ammonia turbine for shipping, generating up to 16 MW of power, enough for propulsion of a large vessel

The adoption of electric propulsion allows the combined cycle configuration, with an overall electrical efficiency, close to the 50% of best combustion engine models, allowing to bridge the main gap that has prevented the gas turbine widespread adoption until now.

The heat generated by the gas turbine, can be used also for different scopes allowing an optimized integration of all auxiliary systems.

Having a single, reliable gas turbine providing all propulsion and auxiliary power on a ship would be much simpler than separate engines, generators and boilers. The power output of the turbine can be adjusted as required.

With a gas turbine, there is nearly no 'methane slip' (gas going through the engine uncombusted).

"If you measure methane content in the exhaust with an non-dispersive infrared (NDIR) spectroscopy you might find something, but it's negligible, almost zero," says Sergio Ghezzi, Senior Process Solutions Manager at Baker Hughes.

"It is orders of magnitude less methane slip than you can find in a standard gas engine."

The gas turbine consumes less than 1 litre per day of oil, where large gas engines typically waste much more oil mixed in the gas for lubrication and/or to support combustion.

And of course, for shipping companies to decarbonise beyond what is possible with natural gas fuel, they will need to use some kind of biofuel, ammonia or hydrogen option. In these scenarios, gas turbines may prove to be the best option. TO

Gibraltar 2024 tanker developments

2024 tanker related news in Gibraltar includes a ship to ship transfer of ammonia, a container ship collision, launch of Hercules Tanker Management, and developments at Sandvik Marine Electronics

Trafigura completed its first ship to ship transfer of ammonia in the Strait of Gibraltar in July 2024.

6,000 metric tonnes of ammonia were transferred between medium gas carrier "Green Power", owned by Purus on time charter to Trafigura, and small gas carrier "Gas Aegean". The shipment will be received by Fertiberia for the production of fertilizer.

The STS operation was conducted by International Fender Provider (IFP) with Next Maritime acting as agent.

Collision

In December 2024 there was a collision between tanker Gloria Maris and container ship HMM St Petersburg in the Strait of Gibraltar, nine miles Southeast of Algeciras.

There were no spillage or injury reported. The tanker had been sailing empty from Cartagena to Gibraltar. Both vessels were detained for safety inspections.

Hercules Tanker Management

Hercules Tanker Management, the company owned by John A Bassadone, also founder of Gibraltar's Peninsula Petroleum, announced it will receive the first of four bunker tanker newbuilds in Q2 of 2025. The other tankers will be delivered at three-month intervals.

The first vessel is a 7,700 dwt IMO II chemical tanker being built at Jiangmen Hangtong Shipyard in China.

The vessels will be able to supply 100 per cent biofuel and methanol. They will have diesel electric propulsion, with capacity to convert later to battery electric.

They will have two engines and Schottel propulsion to improve manoeuvrability, which will be particularly useful in STS operations.

Peninsula anticipates big growth in the use of methanol fuel for ships, which it will be able to serve with these vessels.

Peninsula also announced a partnership with the University of Gibraltar Maritime Academy. Students in the BSc Maritime Science course will be able to undertake a cadetship onboard Peninsula bunker vessels.

Sandvik Marine Electronics

Sandvik Marine Electronics of Gibraltar reports that it opened an office in Rotterdam in January 2025, to add to its offices in Algeciras, Panama and Singapore.

The company provides services for vessel navigation and communication equipment, and other electronics. It provides fleet maintenance contracts for all bridge equipment, including remote support, with over 250 vessels.

Over the past year it has become an agent for SAL Navigation of Sweden, a manufacturer of speed logs, echosounders and the system for pilots in the Panama Canal. It has fitted 32 units with a Norwegian gas shipping company.

It has also become an agent for Sperry Marine, providing its navigation equipment including radar, ECDIS, speed logs and echo sounders.

The company is seeing big reductions in the cost of satellite airtime with the help of services like Starlink.

"We are now seeing a decline in terminals for Inmarsat 5, and seeing Inmarsat C terminals being replaced by Iridium Certus terminals," said Sandvik's John King.

Some equipment suppliers are still struggling with providing spare parts, taking over 3 months, he said. This was a problem which started with Covid and has not yet been rectified.

Resilience- organisations that bounce back

In an increasingly turbulent world, resilience is now more important than optimisation. said Martin Shaw, past president of IMAREST. He shared perspectives on further improving safety, autonomy, and decarbonisation.

The global supply chain has been 'optimised' over the last two decades to minimise freight costs. Outsourcing of production to Asia makes the cost and reliability of shipping critical. Covid and the Ever-Given incident have illustrated how fragile that optimised structure is. Shipowners may be better off over the longer term to take an approach which provides the most resilience, said Martin Shaw, the 2023-24 president of IMAREST.

He was speaking at the Tanker Operator Hamburg conference in October 2024.

Mr Shaw has a background working in tankers for BP, including as a seafarer, running BP vetting and as fleet manager, before retiring in 2010. Since then, he has been a consultant.

Mr Shaw sees optimisation and resilience as "flip sides of a coin." The more you pursue optimisation, the less resilience you have. Resilience means having the space and capability to deal with unplanned things. For example, a 3D printer onboard which can create a spare part should you need it could add to resilience and the micro level. Having enough people to run a ship when automation fails is another.

Martin Shaw, the 2023-24 president of IMAREST

It may be useful to think about resilience more than optimisation if you are building a new ship, because there are so many unknowns about future fuels and environmental technologies. A resilient approach will mean you are better prepared for whatever happens.

Safety getting harder

Anyone working in tanker shipping should be able to eliminate 'high impact high probability hazards. There is a lot of information available about how to fix them. If you can't do it, "you shouldn't be in the business, you should be managing a coffee shop," he said.

But as we react to fewer probable incidents, we hit limits as there is less information. We then create process to stop that particular incident from happening, creating more process to follow.

The hardest incidents are those which have a high severity and low probability-the so called 'black swan' which people do not know how to deal with. "They are not as rare as they used to be," he said.

This is because the world at large is becoming more complex and less predictable, he said.

Big picture challenges on tanker shipping include problems with certain routes (restrictions on the Panama Canal, blockage in the Suez Canal, attacks in the Red Sea); the Ukraine invasion leading to less seafarers available from Ukraine and Russia; China seen as a potential enemy; and disruption in supply chains.

Decarbonisation and resilience

The decarbonisation drive also creates many uncertainties, which suggests an approach based on resilience rather than optimisation could turn out better.

The IMO has talked about reducing greenhouse gas emissions from shipping "by at least 20%, striving for 30%", as a statement of its ambition, Mr Shaw said.

"Ambition" here is asking the shipping industry to spend more money on decarbonisation. And the shipping industry bears a cost if things go wrong, the regulator does not, he pointed out.

For now, the industry "doesn't seem to be moving quickly enough to reach that ambition," he said. While LNG and LPG fuelled propulsion can be considered mature technology today, ammonia and hydrogen systems are not. "We've got 5 years to do this, we really need to get moving."

"Green corridors" provide a pathway to roll out of low carbon fuels, with the aim of creating a supply of low carbon fuels along a specific route. So, the costs of getting both low carbon ships and fuels is cheaper than trying to transform the whole world.

Although any "green corridor" through the Red Sea will no longer be viable, with vessels being routed around South Africa. So, Resilience needs to be built in to this approach and that may drive the shipowner towards hybrid vessels which may exclude some fuel types. Or it may drive more fuel capacity to cope with diversions.

Another concern with the roll-out of green technologies is that resale values might "fall off a cliff," if you buy a ship with technology which turns out not to be what the future wants. This affects the ability to sell something to buy something new.

Shipowners also need to consider if the green techonlogies available today are as reliable as those which will be available in future. "We went through two or three generations of oil water separators before we had reliable ones," he said.

"You may have to replace the first generation of some of this environmental technology. The first mover does not necessarily have an advantage."

Human element and resilience

People give you resilience, but only if you support them to do it. It does not help if people are seen mainly as something that can go wrong, he said.

Shipping people still cite the statistic that "80 per cent of accidents are caused by seafarer error". Mr Shaw said he looked hard for the source and the only source he could find was 1991 data from an ITOPF study about oil spills.

Mr Shaw's view is that nearly 100 per cent of accidents are caused by human error, but the errors can be people who created the environment seafarers work in, not the seafarers themselves. "It could be at the design stage, specification stage, building stage, classification stage, regulatory stage.

One such error could be the lack of standardisation in equipment on ships, he said. It is much better in the airline industry,

where crew can change from one plane design to another without too much difficulty. The cockpits of different aircraft models by the same manufacturer are "more or less the same."

Electronics systems manufacturers try to push against standardisation, because it takes away the possibility that they could develop a new design and get a competitive advantage. Standardisation means they compete only on cost, he said.

Another possible error by systems manufacturers is replacing old school ship navigation systems with switches and knobs with touch screens, which prove to be much less intuitive for crew, he said.

The 'human element' discussions focus the industry on the environment that crew work in and how it can support them to work in a resilient way.

It does not help that people sometimes confuse the term 'human element' for person, such as to ask, "how many human elements are on a ship," he said.

It also does not help that IMO puts its human element discussions together with other people-related matters such as gender diversity and wellbeing, which are very important topics in their own right and with different solution sets, he said.

"SIRE 2.0 is an opportunity for shipping companies to think deeply about how [human element focus] can be improved," he said.

Autonomy vs resilience

The pathway towards autonomous technologies on ships may reduce resilience.

The so-called irony of automation is well known. Automation will try to recover if something goes wrong, maintaining operations as long as possible. This means that when it finally fails, even a highly skilled person does not have time to fully understand what is happening and recover.

This person would then need to operate the system manually, something they might not have done before. You are on the verge of system collapse then., he said.

Mr Shaw does not believe that totally unmanned technologies have much immediate relevance to tankers, and is pleased to see that they are being discussed more in the context of helping the human onboard rather than replacing them.

Autonomous vessels are very useful in military applications because they can attack without a human being at risk. The military cycle of preparing an attack, deploying a drone, recovering it, and repairing it, is suitable for autonomous technology.

