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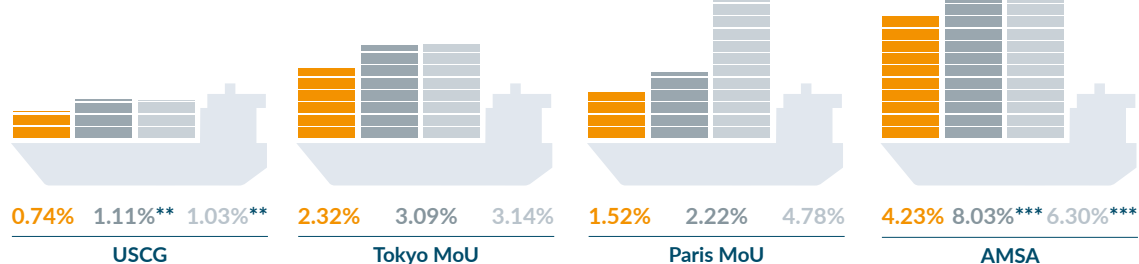
* Source: Clarksons Research's World Fleet Register

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THE MARSHALL ISLANDS REGISTRY

Port State Control Detention Trends (%)

Marshall Islands Liberia Panama



** Liberia and Panama are targeted for additional port State control (PSC) examinations by the USCG for having a detention ratio "between the overall average and up to two times the overall average."

Sources: 2018-2020 Performance Lists Paris MoU, the 2020 Tokyo MoU and USCG PSC Annual Reports, and the 2018-2020 AMSA PSC Annual Reports.

*** Liberia and Panama have exceeded the overall AMSA average detention rate over the three years from 2018-2020.



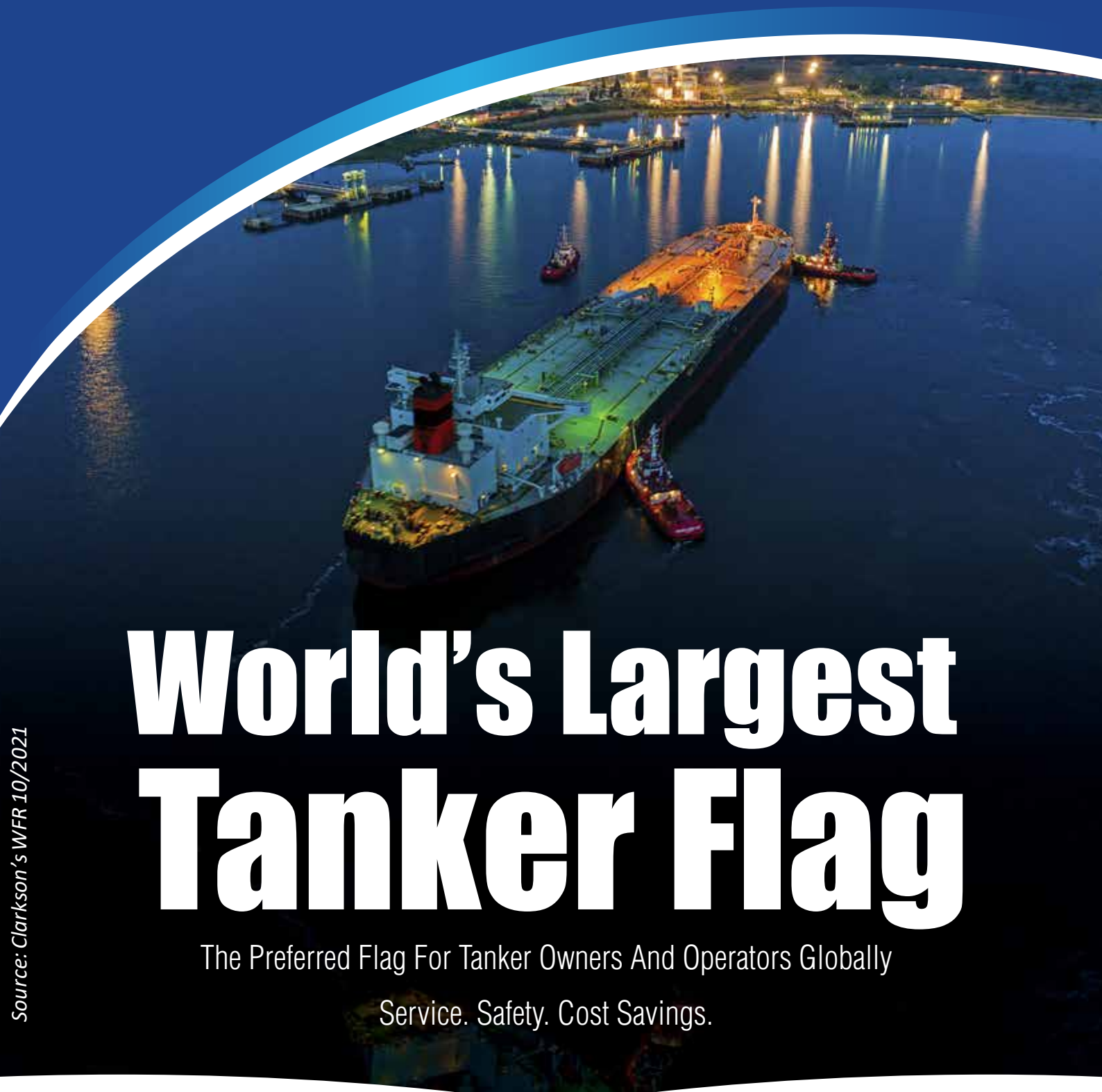
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Contents