But that is not how merchant ships work, going from one port to the next without necessarily having a home base. And on merchant ships bout 70 per cent of man hours on board are typically spent doing maintenance and critical operations, he said. There is no economic benefit of doing maintenance in port instead, so the vessel has to spend less time carrying cargo.

There have been arguments that autonomous vessels will be safer than vessels operated by people. But on the other hand, there are many examples of technology itself causing safety problems, such as on the Boeing 737 MAX aircraft.

IMAREST

Mr Shaw is immediate past president of IMAREST (Institute of Marine Engineering, Science and Technology). IMAREST was founded in 1889. One of its first presidents was Lord Kelvin, who invented the absolute zero temperature scale.

Today it is a charity with 15,000 members, of which 90 per cent are marine engineers. It has branches nearly everywhere in the world where ships are managed.

It is a forum for engineers to work together to discuss issues. There are IMAREST qualifications, knowledge sharing platforms and events. It publishes books and journals and has a digital archive for members going back to 1914. It also has "a big voice" at IMO, Mr Shaw said.

TO

Experiences with SIRE 2.0 at Essberger

SIRE 2.0 is a "vast improvement" but comes with challenges, said John T Essberger's Niall Mushet. He presented Essberger's experience with trial inspections and how he thinks the system could be improved

The way SIRE inspection is being done with version 2.0 is a "vast improvement," although "a bit more challenging," said Niall Mushet, safety, security, health, environment and quality (SSHEQ) manager at John T. Essberger.

But the company recognises that the work with SIRE 2.0 can further increase safety. "It's a really good step forward and it is welcome," he said.

He was speaking at the Tanker Operator Hamburg conference in October 2024.

The initial motivation for developing SIRE 2.0 was to try to find ways to further improve the tanker industry's ambition of working towards a zero incident industry. The human factors area is "what is left to address".

SIRE 2.0 will help everyone know how well seafarers understand and implement the procedures for the tasks they need to do, and how well the procedures fit the tasks.

The biggest challenge of SIRE 2.0 may be simply that it is a change, and people in seafaring are renowned for their reluctance to change. He said.

"It takes so long to get a change going."

Background

There were big improvements in safety in the years up to about 2010 brought in through engineering advances, legislative changes and procedures. The previous SIRE questionnaire system (VIQ 7) was focussed on process and technology.

VIQ 7 included a fixed set of approximately 300 questions, such as "what is your PV valve set to," and everybody knew the expected answer.

Niall Mushet, safety, security, health, environment and quality (SSHEQ) manager at John T. Essberger.

Inspectors were satisfied by being told that there were procedures available, but did not ask how often anyone referred to them. Seldom were people asked to show a procedure. The questionnaire system also did not have much linking with TMSA requirements. Sire 2.0 provides a link between the SIRE inspection and TMSA requirements.

Mr Mushet has been working in shipping for 47 years, of which 20 were sailing. He came ashore in 1994.

He was involved in developing the original training course for SIRE inspectors in 1998, done together with Glasgow College of Nautical studies.

John T Essberger is a 100-year-old company which manages 35 parcel tankers ranging from 2,800 to 11,300 deadweight tonnes. The main trading areas are Baltic Sea, Mediterranean and Northwest Europe with approximately about 3000 port calls a year.

They are all stainless-steel coated tanks, except one which uses Marine Line coating. The majority are ice class, enabling them to trade in the Baltic.

What 'human factors' means

'Human factors' are the organisational, environmental and individual characteristics that influence our behaviour at work.

As a simple example, weather can play a significant role towards our safety behaviour, Mr Mushet said. People's focus towards a task is "completely different" if they are in the Mediterranean on a lovely sunny day, compared to working in 10 metre waves or in temperatures of -40 degrees.

Organisational factors have a big influence on how we approach our tasks. Such factors include, company culture and leadership, both in the office and on the ships. The way people communicate is very important. Are people only sending e-mails to ships or going onboard to meet people? In the office are people holding Teams meetings with someone who is sitting around the corner, rather than walking a few metres to speak with them in person?

Job factors are also important, do the people being appointed to the task have the necessary skills (is this checked)? Do companies install "standard" equipment where possible? This is one way to increase familiarity with operating equipment.

The individual characteristics of each person are important – their skill, knowledge and experience, and mental health.

Wellbeing is a big influence as to how we work. It is an area which is asked about during TMSA audits. It is important to support the wellbeing of employees, both on board and ashore.

Before the inspection

SIRE 2.0 inspections are booked through the OCIMF portal. A minimum of 3 days' notice is required.

There has been a large increase in office preparation prior to arranging SIRE inspections e.g. completing a pre-inspection questionnaire, uploading documents, certificates, reports and photographs. Adding an additional half day to preparation time.

The photographs themselves are tricky, OCIMF provides a list of photographs and angles you must provide, for example "Bow area from dead ahead" and "hull forward end starboard side" with the photographs being in landscape format.

It is important that the photos are representative of the ship at the time of the inspection. Only one photograph is needed for each requirement, it is important that the photographs are checked prior to uploading.

Ensuring you have the required photographs for inspection can be a "pinch point", it takes time to ensure that the photographs are correct, checking and then replacing (if needed). It is expected that this will improve with experience. he said.

Mr Mushet said he has heard of tanker companies painting marks on the deck, to show where the photographs should be taken from.

Rescue boat and lifeboat drills provide a good opportunity to take photographs of the ships hull from the water, he said.

To make it easier to manage, Essberger asks crew to label the photograph with a filename which matches the OCIMF requirements, we have also developed a file transfer protocol to exchange the photographs from the vessel to office.

The pre-inspection questionnaire needs to be completed with accuracy. If you say that all deck officers have attended an IMO standard liquid cargo handling simulation course, and the inspector asks to see the certificates of the course and they are not available, that is recorded as a negative observation.

Some questions are specific in asking if certain courses are attended at regular intervals – if the answer is no – record it as "no".

You should have a system for recording any defects onboard the ship, and ideally be able to print out a list to provide to the inspector.

Preparing the first ship for a SIRE 2.0 inspection took 10 hours of someone's time, compared to 2 hours with the previous inspection system. But this should reduce with experience and the fact that some questions will remain with the same answers.

The inspection

The inspector will receive the questions for the inspection into their tablet. These questions are categorised into 3 main types:

- Core (asked during every inspection): questions which are focussed on preventing/mitigating risks that could directly lead to a catastrophic risk event
- Rotational 1 & 2: questions focussed on preventing/mitigating risks that could indirectly lead to a catastrophic risk event or directly lead to a lower risk event.
- Conditional: specific questions added due to the context or history of the vessel/operator or ship type.

Additionally, there may be "campaign" questions (something similar to a concentrated inspection campaign run by PSC's), these are areas of specific focus with a time limited exposure.

There are four categories of questions:

- Hardware: based on the condition of equipment, structure and outfitting
- Process: effectiveness, validity, availability and level of implementation of procedures
- Human: interviews with various personnel testing appropriate level of knowledge of operation of equipment and procedures
- Photo comparison: Checking that the photographs uploaded are representative at the time of the inspection.

The human part, interviews are new in that interviews are addressing all ranks. As long as people are fully confident with the requirements for their role there is no need to be apprehensive during the interview.

People will be required to demonstrate that they can find the procedure, not merely state whether they know how to find it, he said.

The inspector uses a tablet to read the questions, enter the answers and collect photographs if necessary. The inspector can compare what the vessel looks like against the uploaded photographs.

It is possible that one question can lead to 3 negative observations, e.g. the inspector asks the deck watch to show the nearest firemain isolation valve:

- The questioned person is not able to show the nearest isolation valve – (human)
- The valve was seized – (hardware)
- There was no job in the PMS to check the valve regularly – (Process)

However, if the hardware didn't work, but there were procedures for how to do maintenance and the person did know the location, that would only be one negative observation.

During the inspection the inspector will compare photos uploaded in advance with the actual condition at the time of the inspection.

During the opening meeting the inspector will request a list of current defects of the vessel.

Trial inspection experience

We have carried out 6 trial inspections at the time of the conference. We had directed the inspectors to "go very hard," looking for every detail.

"It was very good learning for us, good learning for people on the ship and also for the inspectors, it is new for all of us," he said.

In order to get the list of observations at the end of the inspection Companies are required to have a wireless printer onboard, which can connect to the inspector's tablet computer.

"We fell foul with our first inspection, we had supplied a new wireless printer, it didn't connect with the inspector's tablet," he said. "That is resolved now, we've done several more since then."

If you don't have a printer available, the only way to get a list of observations raised is to write them down by hand.

In one trial inspection, a company had a 'deficiency' for its procedure for cargo audits, because it did not include details about the qualifications and seafaring experience of the seafarer assessor in the audit report.

There is also a requirement to calibrate the pressure gauge before doing any mooring line break test. "These are some nuances we have to become familiar with," he said.

Crew have been asked twice about the procedures for enclosed space entry.

One rating "explained the whole thing perfectly," Mr Mushet said. But then the inspector asked to see the procedure.

This made the rating nervous and it took a long time to find the procedure, but he was successful. "Make sure ratings can access the document management system, near miss reports."

With one trial inspection, the inspector spent four hours with the master, asking to see various procedures.

As a result, the company has a good idea of how much its ship staff know about the procedures. This "is fantastic, really good learning," he said.

Some seafarers take the inspector questioning in their stride. For the ones which don't, the biggest reason can be just a lack of confidence. For example, they should be confident enough to say when they don't understand a question.

"We are boosting confidence with seminars and webinars," he said. "So far we are not having too big an issue."

The published question bank from OCIMF is "a fantastic reference". But it may be too much to ask all crew to learn the answers to all the questions.

We have put the questions in a spreadsheet indexed against who would be asked which questions and whether they are core or rotational, so people in different roles can get an idea of what they might be asked about.

Mr Mushet recommends that tanker companies send superintendents onboard when SIRE 2.0 inspections are going on. "It is positively eye-opening," he said.

Wider industry

Intertanko's data about 111 trial inspections undertaken by its members found that their number of observations rose by 4 times on average compared to the previous version of SIRE, from 2.5 per inspection to 10.

It also found 45 per cent of observations were classed under "procedures and processes" rather than human factors, something Mr Mushet finds "really positive," indicating that people know their jobs.

Further information about trial inspections is available in a Intertanko publication and shared in weekly webinars with seafarers and office staff.

Intertanko have also published a guide to SIRE 2.0 inspections, a great reference document for those on board.

Suggestions to improve

Mr Mushet had a number of suggestions for improvement.

As a short sea operator with vessels on the spot market and frequent itinerary changes, it often does not know for sure where vessels will be in three days time, making it tricky to give OCIMF the required notification time for an inspection. "I don't know if there's a way to shortcut the notification period," he said.

There is still no benchmarking tool such as Q88 available, this is disappointing since benchmarking performance is one of the requirements of TMSA.

The feedback from oil companies varies a lot, some giving very clear feedback and others a short message with bullet points without a full explanation.

It would help to have software which could upload the required documents automatically pre-inspection. They could even be taken directly from other sources, such as class society repositories. Unfortunately, the OCIMF software does not allow such digital integration at this time. "There's tremendous duplication of work," he said. "With modern technology we should be able to reduce and improve."

TO

Better critical decision making onboard

Seafarers need to make many critical decisions, where the wrong decision could lead to big risks. How can they be supported to make these decisions better? NSB Group's Ankit Acharya shared perspectives

In seafaring, "Almost every decision is a critical decision," said Ankit Acharya, maritime instructor, NSB Group. Decisions could be defined as "safety critical" when the wrong decision would lead to big safety risks.

Mr Acharya worked on tankers for over 10 years, including with Tanker Pacific and Zodiac. He then did a master's degree at the World Maritime University in Sweden, before joining NSB Group in 2022. NSB Group has 50+ vessels under current management according to its website.

A person making a safety critical decision should gather all possible information in an organised way, process it, and consider it all carefully. There may be many smaller decisions involved.

Even if we have procedures for how to make a decision, they do not usually eliminate the need for someone to make a decision, he said.

Companies should create the best possible environment for supporting better decision making. This means addressing the "human element".

"Human element basically means human involvement, everything that is born out of being human," he said. The "human element" isn't just about people on ships, it is everybody in the company office, agents, and other organisations involved. Ultimately humans are the core of the business."

"Often I have seen that when we talk about human element people don't understand what exactly it is," he said. "The first thing that comes into our mind is to try to find a person to blame."

Situation awareness

To create a good environment for decision making, we need to consider how the person gathers information to make the decision, otherwise known as 'situation awareness'.

Situation awareness can be thought of at multiple levels, he said. The basic level is gathering information. It comes from the machines we work with, what other people tell us, and from our processes and procedures.

This leads to the next level, comprehension, when we try to make sense of it with mental models, including estimates and assessments. "It is happening so quickly we don't even realise that we are doing it."

This leads to the "projecting" part of situation awareness, when we try to work out what is going to happen, what outcomes we might get from the various options available to us.

Finally, the decision is made and leads to consequences.

Cognitive bias

People's decisions are affected by cognitive biases. Scientists have found at least 20 different types. Cognitive biases which impact maritime decision making include confirmation bias, anchoring bias, consensus bias, sunk cost bias and hindsight bias, he said.

Confirmation bias is where a person only seeks information which supports what they already believe, rather than using the information to inform their decision. "We have already made an opinion, and we are looking for more information in that direction. It is very common, especially when making critical decisions."

Ankit Acharya, maritime instructor, NSB Group

Anchoring bias is where a person's mind gets "anchored" in the first information they are provided with and does not change as the situation changes. For example, you could be told that a road is dangerous to walk down, and you continue to believe it is dangerous even if the police have made it safe.

Consensus bias is when someone believes that the whole world thinks the way that their own group does.

Sunk cost bias is where people do not stop a project when it makes sense to do so, because they don't want to waste the resources they have already put into it.

Hindsight bias is the tendency to see past events as having been more predictable than they were, so you think someone made a silly mistake.

"We think it is so simple, but it is not so simple," he said.

Other human factors

People should prioritise preparation and training, rather than rely on optimism that things will work out. An ancient Greek poet said, "we don't rise to the level of our expectations; we fall to the level of our training."

People in shipping often do not learn from experience as well as they could. "We see the same things occurring over and over," he said.

Standardisation of shipboard equipment would mean less time was required by seafarers in learning how to use it, he said.

Better connection between equipment and machinery designers and operators would help. Machinery designers can often be mistaken about how it actually performs. "The people designing ships are not the people operating ships."

Harren's experiences with SIRE 2.0

Captain Yigit Daysal, Quality and Safety Superintendent, Harren Group presented the company's experiences doing four trial SIRE 2.0 inspections, and how it is using technology to improve safety

Harren Group of Bremen, Germany had done four SIRE 2.0 inspections at the time of the conference (October 2024), said Captain Yigit Daysal, Quality and Safety Superintendent.

Contrary to what might be expected, the biggest area for negative observations was process, not human factor, he said.

The subject areas with most of the observations were certification and documentation, crew management and safety management.

The "certification and documentation" observations related to the photos and certificates uploaded beforehand, or inaccuracies in the pre-inspection questionnaire. The conclusion is that companies should take great care to review everything before it is submitted.

OCIMF's Seafarers' Practical Guide to SIRE 2.0 Inspections proved helpful. It is possible to make a custom version of the guide including references from the company's own SMS system, to be placed on the vessel, he said.

SIRE 2.0 means extra administrative work for shore staff preparing submissions.

OCIMF stated the initial population of the pre-inspection questionnaire should take 2 hours, and updates should take 20 minutes. Uploading certificates should take 60 minutes the first time and 10 minutes for updates; uploading photographs should take 20-30 minutes each time. Harren's experience is that tasks take twice as much time as this, he said.

Harren created new roles in the company for experienced people from the fleet department to do the initial submissions and gap analysis. It is considering recruiting more staff to handle the additional workload.

Harren Group has around 50+ vessels in its fleet, including heavy lift vessels, multi-purpose vessels, bulk, containers, tankers, and offshore. It owns, operates and also charters vessels.

Beyond passive training

"Passive" training, such as asking crew to read and watch training materials then answer questions about the material, is good for knowledge development, but that is not the same as competency, he said.

Harren implemented a competency management system in December 2022 for its tanker operations and has since extended it to all other types of vessels, including dry fleet

It also provides more active training to crew via seminars and webinars, where crew can ask and answer questions. Last crew seminar was held in Istanbul.

At the seminar, Harren particularly emphasized the section 'Celebrating Excellence,' which involves recognizing and rewarding employees who have significantly contributed to the company's success. This recognition includes not only vetting but also the completion rates of training programs like CSM.

Safety technology

Harren is considering a number of different digital technologies to support seafarer training including virtual reality training tools.

Currently, Seafarers are able to access the company training platform via their smartphones.

The company believes that in an environment where conditions have changed, rules and expectations have increased, yet the number of crew members onboard remains the same, it is unrealistic to expect every aspect of the 500-page company manual to be learned. Therefore, the decision was made to implement an AI-powered system that provides instant access to answers regarding company procedures through simple queries.

Captain Yigit Daysal presented some statistics on smartphone usage rates by age groups and highlighted a clear reality revealed by research: the new generation's addiction to their phones and their reliance on accessing information through these phones or the internet.

In light of these statistics, Harren Group has started market research to see if preparing for SIRE 2.0 inspections can be made more interesting and effective with a good smartphone application.

It is looking at AI tools which can provide seafarers with written answers to questions about the company's Safety Management System.

Captain Yigit Daysal, Quality and Safety Superintendent with Harren Group

The process of asking questions is also a big learning experience for the crewmembers, just as many people learn a great deal from their vetting inspections. "Basically, you are training yourself through these applications," he said.

Why seafarers leave shipping

Captain Daysal presented the results of an INTERTANKO survey of 5000 seafarers published in 2024 asking why seafarers leave the industry.

The biggest reasons for leaving (ordered biggest first) were said to be family reasons, excessive workload, having better opportunities elsewhere, seeking better financial security, health reasons, personal safety, the threat of criminalisation or threat of abandonment.

The survey also found that very few seafarers leave seafaring because they are retiring from working life, because of the salary, or because of the living conditions / lifestyle.

76 per cent of seafarers reported that they "are overwhelmed by their tasks and responsibilities".

However, the high retention rates within Harren indicate that the above statistics do not apply to Harren and contribute to achieving positive feedback. For example, campaigns focused on the wellbeing of those onboard, as well as internal audits, not only check the fulfilment of commercial requirements but also focus on the overall wellbeing of the crew. TO

Shipping and AI

The shipping industry will probably see the most value from AI through decision support reducing fuel and GHG tax costs as well as future "agentic" tools which complete simple tasks for us, rather than the current generative and data processing AI tools, said DNV's Ola Drange Veglo

"We know [AI] is going to change a lot of things, but we don't exactly how and when" said Ola Drange Veglo, Business Developer for AI & Digital Trust at DNV.

Ola Drange Veglo, Business Developer for AI & Digital Trust at DNV

Today, AI is "basically everywhere," including in cybersecurity, science, business decision making, and will be a critical part of many future systems, he said.

Shipping people and technology developers will need to develop competency to understand how it can work best in shipping, he said.

In the shipping industry, "of course this AI hype has come. We see there's a lot happening." However, so far, the hype is driven more by the rapid improvements in capabilities of these models, not by the value they provide, he said.

ChatGPT was the quickest adoption of new technology the world has ever seen. But it also made people believe that AI will change everything. Now views about how AI will change things is maturing.

"Yes - AI is going to change things but not entirely how we first perceived 2 years ago," he said.

For shipping, in the long-term, it is probably not going to be language models that generates the most value by themselves, but likely from more advanced AI augmented decisions reducing fuel and GHG tax costs or improving commercial activities.

Currently, large language model can help shipping professionals get access to specific information quicker and easier, such as where a crewmember needs to find the company procedure for doing something. "We can find the right documentation at the right time much quicker," he said. AI could be used to automate reporting which shipping people have to do every day. "A lot of this is quite repetitive," he said. Both will free up time for employees to work on more critical and engaging work. The direct economic impact of these use cases is limited in the short term but can allow us to "do more with less". Early implementation of these use cases will drive adoption and engagement required when utilizing more advanced AI-enabled systems in the future.