SAFETY

- 02 ■ **OCIMF/INTERTAKO'S behavioural competency assessment** - the scheme is now 2 years old. We heard an update in a September 2021 webinar
- 04 ■ **BW Maritime and crew mental health** - Patrick Kirkman, general manager for insurance with BW Maritime, explained what his company does to support crew mental health
- 06 ■ **IUMI insurance update on loss rates, seafarers, carbon** - The International Union of Marine Insurance (IUMI) provided an update on important issues to tanker operators relating to insurance

DECARBONISATION

- 08 ■ **How Ardmore Shipping approaches decarbonisation** - Ardmore, a product and chemical tanker operator based in Cork, Ireland, has looked hard at the most cost efficient way to decarbonise
- 10 ■ **Understanding CII** - Tankers will need a Carbon Intensity Indicator (CII) below a certain limit, under regulations taking effect in January 2023. DNV shared their perspective
- 12 ■ **Planning newbuilds with a "decarbonisation stairway"** - DNV's approach
- 14 ■ **EU, Cargill, TOTAL, MISC, Hapag on decarbonisation** - Senior maritime representatives shared perspectives on where the maritime industry is going in a webinar organised by DNV



- 16 ■ **Rotor sails on tankers** - could save 17 per cent of fuel, estimates wind technology provider Anemoi



- 17 ■ **Turbocharging future fuels** - ABB Turbocharging is making plans for what kind of future fuels we will use, how they will be combusted, and how the engine will be turbocharged

TECHNOLOGY

- 18 ■ **Pump news from Hamworthy and Framo** - 'overhaul and seal kits' for pumps, virtual reality training for pump maintenance
- 20 ■ **Svanehøj sees growing desire for dual fuel pumps and services**



- 21 ■ **A simpler way to treat aft peak tank ballast** - how you can use your main vessel system for aft tank ballast and remain in compliance
- 23 ■ **Cargo claims related to tank coating** - Surveyor Paul Hill explained the issues
- 24 ■ **Tanker technology update** - Ship to ship transfers, tanker loading software, hull integrity monitoring, CO2 emission estimating, disbursements accounting and prediction

OCIMF/INTERTANKO'S behavioural competency assessment

OCIMF and Intertanko's Behavioural Competency Assessment and Verification (BCAV) scheme is now 2 years old. We heard an update in a September 2021 webinar

OCIMF and Intertanko launched a "Behavioural Competency Assessment and Verification (BCAV) scheme" for seafarers in November 2018. A webinar was held in September 2021 to provide an update on how the scheme is developing.

The scheme was developed with a recognition that the industry's accident and spills record, although much better than a few decades ago, has reached a plateau. And while the industry has a structured system for technical or 'hard' skills, such as under STCW, it does not do much for the 'soft' or behavioural skills, said Frans Ubaghs, Vetting Manager at INTERTANKO.

The BCAV scheme is not rigid, it is designed as a flexible system which can be implemented to meet what a company needs, supplementing what they have already, said Luciana Maccarone of tanker operator d'Amico Società di Navigazione Spa, and chair of INTERTANKO Human Element Committee.

It is not designed as a standard assessment



Frans Ubaghs,
Vetting Manager at
INTERTANKO

system for the whole industry. "This is key to understanding the system."

It is based around six "competency domains". How people collaborate with each other; their communication / influencing skills; their situation

awareness; leadership and managerial skills; how they make decisions based on available information; and their focus on the needed results.

BCAV also includes guidance on how the skills should be assessed, including at sea, or using simulators.