More economic benefits to shipping may also be seen when we have what is known as "agentic AI", digital tools which can do some of our real work for us, carrying out small tasks and making some decisions.

"There's potential to save a large per cent of time in various admin functions with these types of tools."

Much of these questions come down to the business case – the development costs, risk and financial returns – a lot is already "doable technically".

Supporting decisions

Big tangible value for AI in future might also be seen when it is used to support decisions, such as relating to vessel performance leading to reduced fuel consumption. For example, predicting hull fouling so better decisions can be made about when to do hull cleaning.

If AI capabilities keeps improving rapidly and more data sources become available, its decision-making capabilities will improve.

And perhaps AI systems will be developed which can connect different decision-making tools together, to make more complex decisions like whether to charter a vessel or which maintenance tasks are most urgent.

AI background

AI has been continuously developed since the Second World War. We saw the first type of chatbots in the 60s and 70s, and then AI beating the world chess champion in the 1990s.

The older AI systems were explicitly programmed rule-based systems; newer systems are being fed data and asked to find the right set of rules themselves.

It is important to recognise that AI has a number of different disciplines, and generative AI (as used by ChatGPT) is just one, he said.

It's been hard to agree on a specific definition of AI. "Every time researchers come up with a definition of what AI is, someone invents something new that's outside the description," he said.

Getting started

"The most important part is to get started. Play around with tools, try to understand how to build competence in organisations," he said.

Adopting AI in shipping doesn't need to be costly or complex. Start small to gradually build competence and data structure, so you won't be left behind as adoption accelerates.

By contextualizing data collection, ensuring quality, and adopting scalable systems, shipping companies simplify AI development and establish a foundation to scale AI across fleets and organizations.

Senior leadership must drive the strategy while also empowering teams to create value through concrete, tangible use cases.

"Have some use cases you can get practical, tangible value from, to get the momentum that's needed in the long run."

Prioritize AI projects with quick, measurable impact. Early successes keep stakeholders engaged, build momentum, and show AI's potential for meaningful improvements.

Given AI's rapid evolution, partnering with experts is essential. This lets you tap into the latest advances while focusing on what's strategically relevant for your company.

Generative AI

Much of the AI hype is fuelled by generative AI, which is behind large language model (LLM) based technologies such as ChatGPT. There has been much news and discussion about this over the past 2 years.

"Its strength lies in its ability to provide insights from vast amounts of textual data," he said. "It works by statistically finding out what word should come next."

"It works surprisingly well especially if you have various documents across an ecosystem." It can "retrieve information in a quicker and easier manner."

But so far, generative AI has struggled to create big economic impact, in shipping, he said. Many use cases seem "low value" in themselves. But if you have multiple systems doing low value tasks it can add up to something quite useful, he said.

AI in DNV

In 2018, DNV began using AI in its processes and tools, and today it has a wide range of algorithms integrated into its daily processes. It has 25 years of consistent data in its production system and a dedicated team focused on making smart use of it, he said.

For AI-enabled systems in shipping to be useful, their outputs need to be trustworthy. DNV has been investing in building trust in industrial AI for a long time. It has a research community of 60 researchers who have, for example, published recommended practices on how to assure AI-enabled systems. TO

Danica: more seafarers are job searching while at home

Nearly all seafarers are now scanning for job opportunities during time at home. Shipping companies may be better working with the situation and continually recruiting, said Henrik Jensen of Danica Crewing Specialists

98 per cent of seafarers are scanning the job market during time at home, according to responses in the latest (2023) crew survey compiled by Danica Crewing Specialists.

This rose from 91 per cent in 2019, 92 per cent in 2020 and 86 per cent in 2021, said Henrik Jensen, founder and CEO, Danica Crewing Specialists, speaking at the Tanker Operator Hamburg forum in October. The results of the company's crew surveys are available on its website.

In the latest survey, 73 per cent of seafarers said they would change job if the salary offered was higher. This is true for seafarers of all nationalities Danica works with, and at all ranks, with the exception of Philippine senior officers, who have a stronger tendency to stick with their employers, Mr Jensen says. [Danica does not work with Chinese seafarers].

We are unlikely to see times again where someone rises from cadet to captain in the same company, he said.

Many seafarers got into the habit of switching company during Covid times. They found they were unable to get onboard a vessel of their current company due to travel restrictions, he said. And younger people in general are more willing to switch job today, not just in shipping.

Looking for jobs has become easier now many shipping companies post information about vacancies, including salaries and ages of the vessels, on their websites.

A seafaring job at a specific rank is pretty much the same in any company, he said.

Seafarers don't see any reason to be loyal to a shipowner when they don't even know who the owner is sometimes, particularly if it is the charterer's name, rather than the owner's, on the funnel of the ship.

Low retention leads to operational risk for a tanker company, such as from not being able to comply with the 'crew matrix' required by oil majors, he said. There have been examples of companies employing two chief officers onboard one vessel, to have the required crew experience onboard.

Henrik Jensen, founder and CEO, Danica Crewing Specialists

Danica is an independent crew management and maritime recruitment company based in Hamburg, with an operations officer in Cyprus and five fully owned managing offices in Ukraine, Georgia, India, Philippines and Russia.

There are 45 office staff, over 1500 active crew, and crew onboard over 250 vessels.

What companies can do

Companies can make themselves more attractive to seafarers by offering shorter contracts (some as short as 2 months), and offering benefits such as free internet, medical insurance and pension plan.

They can offer better career prospects, although that only works until someone becomes a captain.

But it may be better for companies to consider how to manage fluctuation rather than aim for retention, so assume that whatever they do, there will continue to be a turnover of crew.

"We cannot prevent crew from leaving, unless you want to be the market leader in salaries and only do newbuildings," he said. "We have to accept that they go. And do not be angry because maybe you need them [back] one day."

Companies could also think more carefully about their crewing needs in advance. In shipping, only 60 per cent of companies have a written strategy for recruitment and retention of seafarers.

A shipping company with 20-30 ships could be managing 1000 to 2000 employees, he said. Every company onshore with a similar number of employees would have a written recruitment and retention strategy.

Many companies could pay more attention to getting a correct 'manning factor,' so they have the right number of seafarers in their total pool, he said.

The basic manning factor calculation is based on how many crewmembers at a certain rank you need divided by the number of vessels. If masters work 4 weeks on and 4 weeks off, the manning factor is 2. A company with ten vessels needs twenty masters.

The calculation gets more complicated when you factor in newbuildings and the likelihood that a certain number of your crew will leave the company. But if you have too many crew on your books, some of them may leave because they cannot find a post with you.

22 per cent of the times when crew change employer it is because their current employer could not offer them a post at the time they wanted it, he said.

Simplifying work

Another approach tanker companies could take is simplifying work, so it does not take so long for a new seafarer to get up to speed working on a vessel.

This could be the cheapest of three possible ways to make sure you always have qualified crew, the others being to train crew yourself, and to hire qualified crew from other companies.

It is common for shipping companies to have thousands of procedures, not all of which they need. There may be a procedure for something which happened 7 years ago but has not happened since then. This might be something you can remove, he said.

A pilot who starts flying with a different airline does not need to read about the company's safety strategy, policy and vision, as shipping companies may expect new seafarers to do. The pilot will have a decision support system which will give him short instructions of what to do if an engine fails, he said.

Shipping companies can also simplify by minimising the number of different software tools they use onboard, he suggested.

Online recruitment tools

Danica makes extensive use of Google Adwords for recruiting, It has also developed a sophisticated WhatsApp chatbot based system to suggest postings to crewmembers on its database.

Mr Jensen believes that Google AdWords is able to identify serving seafarers and serve them recruitment ads, even if they are not looking for jobs online.

Google may be able to identify a seafarer by looking for patterns in their online behaviour, such as someone who moves from Manilla to New York then logs on from somewhere else in the world two weeks later, Mr Jensen said.

If so, this would provide a means to promote employment opportunities to seafarers who are not actively looking for work, normally the hardest group to reach.

Danica has also developed its own recruitment

tool, which sends seafarers automated WhatsApp messages when it believes a suitable vacancy has become available.

The chatbot will pose "screening" questions, such as if they are familiar with two stroke engines or have a US visa.

If the seafarer declines the opportunity they are asked why. If they say it is because they are at a different rank to the one on offer, the chatbot asks if it can update Danica's database of crew information with the new rank.

Once a seafarer has applied for a position, they can see how their application is progressing via Danica's online tool, for example that the next step is an interview.

"We say it should be as easy to apply and get in contact with shipowner [online] as it is to order pizza," he said. TO

Captain Deepak Gupta

The dry bulk sector is moving in similar directions to the tanker industry, with efforts driven by RightShip and other major players in the dry sector (including us), said Deepak Gupta, director of QHSE, marine standards and assurance with Oldendorff Carriers, a dry bulk operator.

Captain Gupta is formerly head of marine with Interorient Shipmanagement, managed QHSE and vetting with Zodiac and training / vetting manager with Tanker Pacific Management.

There are also concerns in the dry bulk sector that vessels and their managers will be judged on the number of 'observations' made during the inspection. And comparing vessels based on the number of observations is not a way forward. It should be "more about reading the whole report, full content incuding the positves while evaluating if the ship as fit for business" he said. "The qualitative analysis, not just the quantitative."

Deepak Gupta, director of QHSE

This requires a certain level of maritime competence, which currently is an area of imprvoement for people working with inspection reports, he said.

Oldendorff also has a project with Strathclyde university in Glasgow, UK, to find the best way to develop AI tools so that seafarers are connected and feel supported. The university has set up a collaborative research group with Oldendorff to eork on new methods of human science, element and behaviours.

The basic function of any tool for seafarers should be to support them, not to monitor them, he said. "We are looking forward to developing that with the university. Hopefully we will have some solutions soon."

Any safety management system or training should be built around trust of the seafarer, not monitoring them, he said. People develop their competence when they feel that they are trusted.

When a shipping company is continually asking seafarers questions, asking them for evidence of something, or giving them feedback, it makes seafarers feel they are not trusted, and someone is keeping an eye on them, he said.

"All applications and solutions presented in the market give a nice picture, but at the end we are talking with people," he said. "If trust is broken it is very hard to build it up again." TO

Yara "don't worry about clean ammonia supply"

Ammonia producer Yara says the shipping industry should not be concerned about the availability of low carbon ammonia fuel, with so many projects being planned

The shipping industry does not need to worry about availability of low carbon ammonia, Murali Srinivasan, senior vice president of Yara Clean Ammonia told a meeting of shipping industry journalists on Nov 20.

"Our promise to shipping is, 'don't worry about supply, leave it to us,'" he said.

Yara is planning or developing the following low carbon ammonia projects:

Green ammonia: Porsgrunn, Norway (24 kilo tonnes per annum or ktpa); Pilbara, Australia (4 ktpa); ACME, Oman (100 ktpa); Scatec, Egypt (150 ktpa); AM Green, India (500 ktpa available to Yara).

Blue ammonia: Sluiskil, Netherlands (400 ktpa); Enbridge, US Gulf Coast (1,400 ktpa); and BASF, US Gulf Coast (1,200 to 1,400 ktpa).

If all these projects are developed as planned there would be 778 ktpa of green ammonia and 3 million tonnes per annum (mtpa) to 3.2mtpa of blue ammonia.

Green ammonia is produced using renewable electricity to separate water into hydrogen and oxygen, then using the hydrogen to make ammonia. Blue ammonia is produced using gas reformed into hydrogen and CO2, with CO2 sequestered in the subsurface.

Green ammonia "will cost a lot more than blue," Mr Srinivasan said. He was unable to be more specific about how much more expensive it will be.

But blue ammonia production has a further big difference to green ammonia in that it gets cheaper with bigger scale production. Bigger scale requires bigger gas pipelines, gas reformers, ships and CO2 storage facilities. With increasing scale, the cost per tonne reduces.

Murali Srinivasan, senior vice president of Yara Clean Ammonia

For green ammonia, more production requires a larger number of wind turbines or solar panels, rather than bigger ones, so the cost per tonne will not decrease with scale.

Of all the mooted future low carbon fuels, blue ammonia is the only one which can be produced relatively easily at the scale needed by the shipping industry, he said.

Any fuel generated from renewable electricity, such as "e-LNG", is just as expensive to produce at a big scale than a small scale. TO

Suction sails proving popular with tankers

Suction sails are proving of particular interest to tanker operators, with Bound4blue installations completed or planned with Odfjell, Eastern Pacific, Louis Dreyfus, Marfleet Marine and Klaveness

Suction sails, which create thrust by "sucking" air from one side of a sail, are proving of particular interest to tanker operators, says Barcelona sail technology company Bound4blue.

Installations have been completed or planned with Odfjell, Eastern Pacific, Louis Dreyfus, Marfleet Marine and Klaveness.

The company was founded in 2015 by three aerospace engineers. Today it has over 45 staff.

Bound4blue's office is in Barcelona, and the sails are manufactured in China. The company will open an office in Singapore in 2025.

During 2024 Bound4Blue raised Euro 22.4m investment from venture capital and corporate investors. Investors included GTT (a French maritime engineering company); Louis Dreyfus Company, an agribusiness company; and Shift4Good, a venture capital company based in France and Singapore.

The company calculates that an LPG tanker going from Houston to Antwerp would save 10 per cent of fuel using eSails, which would mean $283,000 saving.

If the savings on buying EU ETS allowances and savings under FuelEU Maritime are considered, the savings could be $523,000 on the voyage. Under FuelEU Maritime, companies can consider wind propulsion a 'fuel'.

How suction sails would look on an Odfjell chemical tanker

Installations

The first prototype system was installed in 2021 on fishing vessel Or.Pa.gu.

Short sea dry bulk / offshore shipping company Amasus installed 17m suction sails on its vessel "Eems Traveller" in July 2023.

In 2024 Louis Dreyfus Amateurs (LDA) installed Bound4blue sails on its ro-ro ship Ville de Bordeaux. Louis Dreyfus Company had also announced it would install Bound4blue sails on a juice vessel during 2024.

In August 2023, Odfjell announced it would install the suction sail system on its chemical tanker Bow Olympus, with installation expected in late 2024. This made it the first tanker company to test suction sails, it said. The decision followed an extensive study by Swedish research organisation SSPA evaluating different wind propulsion systems on the market.

Odfjell said the vessel was prepared for the installation by installing foundations, adjusting radars and lighting, and installing bow cameras to improve visibility.

Bound4blue has a contract to install sails on a chemical tanker operated by Eastern Pacific.

A system will be installed by Marubeni on a Panamax bulk carrier in late 2025.

A system will be installed on passenger and cargo vessel Tuhaa PAE operating in Tahiti, to be delivered in the first half of 2026.

A system will be installed on a 49,999-dwt oil and chemical tanker "Santiago" operated by Marfleet Marine.

In October 2024 Amasus signed its second contract with Bound4blue, for the "world's largest suction sail system on a general cargo vessel," with a 22m sail to be fitted on a 90m vessel at Astander Shipyard in Santander, scheduled for mid-2025.

Klaveness will install sails on a combination carrier. There is also a plan to fit sails on Maersk tankers.

How suction sails work

With a suction sail, the propulsion force is created by the difference in pressure as air flows over each side of a vertical sail. The pressure difference is achieved with a fan sucking the air into the sail on one side.

This is the same principle as used by aircraft to create lift. Air flows a longer distance over the curved top of the wing, than the air flowing over the flat underside of the wing. So there is reduced pressure above the wing.

Shipping companies might want to choose between a suction sail and a rotor sail, which is a tall vertical cylinder which rotates. Here, thrust is created as air moves across the spinning object, as with a spinning cricket ball flying through the air.

A large spinning cylinder is very complicated to manage technically, says David Ferrer, CTO of Bound4blue. Its weight needs to be balanced perfectly on its bearings, otherwise they will wear out quickly, he says.

With a suction sail, the only continuously moving part is the fan. The only maintenance needed is greasing the fan bearing or perhaps replacing the motor. The entire fan can be easily replaced if necessary, he says.

Flettner rotors are typically made from composite materials which have a lower weight and vibration to make them easier to rotate, but these materials are difficult to recycle and repair, he says.

It also requires more energy to keep a large cylinder rotating. On a suction sail, the only energy input is the fan, he says. The rest of the sail does not move and can be made from metal.

The other alternative for ships is a fixed sail. The suction sail has lower weight and size than a fixed wing sail for the same propulsive power, Mr Ferrer said. The extra height of a fixed wing

A suction sail installed on the Amasus short sea bulk carrier "Eems Traveller"

sale means it is more likely it will need to be retracted in heavy weather.

Suction sail background

Suction sail designs were first considered in the 1930s for aircraft wings, by a US research agency. While they would have increased lift efficiency, the design was abandoned for safety reasons, since it created a new point of failure.

The first suction sail was installed on a ship in the 1980s for a foundation run by Captain Jacques Cousteau, the explorer and inventor. He had been interested in a Flettner sail but did not like the complications of having a large spinning cylinder, Bound4blue says.

Working together with physicist Dr Bertrand Charrier, he developed a suction wing as described above. It proved to make three to four times as much thrust as a standard "Marconi" sail. It was installed on Cousteau Society vessel "Alcyone" in 1985.

There was little market interest in the idea at the time due to fuel prices being very low. But now there is much interest due to the maritime decarbonisation drive.

Dr Bertrand Charrier currently serves as a partner at Bound4Blue.

Since the 1985 installation, the design has been tweaked to get 20 per cent more thrust, says Alberto Llopis, Lead Aerodynamics Engineer with Bound4Blue.

Where to place the sail

The position of sails on the deck makes a big difference to performance.

The sail itself creates drag (air resistance), which is an opposing force to the thrust they create.

Also, other vertical structures on the deck, including cranes, accommodation and other sails, will impede the flow of wind to a sail downwind of it.

So you cannot double the wind propulsion force on a vessel simply by doubling the number of sails.

The wind speed is also different at different heights.

While quick calculations can be done mathematically, for higher accuracy the company does computational fluid dynamics (CFD), making a granular model of how the wind creates force. It also gathers experimental data in a wind tunnel.

Bound4Blue has developed its own modelling tool to do the calculations for the best sail configuration, which can run 25 times faster than CFD, Mr Llopis said. It is called POINT (POtential INterference Tool).

It builds on mathematical modelling and techniques used in the aviation industry.

With the model, it is possible to try out different configurations of sails on the deck.

It usually turns out that the best choice often has the biggest separation between the sails, Mr Llopis said.

Bound4blue is developing its software development and data analytics capability. It is possible a competitor may steal the design and build sails in the same way, but they would find it much harder to replicate the software and data expertise, says Mr Ferrer. TO

Transporting CO2 by ship

If an industrial facility wants CCS and is not near a pipeline, it will need to move CO2 by ship, rail or even road. Will this transportation be available? A London carbon capture conference discussed

Many coal and gas power stations and industrial facilities are located a long way from pipelines which could carry their CO2 to a storage site.

If they want to do carbon capture and storage, the CO2 will need to be transported another way, with the two main alternatives being rail or ship.

Issues were discussed at CCUS 2024, the annual event of the Carbon Capture and Storage Association in London on October 15-16.

Most European power stations were originally built to run on coal, and so built next to a railway line or port to bring in the coal.

The Carbon Capture and Storage Association has identified that over half of its members will require a means of transporting CO2 other than a pipeline.

But so far, there are very few CO2 ships and rail cars, and this is likely to be a much more expensive way to move CO2.

Tankers

Normally the costs of moving goods by ship are a tiny proportion of the total costs of the goods, said Bruce Moore, Director New Energy & Strategy, Energy, Decarbonisation and Offshore Business with shipping company MOL.

But for CO2 projects, in contrast, the costs of moving CO2 by ship can be a large proportion of total CO2 transport and storage costs.

Murali Srinivasan, senior vice president of Bruce Moore, Director New Energy & Strategy, Energy, Decarbonisation and Offshore Business with MOL (left)

A large part of this is the cost of building the ship. "Building anything in a shipyard is incredibly expensive," he said. "There doesn't seem to be much prospect of that

Stefan Siegemund, Business Development manager for New Energies, VTG; Ben Burggraaf, CEO, Net Zero Industry Wales; Fridtjof Wisur, commercial director, Northern Lights

coming down."