Intertanko and OCIMF worked together so they could pool their collective expertise,

The collaboration between OCIMF and INTERTANKO has also led to a plan to develop a tanker accident database, and a program to look at incident investigation methodologies, she said.

"We know analysis of incidents in shipping show a major contributing factor is the human element," she said.

Vicky Norris, BP

Vicky Norris of BP Shipping, and Vice Chair of OCIMF's Human Factors Committee, said that human factors in safety management starts "by recognizing that people are a part of a system."

"Human action or human oversight is essential to many of our risk barriers, including engineered barriers. We need human input into the design of the barrier, management and maintenance."

For example, a system may involve a person detecting when a tank is full, and shutting off a valve, and if this is not done, the tank will overflow and spill.

"People are part of a complex system of relationship and interactions with other people, equipment, processes and organisational culture."

"Human factors" can be generally defined as "factors which influence a human's performance."

That can include "organisation factors, social factors, physical, psychological factors, characteristics which affect this human's interaction with equipment, systems, processes and other individuals and work teams."

The cause of incidents is often attributed to people, which "gives us the impression that people cause the incidents." But we can also see that most of the mistakes or erroneous decisions people make are a result of how the workplace is set up.

This can include equipment, control measures, and culture, which can be influenced by the leadership style. "If we can address these issues we can make people more effective."

In more granularity, issues which affect people's ability to make the right decisions include equipment design, machine and human interface, labelling, processes and procedures, how we handle fatigue, communications and competency. Also training, the organisation of the work, and how people respond to situations they are in. These are "just some of the human factors that we can look at."

"People's actions are rarely malicious, they often make sense to people at the time."

"Looking at development of 'soft skills' - to interact with others - and respond to emerging situations - are equally important."

"These skills (eg competency) _ can be affected themselves by poor communication [such as] procedures which are hard to follow, or how leaders respond when things go wrong."

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Chevron



Neil Hunt- Chevron Shipping Company

Neil Hunt with Chevron Shipping Company talked about the company's experience implementing Behavioural Competency Assessment and Verification.

"We found that behavioural competence and skill sets is a continuously evolving program," he said. People's perceptions and behaviours are shaped by the company culture, the culture of individuals, the equipment, and the operations processes.

The aviation industry has been looking at behavioural skills since 1977, and Chevron has been looking at it since the early 2000s, initially as classroom sessions. In 2014 it started evolving the programs further.

"Behavioural skills are being reinforced through all our development programs, it's not something we apply to just one area of operations," he said.

"We provide feedback to individuals on behavioural competency, and how they use behavioural competencies to shape management style."

A guiding principle is to recognise that error is normal. "People will make mistakes. Expecting humans to be perfect is not a reliable safeguard." Human error "is never the root cause," he said.

But it should be possible to develop systems which make it more difficult to make errors. "We can manage or prevent error-likely situations."

This also involves understanding the reasons why people made mistakes and learning lessons from it, without blaming people. "Blame, we find, prevents improvements."

"The majority of incidents stem from existing conditions, they are triggered by mistakes."

"Violations of rules and procedures, we find, are very rarely malicious. They are well meaning behaviours - intending on getting the job done."

"One of the most important areas is how we respond, it matters. Leaders contribute to shaping the conditions that influence what people actually do. It matters how leaders respond when things go wrong."

"We need to focus on the context not the outcome, reshape how the organisation learns - by our reaction to failures. Learning from failure is an integral part of long term success."

"The maritime environment is traditionally quite a hierarchical environment. We looked at leadership styles and how people can change styles to suit the situation." People need to be able to "allow challenges to take place."

"We look very closely at how we develop the monitoring strategies. We talk about closed communication to share the mental model in the team briefing and debriefing to build shared mental models,

"There's a very useful tool, 'thinking aloud,' we really promote.

"We've found the practical use of these tools in courses and simulations and onboard the ship has been very effective."

"We have to change people's attitudes before we change behaviour."

Chevron Shipping has found that adopting these principles into all areas of operation and all levels of management "has been very effective in building the 'culture competence'", he said.

It involves a mixture of classroom and simulator training.

Feedback is sought from mariners. "We make sure they are a key stakeholder in implementation of these programs. "We build the principles - into all the areas of operation onboard and into all the courses."

"It also builds into developing clear development paths for them that build into a career ladder for progression within the fleet. This feeds into a wider managerial skill set which is transferrable."

Maran Tankers / Angelicousis Group



Dimitris Fokas- Training manager of Angelicousis Group

Dimitris Fokas, training manager of the Angelicousis Group, which owns Maran Tankers Management, and Deputy Chair INTERTANKO Human Element Committee, talked about his experience with implementing BCAV.

Implementing BCAV during the COVID period was tricky, with people having bigger concerns than implementation of new system. It also meant that training could only be provided virtually. "We tried to do our best and see what we could do."

"We are hoping we can go to all the fleet next year."

The system was discussed during onboard audits and superintendent visits.

Ship masters are assessed on the instructions to junior officers, management of their team, decision making, communication, participation in the team, response to challenges. "We try to assess that as well together with technical skills." There can be 15 different exercises in a 5 day

course.

The exercises can be based around tricky tasks like turning a vessel "pivot point" in a sea with a current, a task which involves "decisions being taken on the spot", and entering the Suez Canal Northbound as part of a convoy.

The final assessment is provided as scores of 1 to 5 on topics like ability to learn, willingness to learn, ability to train others, attitude.

Maran Tankers also provides training for office staff in soft skills, it is not just for seafarers. The company has hired an expert on soft skills training for its office staff.

"The main difficulty has always been how to incorporate training on soft skills within the simulator," he said.

Scorpio Ship Management



Shashi Khanna, general manager of the fleet support team with Scorpio Ship Management.

"The world has recognised that soft skills are even more important than hard skills," said Shashi Khanna, general manager of the fleet support team with Scorpio Ship Management.

Scorpio didn't want to adopt the BCAV in full, because it was not seeking a completely new competency assessment program, but more ideas about how to improve its existing appraisal system.

It mapped some of the areas in BCAV, including its 6 "competency framework domains", against its existing system.

Ocean Technologies

Ocean Technologies Group, a company formerly best known for its video based maritime training packages, under the name of VideoTel, is developing ways to integrate behavioural competency assessment with its learning management system.

The company has revised its mission to "empowering seafarers, and the maritime professionals that support and rely on them, to excel."

"People understand the benefits but there's a lot of fear about the amount of work that will be required to implement one of these systems," said Raal Harris, creative director of OTG.

Many companies need some convincing as to why it is worthwhile implementing a behavioural competency assessment system, to supplement the existing competency management systems they have, he said.

BW Maritime - supporting crew mental health

Patrick Kirkman, general manager for insurance with BW Maritime, explained what his company does to support crew mental health, speaking at the IUMI 2021 event

Patrick Kirkman, general Manager, Insurance with BW Maritime Pte Ltd, explained what his company does to support crew mental health, and what the industry can do.

In the maritime sector, the BW Group operates product tankers (through its subsidiary Hafnia), ethylene and gas carriers, LNG, LPG and dry cargo vessels. Mr Kirkman was speaking at the annual event of the International Union of Marine Insurance (IUMI) in September.

Crew mental health “is not a unique issue with my company, it is an industry wide issue. An issue which, in the wider environment, has only recently become a topic people are willing to talk about,” he said.

Mental health “is not an issue unique to shipping. But there’s no other careers out there when you’re away from your family for such a long time, on a restricted space with people you may or may not have known before.”

“We have a unique set of circumstances that affect us with our crew onboard our ships.”

“Our crews are the heartbeat of our companies, from them flows how we perform. More than the individual shipping company, it is how the industry performs.”

“If we had a healthy happy crew, hopefully ships are better maintained, better run.”

That leads to business benefits, and will help achieve decarbonisation objectives. Also, “if we have a happy crew, we present an attractive career for others to come in, and hopefully we retain good crew to take our businesses forward,” he said.

Today’s maritime life

Today’s maritime life is improved in many ways, with double hull tankers, better designed ships, better communications, better navigational aids.

Although crew are not necessarily trained to use these things. “We forget that with the new designs, new equipment, issues of competency arise.

“We need to ensure we give them the training. In our ships we don’t take out spanners and screwdrivers as often as we used to. Quite often, it’s a laptop plugged in, a diagnostics test.”

Shipping regulators are focussed on how many people are onboard, not whether we have the right people in the right roles to do the necessary tasks. “Flag, for example, is focused on numbers. ‘Do you have a safe manning level.’ It doesn’t focus on roles. There are roles which used to exist and don’t exist now, and others take on.”

A big cause of stress is piracy and corrupt port officials. “In West Africa, the first thing someone says when they come onboard, I want cigarettes. We have to say we have zero tolerance for bribery. Then there’s a whole manner of issues arising.”

“There’s the Covid situation. The morale impact this has on our crews - not just because of crew being onboard ships with people infected, also they worry about families at home.”

“The ability to have port leave has evaporated. All of this brings greater stress upon crews who are manning the ships.”

A coordinated approach

One of the challenges with seafarer health is lack of data. “There isn’t any real useful macro level data. We don’t have any systematic analysis. We don’t have an effective coordinated approach [for] looking at how bad health issues are onboard ships and how to approach them. Most of the data is data that companies like mine have.”