For CO2 transport, MOL works in partnership with Larvik Shipping of Norway, which has been carrying CO2 by ship for 35 years.

Mr Moore's background is in LNG shipping. For LNG, as with CO2, there was a requirement to build an entire supply chain before anything could be done.

It might help if the CCS industry could agree on standard tanker sizes for CO2 tankers, he said, just as the maritime industry has standard sizes for other types of tankers and bulk carriers.

Northern Lights

Norway's Northern Lights project uses tankers to transport CO2 from emitting sites onshore in Norway to an onshore terminal in Western Norway. This terminal is connected by pipeline to offshore storage. The initial stage of the project, "Phase 1", handles 1.5m tonnes of CO2 per annum.

Northern Lights has four customers so far. Heidelberg Materials' cement factory at Brevik, Norway; Hafslund Celsios' waste to energy facility in Oslo, Norway; fertiliser company Yara's ammonia and fertilizer plant in the Netherlands; and Ørsted's bio-based power plant in Denmark.

The project team's challenge is to get "Phase 2" running, working on a purely commercial basis (without government support), to carry 5m tonnes CO2 a year. This could be followed by a larger Phase 3, said Fridtjof Wisur, commercial director.

While most of the CO2 is delivered to the terminal by ship, there is also the possibility of delivering it by truck.

Two CO2 ships have already been built for the Northern Lights project, and two more are on the way.

Provided there is a standard ship-shore interface, the ships provide operational flexibility, because they can be easily deployed to different customers, he said.

Mr Wisur noted that companies need to be willing to collaborate for projects such as this to work. "It requires trust and alignment of objectives," he said.

Wales

The industrial facilities in South Wales (UK), which include steelmaking and chemicals, form "arguably the largest cluster in the UK that doesn't have access to [CO2] pipelines or storage," said Ben Burggraaf, CEO of industry body Net Zero Industry Wales.

For this reason, the Wales facilities can never be part of the UK government's "track" CCS current funding schemes, he said, which are built around clusters with both capture and storage. CO2 shipping will be required for South Wales to decarbonise. TO

Managing the cleanliness of hulls

Tanker operators can keep hulls clean using antifouling coatings, ultrasonic vibration, and underwater cleaning. Copper release from coatings should be considered. They can get certified or achieve standards for effective hull management. The Port Inspection and Cleaning Conference in Italy explored the issues

A number of members of the PortPIC community contributed to this article

The gradual increase in fouling and hull roughness can lead to 7-10 per cent increase in fuel consumption, if it is not cleaned.

And traditional methods of fouling removal are being banned by port authorities because of concerns related to invasive species and release of paint particles into the environment.

And rough cleaning practices often lead to premature depletion of the paints and subsequent loss of protection.

These challenges can be overcome using new technologies and solutions now being developed. Agreement needs to be reached on best practices and standards so the new ways can be rolled out.

Recent developments include biocide-free antifouling solutions, nano-coatings including graphene-based coatings, and coatings with passive air lubrication. There are also protection systems based on ultrasonic or ultraviolet radiation, and rapid growth in robotic cleaning technologies.

"There are changes underway in terms of going from traditional methods to robotic cleaning approaches, and also the different ways to monitor hull and propeller performance," said Ivana Melillo from Grandi Navi Veloci, a subsidiary of MSC Cruises.

CMA CGM's Jean-Loup Barrere admitted that 10 years ago, his company did not consider biofouling to be a problem on its ships. It only did what it thought necessary. But now it does regular cleaning and inspections of its hulls.

"As I see it, there are many options, many questions and it is not easy to select the right technology," he said.

DNV's Volker Bertram questioned whether the development in cleaning methods is aligned with developments in the coating technologies, and if regulators and port operators are keeping up with the developments.

Ultrasonic

Devices which create ultrasonic vibration in the hull cause very high accelerations, which destroy cell structures of fouling, explained Ove Hagel of Hasytec.

So "ultrasonic protection" offers biocide-free protection for ships even at zero speed.

Ultrasonic systems have been used successfully for some time on niche areas but application to the entire hull of a large vessel is a novel approach, he said.

In-water cleaning

For in-water cleaning (IWC), the regulatory landscape is "crowded and complex," said Anita Børve of Jotun.

"Several international and local entities are working in parallel. But technologies and

regulations are under development with various maturity and timelines," she said.

Existing methods of testing and ensuring water quality during IWC are very comprehensive, labour and time consuming. They do not match what is possible to achieve in practice during a normal port call, she said.

Jotun has developed a new method of testing water quality. "Testing has also proven that proactive cleaning without capture can be done without imposing any excessive release of biocides."

Anna Yunnie of PML Applications said that not enough is known about the compatibility between different cleaning methods and coating types, and not enough is known about the physical impacts on coating integrity and antifouling performance following an in-water clean.

If the shipping industry is to meet IMO guidelines on biofouling management, these information gaps require attention, she said.

ISO standard for in-water cleaning

The ISO 6319 standard for in-water cleaning, to be published in January 2026, will be based on agreed best practice, said Irene Ø. Tvedten from environmental organisation Bellona.

If regulators are concerned about in-water cleaning procedures, they can ask shipping companies to follow ISO 6319, rather than just ban in-water cleaning, she said.

The standard will also help ports and relevant authorities evaluate requests for in-water cleaning, as well as help shipowners ensure that cleaning services are performed in a specific way regardless of location.

LR Clean hull notation

Sahan Abeysekara from Lloyd's Register shared information on LR's Clean Hull Notation. This provides recognition of various hull management practices. It shows how management quality can be quantified, with a surveyable output.

The aim is to maintain the hull at near cleaned condition at all times. This requires a close relationship with hull management or vessel performance monitoring systems.

Hull condition is assessed with frequent biofouling inspections and fouling prediction modelling.

Copper release from paints

Morten Sten Johansen, Jotun's Global Category Director, Hull Performance presented a paper analysing copper release rates from antifouling paints, and how to make accurate risk assessments.

Regulators and port operators are likely to make decisions to approve products based on their risk to the environment. So accurate data on release rates of substances of concern such as copper compounds are essential.

Tests carried out on a variety of coatings in several European ports revealed that the standard input values for risk assessment based on ISO 10890 (mass balance method) can overestimate release rates, he said.

From the analyses presented it can be concluded that seawater flow has a greater impact on the release rate than salinity.

Delegates at the Port Inspection & Cleaning Conference (PortPIC) held its fifth annual conference in Pontignano, Italy on Sept 30-Oct 1. The conference was put together by Volker Bertram of DNV and Jotun. It brought together over fifty industry representatives TO

Shipboard carbon capture – trial finds no 'dealbreakers'

A Dutch research project "EverLoNG" put a CO2 capture system onboard a TotalEnergies LNG carrier, and found that there are no obvious dealbreakers behind doing CCS onboard ships. Further research would be helpful

A carbon capture system was placed onboard a TotalEnergies LNG Carrier "Seapeak Arwa," to see how well it would operate and to compare it to onshore systems.

The project wanted to see how much CO2 would get captured, how fast the capture solvent would degrade, what impact the sea conditions (including movement of the vessel) would have, and the effect of impurities in the vessel's exhaust on the capture solvent.

Project partners include gas shipping company Anthony Veder, heavy lift vessel operator Heerema, Bureau Veritas, DNV, Lloyd's Register, MAN, SINTEF, TNO and TotalEnergies. The project was funded by the "Accelerating CCS Technologies" (ACT) initiative, which is itself funded by governments of countries participating in the project - Netherlands, Germany, Norway, UK and US.

The conclusion is that carbon capture on a ship was "successfully demonstrated", with 2475 running hours. No dealbreakers were identified for implementation of ship-based carbon capture from a technical perspective.

The behaviour is "pretty much comparable" to what has been seen in land-based carbon capture systems, the researchers said.

The system

The carbon capture system was brought onboard in three 20-foot box containers and installed close to the vessel's funnel.

One box contained the capture tower, where the flue gas is brought in contact with a solvent which attaches to the CO2, and the regeneration tower, where solvent is heated to release the CO2 it is holding.

It used a solvent containing 30 per cent MEA by weight. This is a very well understood solvent, which has been used in many carbon capture pilots.

The carbon capture system (circled) fitted on an LNG carrier

A second box container held the systems to dry the captured CO2 and liquefy it. A third container contained the CO2 storage tank, holding liquid CO2 at 15 bar. At this pressure, CO2 stays liquid at about minus 25 degrees C.

The system was only of a scale to be able to treat a portion of the vessel's flue gas. A system to treat the full flue gas flow will be the same but with much wider columns. A full-scale system would also require more heat input, and so would need more consideration on the best way to integrate with the vessel's systems.

The study

In the study, the carbon capture system was operated for 2475 hours, from October 2023 to February 2024. The engine was running at high load for most of the time, but not all of it.

The carbon capture system was operational 62 per cent of the time in this period. It was taken offline when Diesel was used as a fuel, LNG was being offloaded and when the engine was being maintained. There were some operational issues with the capture system, and times when specialist operators were not available onboard.

Data was gathered from sensors analysing the ship exhaust. Data about the solvents was gathered by collecting and analysing liquid solvent samples.

The study also compiled data about vessel operations, including motion, engine load and wind speed.

In the first month, it was operated for 400 hours with 7 per cent MEA solvent; in the second month, operated for 500 hours with 17 per cent MEA; in the third month operated for 600 hours with 30 per cent MEA.

The campaign was run by specialists in carbon capture (rather than maritime professionals).

Results

The untreated flue gas of the vessel contained on average 4.78 per cent CO2. As would be expected, the amount of CO2 captured increased with the concentration of the solvent.

With solvent at 5-7 percent (low concentration), the outlet of the capture system contained about 4 per cent CO2; with MEA at 16-18 per cent (medium concentration), it was 2 per cent CO2; and at 30 per cent MEA (high concentration), it was 1 per cent CO2.

Expressed in terms of the percentage of all the CO2 in the flue gas which was captured, it means with low solvent concentration the capture rate was around 23 percent; with medium concentration solvent it was around 54 percent; with high concentration solvent it was around 80 percent.

It is possible to capture more than 80 per cent with higher packing heights (a taller column).