“This risks there being an ad hoc approach to dealing with situations, which may or may not be the most effective way of doing it.

“It would be better if the industry were working in a more coordinated fashion.”

“We have to recognise there has been progress,” including in “recognition there is a problem.” [But] “we have to look at the causes not the symptoms. That brings us back to having a better coordinated industry approach.”

“We need to connect much more. We shouldn’t have a situation where ITF was saying to crew go on strike so you can force the issue to be repatriated early. Shipowners are saying the environment is not right to do that. We’re doing our best.”

“There needs to be a lot more talking a

lot earlier so we can come up with the right solutions.”

Doing more for crew

Good companies should take away stress, support development and training, attract the highest quality crew they can and hopefully retain, he said.

Crew retention “is something I think companies haven’t focused on enough.”

One central pillar for keeping crew, which BW Maritime is focussing on, is to “allow the crew to know there is a back to work policy.”

“If you come forward, you have a mental issue or something you want to bring to our attention, you’re not going to be judged, you’re not going to lose your job.”

There may occasionally be specific safety reasons where a crewmember cannot come back to work, “but you need to create an environment where that’s the exception not the rule.”

“They know the company is going to look after them. That is incredibly important.”

“From a shipowner’s perspective, we all need to have a holistic approach, we need to identify the issues which could help make the life of the crew better, and also ameliorate some of the downsides.”

“You need good food. Not all ships have good food. When you can, address shore leave. Have good recreational facilities. Have good crew communal facilities - painted in colours rather than slate grey. Having those antibullying, anti-harassment policies in place.”

You need reinforcement of the anti-harassment policy, good clear leadership, don’t have mixed messages being sent.

You need to “recognise that life at sea can be lonely and isolating, and there can be boredom.”

One of the most important factors in helping crew maintain lower stress levels is their level of confidence in how people will be treated if things go wrong, he said. “You need to get away from that blame culture, you need a just culture.”

A just culture is defined as one which recognises that mistakes are usually a result of the organisational culture, not something one person did.

“You’ve got to create the cultural environment where a just culture is integral to the way the company operates. They are not hollow words.”

"If it's not [part of the culture] you're never going to address the wider mental health issues. You've got to get rid of the stigma, 'if you have a mental health issue you're going to be judged'. That will embolden and empower the crew to come forward. You need that sort of respectful interaction."

You have a good crew manager who knows a good crew, who ensures that all of this is carried out, and not lip services."

Company senior management need to be part of that first responder team. "If an issue is raised to us, we're there to help out."

And "it doesn't matter if you do all of that if the crew believe they're going to lose their jobs. They are going to seize up. You've got to have this supportive culture - and one which ensures job safety."

BW Maritime

One way BW Maritime achieves this is by helping crew "make sorting out your life on board a ship fun," including with games, social activity and rewards.

"If you have your fitness and wellbeing programs, you make them fun, you make them competitive. You have the interaction activities, you have rewards. That makes people want to take part. You have to create this sense of wellbeing where everyone supports one another."

It is possible to bring in people's faiths, so religion "is built into the culture of the ship and the company."

Other supports include providing access to psychological help, medical care such as through International SOS, and free broadband.

BW Maritime has 50 per cent of its crew vaccinated. "It is a challenge. you have to go for J+J [vaccine] and do it in one shot. Or be quite clear about the itinerary of the ship - so if you have one jab you can get back in time to have the next."

"I can understand why a large part of the world's crew have yet to be vaccinated."

What we can see going forward, we will be vaccinating our crew ashore - so we deal with it onboard the ship and ashore."

What crew can do

Crew themselves need to be 'empowered' to look after their health, and encouraged to speak to counsellors, with confidence that their concerns will be treated in absolute confidence. "Were that not the case, it simply wouldn't work."

Other crew members are also the 'first responders' to support someone in trouble.

"That comes back to this sense of family, everybody being as one onboard the ship, colleagues looking after other colleagues. And

if they see some behaviour they can report to the 'old man' on the ship."

What regulators can do

Fine words from governments and regulators about crew being "key workers" are not put into practise. "We need local officials to show a bit more sympathy," he said.

"We had a case recently where we had two crew who were affected by Covid in the US. We wanted to send them ashore, the Customs and Border Control immediately sent them back and said, 'you quarantine them onboard.'"

"Well fine in one sense, if the condition deteriorated you can shift them off the ship to hospital. But the effect on the remaining crew, even though we isolated the two crew, was immense. We put a doctor onboard. We didn't have any sympathy from local officials."

This was in Texas. "We had a ship in California with a completely different attitude."

"This NIMBY [Not In My Back Yard] approach has to stop."

Mr Kirkman ended his talk with a quote from Barack Obama, "We have to acknowledge the progress we made, but understand that we still have a long way to go. That things are better, but still not good enough."

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IUMI insurance update – losses, seafarers, carbon

The International Union of Marine Insurance (IUMI) provided an update on important issues to tanker operators relating to insurance, including trends in loss rates, seafarer issues and decarbonisation, following its September 2021 annual event

The main annual event of the International Union of Marine Insurance (IUMI), held over September 2021, was online this year, but hosted by the General Insurance Association of Korea. After the event, the chairs of the main committees provided Tanker Operator with an update on some of the most important developments relevant to tankers.

Lowest loss rates

Maritime losses, leading to insurance claims, are at their lowest ever, and have stabilised at this low level, said Philip Graham, chair of the Facts & Figures Committee at IUMI.

It should be factored in that maritime activity over the past year was lower than usual in many sectors due to Covid, he said.

In terms of loss rates, “it’s safe to say the tanker market does perform better than other types of vessels,” Mr Graham said.

The role of oil companies via OCIMF may be a factor. “I believe there’s a correlation between the two, it is born out in some of the statistics.”

Seafarers

Ramachandran Radakrishnan of QBE Insurance in Singapore, and chair of IUMI’s Ocean Hull Committee, said that he has heard “reports of ships operating with 50 per cent of their crew onboard, and unable to offload crew with Covid in some ports.”

Mr Radakrishnan is a former seafarer and a former OCIMF vetting inspector.

Some seafarers have been onboard for over 12 months, where they would usually stay onboard 4-6 months. “All this would lead to tremendous fatigue and stress.”

IUMI has identified a trend of increased near misses in the first 6 months of 2021. That has “a direct correlation with the stress and anxiety of the crew,” he said.

“We need to be able to tell the governments that some of them need to be offloaded and crew change needs to be made possible.

This bad news has had an impact on enrolment in seafaring colleges, he said, with life as a seafarer looking less desirable. “This will probably lead to a midterm and long term problem going forward.”

If the maritime sector was forced to employ less experienced seafarers, we may see more accidents and insurance claims. Something similar was seen in 2006-2008 when there was a big expansion in shipping, said Philip Graham of IUMI’s Facts and Figures Committee.

Decarbonisation

Frank Streidl of Zurich Global Energy, and chair of IUMI’s Offshore Energy Committee, noted that carbon footprints from shipping are “incredibly difficult to measure,” for insurers.

One problem is that the criteria of how to measure the footprint of a shipping company is “not universally agreed”. The data shipping companies supply to IMO, so far, is limited in richness (breadth of coverage) and granularity, such as one figure for a whole year.

The second problem is that shipping companies can be reluctant to provide their emissions data to their insurers, and they are not forced to disclose it. “It is very difficult to get that.”

A change to the data disclosure rules would need to go through the IMO decision process, and require a consensus of countries to agree.

But without knowing what emissions companies are making, “how do you prove what you have done?”

Another challenge is the different levels of commitment around the world to decarbonisation.

“Without any fingerprinting, we have the advanced industrial economies taking a certain view, we have some eastern economies taking a different view, we have developing economies that might again be at a different point in the journey,” he said.

“In general regulation depends on countries, it is driven by governments. There’s pressure on certain parts of the industry driven by their respective governments. There’s other parts of the industry that virtually feel no pressure. State oil companies in certain part of the world can carry on as is, or are encouraged, whether we like it or not. If governments don’t feel they want to regulate then there’s no pressure on industry,” Mr Streidl said.

ESG goals are not all about emissions, and some can be in conflict with emissions. For example, there can be efforts to support the rights of indigenous people, but indigenous people want the right to make emissions.

The topic of ESG is covering an increasingly wide net, including illegal fishing, sustainability of ship recycling, as well as emissions, he said.

The insurance sector gets involved in decarbonisation in other ways. It is “sitting on huge amounts of premium,” which is invested rather than just kept in a bank. There is an opportunity for the industry to make a difference on ESG based on its investment choices.

Another area it can improve is on reducing the emissions of running the insurance operation.

A third area is in developing new insurance products, linked to low carbon shipping.

Another area where decarbonisation affects insurance is if it changes the type of ships seeking insurance, such as from less waterborne transport of coal.

Richard Turner, president of IUMI, added that while the insurance sector has every reason to support decarbonisation, it also wants to ensure that risks are not increased in the process of doing so. “There are factors which need to be managed.”