After 600 hours of operation at 30 per cent MEA, the solvent was 20 per cent degraded. Degradation is usual, but the rate of degradation affects the overall project viability, because the capture is less effective and eventually solvent needs to be replaced.

The system showed stable operation, including stable temperatures, despite the vessel operating at one time in wind speed of Beaufort 10, meaning a storm (between a strong gale and a hurricane).

"The observed stability of the process shows a reliable process control system was implemented," said Jasper Ros of TNO. There was "quite robust technology implemented onboard."

There was one person onboard dedicated to operating the system.

Concerns

One concern is that NO2 in the exhaust can react with the amine solvent causing oxidative degradation of the solvent. This can make the whole project more expensive.

NO2 can also form nitrosamines if it is able to react with secondary amines, which would be a safety concern.

These concerns could be mitigated by using NOx emission reduction technology far beyond current Tier III regulations and avoiding the use of secondary amines as a solvent. However, also degradation of primary amines (like MEA) to secondary amines can lead to nitrosamine formation in primary amine systems.

There was on average 69.2 ppm NO2 in the capture system outlet (the exhaust gas was only measured at this position). This compares with 0.5ppm NO2 in the inlet of the carbon capture system in an onshore study conducted at Technology Centre Mongstad in Norway in 2015. This used the same solvent, although this project was 400 times bigger in terms of gas volume handled.

Another concern is that ammonia can be formed through oxidative degradation of MEA. The ammonia emissions were measured at 45 mg per normal cubic metre of flue gas, when operating at 30 per cent MEA, around three times higher than what was observed at TCM.

One observation was that amine emissions increased after the load on the engine changed, which could be caused by aerosol-based amine emissions, but more research is needed towards this.

The degradation of solvent could be as much as 3.5 to 4kg per tonne of CO2 captured, which is high compared to other research projects, but not "off the charts," said Juliana Monteiro, senior scientist at TNO.

Further research

The research has only focussed on one specific engine type and one vessel.

It may be useful to run pilots on other exhaust streams with different NOx levels, to see how much this disturbs the capture process.

One challenge with shipboard carbon capture systems, which onshore systems do not normally have, is that the flue gas flowrate is highly variable, depending on the engine load. The capture system will be designed for a specific flow rate. It may be necessary to do trials with capture systems handling flow rates different to the one they were designed for.

The project trialled amine solvents and post combustion carbon capture since it is the 'most mature technology,' and so probably the best to start with for maritime trials. The selection of solvent will have an impact on cost, safety and environment, Ms Monteiro said.

"If you were thinking about implementing 10 years from now, there might be other things to look into [such as] rotating packed beds and membrane contactors that could lower the volume and height of equipment onboard," Ms Monteiro said. "Ships may have limitations in terms of height, that might bring advantages."

Mr Ros noted that these novel technologies may not lead to better performance than the classical amine systems.

The equipment onboard with the biggest volume is the CO2 storage tank, and there is no way to reduce this.

Shipboard carbon capture research has other specific difficulties shore-based projects do not have, including the long time taken to deliver samples from the ship to the laboratory. Also, if something fails and the spare part is not available onboard, it takes a long time to deliver a new one. "We have to wait months. For us it is something we have to learn to deal with," Ms Monteiro said.

This article is based on a webinar "Results from the first EverLoNG capture demonstration campaign", held on June 25, 2024. It can be viewed online at

www.youtube.com/watch?v=e7cqqUfBtJY

IACS cybersecurity notation on a newbuild tanker

Metrostar Management Corporation built a new tanker to comply with the DNV / IACS cybersecurity notation. CIO Matthew Maheras explained the challenges

Metrostar Management Corporation is operator of 4 LR2s and 2 Suezmaxes. Three of the LR2s are sister vessels, all delivered in 2024.

Metrostar wanted all of its 2024 deliveries to comply with the DNV / IACS cybersecurity notations. This is required for all ships contracted for construction on or after 1 January 2024 with an IACS member.

Matthew Maheras, CIO, spoke about the challenges, at the Digital Ship Athens forum on October 10, 2024.

He was just back from visiting the shipyard constructing the third LR2 vessel for delivery in 2024.

"A couple of weeks before the vessel was delivered we had many surprises," he said.

"Every maker had his own idea about what cybersecurity onboard means and how he would secure his OT [operations technology] systems. Almost everybody had his own plans, with different IP schemes and everything."

For everyone involved in the shipbuilding, meeting the cybersecurity standards was something new. "Neither the yard nor the classification society, not to mention the makers, were very sure on how to go about it," he said.

Many cybersecurity documents were only supplied one or two weeks before the vessel was due to be delivered, and could get amended up to the last moment, he said.

Many providers of equipment and systems "were just fire fighting to get past the test," he said. One vendor was "lost in space, trying to understand it. We all had a couple of days before the final review."

Some providers took an approach which was too trivial, he said. At one point, the shipyard tried to declare the engine was secure by providing a short note, 'the yard is in contact with the engine maker and it is secure.'

Matthew Maheras, CIO, Metrostar Managmeent Corporation

"That was funny for me," Mr Maheras said. "We don't have visibility on 'how it is secure,' 'what is secure' and so on."

Some equipment companies just stated that their equipment is "secure", without providing any documentation to show how it would be secured.

Another put simple firewalls on their equipment "like you might use to protect a home computer," he said.

All traffic going to and from the vessel is "sniffed" by a more sophisticated system, so even if the vendor only provides a basic firewall for their own equipment, "we are not worried," he said.

But it would be better for cybersecurity to be built into the development from the start.

There was not much consistency in how the regulations are applied. The three sister vessels had separate auditors from the same organisation, and they all made different remarks. "Everybody is learning on the job," he said.

What regulations require

Under IACS cybersecurity regulation E26 for systems integration, it is the shipyard's responsibility to develop the overall cybersecurity plan, including risk assessment and management, cybersecurity policies and procedures.

These procedures are then incorporated into the shipping company's policies and procedures.

The policies also need to include roles and responsibilities for different crewmembers. Although the shipyard does not have much knowledge of how much capacity these individuals have to take on additional workload, Mr Maheras said.

The yard must create an 'asset inventory' of everything on the ship containing digital technology.

All providers of equipment have to prove that what they provide is secure, unless they can claim it is "out of scope" of cybersecurity requirements, because it is not connected to any network.

Satellite communications systems are always part of a digital network unless only handling voice calls. Propulsion, steering, fire detection and navigation systems are sometimes part of an IT network but not always. Any analogue equipment is self-evidently not part of a network.

There are systems onboard which are part of an IT network, but which, in the past, the company IT department did not have much involvement in. This includes radar, VDR, AIS and GMDSS. Because they are part of a network, they need to be cybersecure.

There is also a requirement for ongoing monitoring and maintenance.

Such as for regular vulnerability scans, network monitoring, security updates and security awareness training.

Segmenting onboard networks

One of the biggest challenges for IT managers is securing the onboard systems and networks.

Better security is achieved if networks onboard are segmented. For example, business activities should be on a different network to the one involved in equipment operations.

The shipboard business network need only be accessed by people who need to communicate with the outside world, normally the captain, chief engineer and cook.

There can be a separate crew network for crew personal communications,

Within the "equipment operations" network, there can be firewalls so a piece of equipment does not accept a request from another IP address or equipment it does not know. For example, the Voyage Data Recorder should only gather data from certain equipment and provide data to certain equipment.

Staff training

All shipboard staff have to undergo general cybersecurity awareness before they go onboard.

People working with specific equipment, such as navigation systems or engine controls, need to know the cybersecurity requirements relating to that equipment.

The vessel probably would not have a cybersecurity expert onboard, but needs to be able to access remote expertise if there is a serious problem.

The company IT staff need to know how to back-up and restore critical systems, and the procedure for post-incident analysis.

Mintra: 114 tanker specific courses available

Mintra now has 114 training courses specific to the tanker industry available on its platform. It also offers a competency management system and is developing AI tools to provide customised training

Mintra of Bergen, a company which runs a training and competency management system for maritime and offshore industries, reports that it now has 114 tanker specific courses on its platform.

It has over 20 tanker companies as customers. This includes Stolt Tankers and German Tanker Shipping.

There are four thousand courses altogether on its platform, of which 600 are relevant to maritime, says Jan Wiborg, Product Director at Mintra. The courses are created both by Mintra and by outside companies.

Most Mintra customers generate their own courses, such as to help crew get familiar with equipment on a new vessel. It offers an authoring tool to create courses, including the ability to convert a PowerPoint slide into an e-learning course.

A course can be as simple as a one-page article to read, where someone ticks a box at the end to confirm they have read it. It could be a video from the CEO, or a number of videos.

Some courses will have an assessment at the end of the course. Some courses have large question banks which can be used to run an assessment. Seafarers can be asked a question relevant to their rank and role.

There are courses which involve simulators, including some accessed with virtual reality goggles, although not all vessels have them onboard.

Mintra also offers online ECDIS training courses specific to certain equipment, with the course content provided by the ECDIS manufacturer. A seafarer can complete the ECDIS course before boarding a new vessel and be certified to use the equipment when they arrive.

The courses can be accessed directly from the cloud and seafarers can access them via an app. They can also be downloaded onto a server onboard a vessel. This enables crew to do the courses onboard without needing internet access.

The software keeps track of everything people have done. You can continue the same course at a later stage.

Competency management

The competency management system can be used by a shipping company to specify what competencies someone in a specific role will need, and what training and assessment can ensure they have attained it. They can be asked to take multiple courses as a path to moving to a new rank.

Skill assessments can be included in this. The skills can be assessed by a more senior seafarer or company expert.

Seafarers can be asked to re-take an assessment in a certain area every year so the company can check they still know the material. This ensures that people do not need to spend hours training in something they already know.

Mintra suggests that tanker operators should develop their own learning management framework, rather than use a generic system, because every company's needs are very different.

AI

Mintra is working together with an AI company to find ways to generate custom training material using large language models (LLMs).

Jan Wiborg, Product Director at Mintra

The LLM is fed a text transcription of the course, generated from the video using automated transcription tools.

It can then generate custom questions and identify whether the seafarer has provided the right answer.

Seafarers can also ask questions of the LLM and get an answer together with the source of the information.