“I think this conference has been a watershed moment in terms of IUMI embracing the ESG agenda, it feels like we’ve made a real step change,” said Richard Turner, president of IUMI.

“Pretty much every workshop had something to do with ESG matters.”

“I have an increasing sense that loss prevention is linked to measures in the industry linked to sustainability,” he said.

Discussions are underway to develop a version of the Poseidon Principles for marine insurers, said Helle Hammer of CEFOR (The Nordic Association of Marine Insurers) and chair of IUMI’s Policy Forum.

The idea is that it will use the data which shipping companies already report, such as to IMO, banks and charterers. “That will avoid a lot of double reporting.”

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How Ardmore Shipping approaches decarbonisation

Ardmore Shipping, a product and chemical tanker operator based in Cork, Ireland, has looked hard at the most cost efficient way to decarbonise. CEO Anthony Gurnee, and COO Mark Cameron, shared what they have learned

Anthony Gurnee, CEO and president of Ardmore Shipping, a product and chemical tanker operator based in Cork, Ireland, believes that “every ship in the world should have a propeller boss cap fin.”

Ardmore has a fleet of 25 MR product and chemical tankers, on average 8 years old.



Anthony Gurnee, CEO and president of Ardmore Shipping

The propeller boss cap fin is a small device with static fins, which sits on the back of a propeller. The “boss cap” is a unit which holds the propeller in place, hence the name.

The technical explanation for how it works is that the device “disrupts the vortex” of the flow coming off the propeller. It is not the most intuitive energy saving device to understand.

But data shows that it improves fuel efficiency by 3-4 per cent, Mr Gurnee says. That typically works out at a 50-75 per cent return on investment in a simple retrofit, depending on the vessel’s remaining life.

The company has worked out how it can be retrofitted without a drydocking, using divers, without the time and operational complexity of “tipping up the stern”.

Mr Gurnee’s second piece of advice is to carefully manage load on the engine. Ardmore uses a digital system from the company Lean Marine. It finds the return on

investment works out similar to the propeller boss cap fin, and the improvements on efficiency also 3-4 per cent.

While 3-4 per cent may not seem like much, by doing both of these, you are improving at least 6 per cent. “Quickly these things add,” he says.

The third recommendation is “high quality hull coatings, along with measures to minimise fouling on the hull.”

On one ship, Ardmore put different coatings on each side of the ship, to compare them. The impact on vessel performance cannot be compared in this way, but you can compare how fast the coatings became fouled from a visual inspection. Crucially, you can solve the argument of which coatings perform better under a truly normalized set of environmental considerations.

Minimising fouling on the propeller is also worthwhile. “If you’re able to find ways to keep the propeller clean constantly, you’re in a much better spot,” says Mark Cameron, COO of Ardmore. “We know very often that if you have a 6 month interval between when you clean, there’s a degradation over time.”

A fourth recommendation is to give crew tools to adjust the trim, and see what difference it makes. The trim of a ship is the difference between the forward and aft draft.



Mark Cameron, COO of Ardmore

It can be adjusted by pumping water into and out of the vessel ballast tanks at different locations throughout ship.

“The way we approach trim optimisation, we let the crew experiment with trim. It’s in the hands of the crew, they develop and share their experience and understanding of what works and what doesn’t for a particular set of conditions including the weather and swell at a given time. We have a system onboard, we collect all the data. It gives us very accurate information on draft, weather conditions, what’s the optimal trim,” Mr Gurnee says.

“We think there’s a lot of low hanging fruits in terms of efficiency improvements. Individually these things may not seem to be very impactful, [but] when you add them together - they can make a big impact. When you apply across a global fleet, there’s an ability to have a meaningful impact, it could be 10-15 per cent improvement.

“That doesn’t get us to 2050 [but] it can get us on the trajectory very quickly.”

“There’s a fascinating range of things that can be done, a lot technical, a lot operational, a lot is logistics.”

There is some scope for further improvement based on understanding how these systems work together, he says. For example, if you can find the optimum speed taking into account that you have a propeller boss cap fin, the engine load is managed, the hull is in good condition, and you have the optimum trim.

There would also be scope for further improvement in ROI if there was a carbon price, or other tax on fuel consumption, because this would mean more returns on the same investment in different technologies. Otherwise, the commercial benefit is limited to direct savings in fuel consumption, he says.

Wind power is not presently under serious consideration, for reasons including that rotor sails would not easily fit on the deck of a medium range chemical tanker, with so many pipelines. However, it is an area of close scrutiny, in time it may very well become

an important opportunity to improve cost effectively improve performance

Data gathering

A critical factor in reducing emissions is to have good systems for data gathering, visualisation and interpretation, so you know what is working and what isn't, Ardmore believes.