The user can be taken directly to the specific section of a video in the course which shares the answer, instead of doing the full course.

Instead of watching passively, people are having a "conversation with the content," Mr Wiborg said.

TO

New STS safety system

Safe STS and Gall Thomson have jointly developed a "Protected Transfer System" called PTX for ship to ship transfers. it is designed for crude oil operations between tankers.

The system can be delivered to the ship on a skid.

It is designed to ensure that the pipelines instantly close if there is a breakaway (the two ships moving apart), so no crude oil can escape and spill.

It can be installed between the vessel manifold and the transfer hose. It can be installed permanently if desired.

It is activated remotely via what is known as a "Reflex High Pressure Unit".

After being activated, it can be reset in 30 minutes.

The system makes use of Gall Thomson's "Marine Breakaway Coupling" (MBC).

TO

How tanker terminals can manage vessel delay

Tanker terminals are finding better ways to use data to find the reasons for tanker delays and solve them. Robert Kessler of MIS Marine explains how

By Robert Kessler, Product Manager, Marine Terminal Operations, with MIS Marine

Tanker terminal operators are using data to uncover root causes of terminal-call delays and determine how best to solve them.

This way they can mitigate the risk of these delays and miscommunication that hampers dock operations.

Consistent data collection of event data before and during a vessel call allows for aggregation and identification of delay trends, ultimately helping to reduce the time alongside.

Documenting the vessel call

To understand and then mitigate the many different reasons for terminal-call delays, It is critical to measure and document each vessel call operation.

Some sources of delays are under the terminal's control, others are not.

Causes of delays can be a vessel waiting until tank space is available, a customer-related cargo-transfer interruption, to poor pre-arrival communication ahead of a marine surveyor inspection.

Each type of dock event must be accurately and consistently logged.

This includes both the terminal-call delays and the routine events that impact idle time.

Accurate logging requires a combination of collaboration, transparency and a single source of truth that cannot be achieved with a paper log or third-party service.

It can be accomplished with an easy-to-use digital system for entering events in real time, which also delivers the benefit of making data immediately accessible for analytics purposes.

It is important to ingest information from all sources including the surveyor time log, vessel statement of fact and the terminal berth log.

These sources need to be considered separate sources of truth that must be compared to understand each party's version of the truth.

Discrepancies can be identified and used as discussion points.

For example, when supporting a demurrage claim, terminal operators need to locate the letter of protest, identify delay reasons and responsibilities, and compare the vessel statement of fact with the terminal dock log to identify differences.

Houston Port

The Greater Houston Port Bureau (GHPB) has established a set of pre-arrival best practices that are standardized and tailored so that marine surveyors can plan and perform their services without causing delays or rework.

As the GHPB describes in a white paper (link below), the pre-arrival steps range from agreeing on berthing prospects to exchanging information about cargo transfer characteristics and calling in the vessel.

There are dozens of these communication exchanges that heavily impact the overall efficiency of a port call.

Dow, Vopak, SGS, Stolt

Another example is a collaboration between Dow Inc, Vopak, the terminal management service supplier SGS, and Stolt Tankers aimed at boosting supply chain efficiency in the US.

As part of their "Time Alongside Optimization Project" the four entities have shared their learnings to reduce the time that ships are berthed at a terminal, resulting in an average reduction of nearly two hours in port time.

The goal is to ensure that everyone is informed instantly when delays occur, enabling stakeholders to take coordinated action to improve cargo transfer efficiency and reduce demurrage costs.

Phillips 66

Phillips 66 is using MIS Marine's Mainstay system at 14 terminals to accurately and wholly collect all time-based events during a vessel call.

It is categorising delays by responsible party and type, comparing chunks of time during the vessel call by the terminal, dock operator team, vessel operator, product. It can identify the least time-consuming ways of working and expand that best practice to the entire ecosystem.

The system provides an accurate record of delays and associated documentation to reduce the effort around processing demurrage claims. It enables Phillips 66 to inform relevant users in real-time when delays occur, facilitating awareness and closer collaboration to minimize the delays.

Robert Kessler, Product Manager, Marine Terminal Operations, with MIS Marine

Phillips 66 uses this tool to process vetting requests and compare each nominated vessel with the company's risk matrix.

This provides valuable information for the vetting team to approve or reject a vessel for a specific cargo. The team can also take suggested actions for ships not meeting its risk tolerance threshold.

When the Phillips 66 team identifies delay causes beyond the terminal's control, it can collaborate with vessel operators and other third parties to reduce the impact of the delays.

The system enables all stakeholders to visualize and understand their effect on the vessel call length. It is possible to compare cargo inspector call-out durations over a year and determine if one company has a substantially quicker response time. The team can also identify why and then adjust to improve other partners' call-out response.

The Phillips 66 marine team can measure its performance using Key Performance Indicators (KPIs). These KPIs provide essential feedback on its progress and help the company identify areas for improvement.

Internet links:

Greater Houston Port Bureau White Paper
https://www.txgulf.org/news/standardized-marine-surveyor-communications-can-improve-port-call-efficiency

MIS Marine Case study with Phillips 66
https://mismarine.com/case-studies/phillips-66/

Avoiding off specification fuels

Over 10 per cent of HSFO and ULSFO fuels tested by VPS during January to October 2024 were off specification, a potential damage to ship engines. VPS shares advice on how to avoid engine problems from bad fuel *By Steve Bee, Group Commercial Director, VPS, a major marine fuel quality testing company*

10.9 per cent of HSFO, 6.3 per cent of VLSFO, 10.6 per cent of ULSFO and 7.7 per cent of MGO tested by VPS from January to October 2024 was off specification.

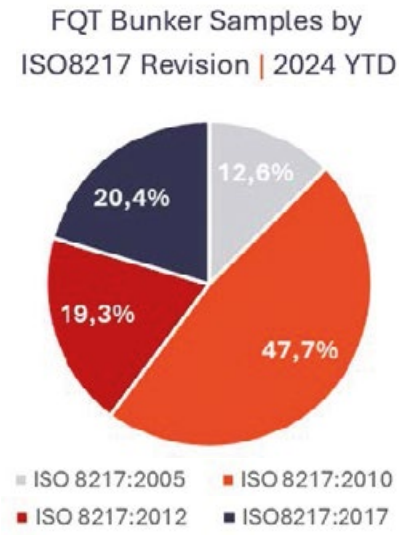
VPS has also issued 21 Bunker Alerts this year. These alerts have highlighted witnessed quality issues with the three main fuel types of HSFO (6 alerts), VLSFO (9 alerts) and MGO (6 alerts).

The 2024 alerts show fuel which was significantly off specifications for 8 different test parameters. They were found in 11 different locations, across Europe, Middle East, Asia and the Americas. Fuel quality issues can arise anywhere at any time, for any fuel type or test parameter.

2024 fuel quality standard

June 2024 saw the 7th revision of the marine fuel standard ISO8217 released to the industry. This is a major step forward in terms of setting specifications for marine fuel quality.

At the date of writing (Oct 2024), VPS had not received a fuel sample, fossil fuel, or biofuel, purchased to the 2024 revision. Based on past history it maybe sometime before such a sample is received. In addition, the shipping industry has a very poor track record of purchasing fuel against this revision.



Nearly half of fuel is purchased according to the 2010 standard; only 20 per cent is purchased to the latest 2017 standard

This latest revision has moved from two fuel specification tables to four. It includes, for the first time, specifications for VLSFO and ULSFO fuels containing 0.50% or 0.10% sulphur respectively, plus biofuels containing FAME, HVO, GTL, BTL, biocomponents.

This revision still does not cover enough of the further potentially problematic issues of chemical contamination, cold-flow properties, microbial-growth. It doe not cover wider bio-components such as Cashew Nut Shell Liquid (CNSL).

2005, 2010, 2017 standards

To date VPS sees 12.6% of samples received for quality testing being purchased against the 2005 revision of the standard. That revision has since been replaced by four further revisions of the standard over the years and it bears very little relevance to today's fuels.

Vessels are operating at a significantly increased level of risk if they are relying on ISO8217:2005 to fully protect them.

The most common revision against which marine fuel is purchased today is still ISO8217:2010. 48% of all fuel samples received by VPS, are being tested against this revision.

ISO8217:2010 is almost 15 years old, so why is almost half of the fuel being purchased to it? There is no consideration of VLSFO, or ULSFO fuels, with FAME being classed as a contaminant.

The 2017 revision accounts for 20% of the fuel samples VPS receive for testing, even though it is nearly eight years old. It does consider the presence of FAME within certain distillate grades. But it still offers no specification for the lower sulphur grades of residual-based fuels, where VLSFOs are the most widely purchased fuel type.

This means the global fleet is buying fuel and testing its quality against a standard which is between 8-20 years old.

Avoiding engine damage

In 2018, The Swedish Club released their independent report, "Main Engine Damage". It included the information showing the average cost of a single fuel management incident onboard a vessel was $344,069 and the average cost of a single lubrication failure was $763,320.

Steve Bee, Group Commercial Director, VPS

The Swedish Club's advice and recommendations were to implement robust oil management systems for fuel and lubrication; carry out drip sampling when bunkering and avoid consuming the fuel until you have the results of the analysis; submit lubrication oil samples for laboratory testing at least every third month; and carry out regular system checks of purifiers and filters for fuel and lubrication oil systems.

VPS' additional testing

VPS launched its Additional Protection (APS) service, including the full ISO8217 test scope, plus a number of additional tests, in 2019.

The service was launched in the lead up to IMO2020 and the reduction in the global sulphur cap to 0.50%. At the time, VPS foresaw potential quality issues with the new incoming VLSFO fuels. These fuels would have higher paraffinic content, leading to poorer cold-flow behaviour, potential wax precipitation and major stability issues.

The additional tests provide information about stability, chemical contamination, cold-flow properties, lubricity and microbial activity.

In 2022 VPS launched the "APS-BIO packages" with additional tests suitable for the incoming range of biofuels. They cover energy content, stability, renewable content, microbial activity, corrosivity and cold-flow properties.

These tests would help identify biofuel management issues and understanding of their behaviour and operational risks.

The tests cover biofuels FAME, HVO and CNSL, plus the fossil fuels used in a bio-blend, eg HSFO, VLSFO, MGO. TO

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