"By having simple information that's presented in a way that we have, the guys on the ship can make instant decisions," says Mark Cameron, COO. It's not telling people what they should have done 6 hours, 6 weeks ago."

"I don't think many ships have systems onboard that enable them to measure very small increments in performance to validate the effectiveness. We've had a system out there for 10 years. We can evaluate incremental efficiency gains," Mr Gurnee adds.

This approach can work much better than what he calls the big data approach, "when you analyse onshore and tell the crew what to do."

"We don't think that's effective," he says.

Ardmore does have mass spectrometer flowmeters fitted on its vessels, an investment some shipowners find too expensive, but which provides accurate granular information about fuel consumption. Many shipping companies are still only requiring tank level readings once a day for the noon day report.

The performance management system the company uses is one developed by SkySails, a company based in Hamburg whose main business is providing sails for ships. It also provides software, called V-PER, through its SkySails Marine Performance division.

This software collects and analyses data from onboard vessels to provide relevant, reliable information to decision makers onboard and onshore, displaying all factors influencing fuel consumption on one screen.

Ardmore first heard about this technology at a conference in 2011 where SkySails gave a presentation. "They had a really interesting

onboard performance measurement system to prove the kite worked. We said, we're interested [but] not so much in the kite," Mr Gurnee said.

Philosophy

Ardmore has had a focus on fuel efficiency since it was started in 2010, initially purely for saving money on fuel.

"What's good for fuel efficiency is good for business," Mr Gurnee says. "It is easy to get caught in the trap that fuel efficiency is one dimension [by itself]."

"One of the great things time has taught me, nothing beats a good, well run, [inexpensive] ship. If you generate value - you've got a better well round performing asset."

"Our investment thesis has been to buy the right ships at the right price.

"We've been very specific about looking at the ships that we've bought, and where we find a bit of secret sauce we buy more of those types of ships. There are differences between ship yards, we can see that and prove that.

"Being able to measure what we do is pretty essential. People can make great claims on any given day. Making the claims stand up is often something I find lacking."

"When we want to invest in something, we'll invest in singular technology first. We've looked at a really wide range of technologies, mostly in the retrofit space."

"We'll measure it in ways we think are probably fairly unique in the industry, to makes sure the measurements are accurate and we can exclude the white noise."

"We can look at the trends we expect and see if that's a good investment for us."

In the short term, by making a number of small changes to the fleet, it will be possible to keep vessels with existing fuels and designs in operation, rather than committing, at this point in time, to build new vessels running different fuels.

"In the newbuild stages you can plan a lot more into the design of the ship. We take the

[shipyard's] designs and add extras on."

People

One of the most important aspects of a decarbonisation strategy, also perhaps not intuitive, is the people side of it.

It can be a great help "just bringing people together into a room, who understand the various technologies, to talk to each other, Mr Gurnee says.

Investing in people can actually be more important than investing in technology, adds Mr Cameron. This includes engaging people in efforts to decarbonise, making effort to retain crew, and rewarding them.

"We've built a level of commercial understanding in our staff which is a little unique in the business," he says.

It's good "when you get the guys onboard to care about what we care about," he says. "Safety remains paramount, [but then] we make sure they understand what makes good business."

It's about "bringing them into the fold with more information about how the business operates, and why we choose to take certain specific approaches and explaining the rationale to them. Making sure they understand there's a bigger issue. Time spent in that area is time well spent on performance."

Although the crew are provided by crewing agencies, including a ship management joint venture with Anglo Eastern (Anglo Ardmore) some of them have worked continuously with Ardmore for over 10 years, he says.

Decarbonisation could also happen through better collaboration with customers, the cargo owners. Consider that a "third of the world's container ships are sitting idle at the moment waiting to discharge. That's not very efficient."

"I always like to say, obviously big data and IT is really important, [but] when we think about it, we've got dozens of supercomputers in the company, that's our staff," Mr Gurnee concludes.

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DNV – helping understand CII

Tankers will need a Carbon Intensity Indicator (CII) below a certain limit, under regulations taking effect in January 2023. DNV ran a webinar to explain how this scheme works

The Carbon Intensity Indicator (CII) requirement from IMO is somewhat confusing, since when we also have the EEDI / EEXI requirements, you may wonder why the industry needs to be regulated twice.

The difference is that EEDI / EEXI focus only on the ship itself – how much fuel is needed to move the cargo in standard speeds and operating conditions. CII is looking at the actual emissions you make. So if you improve your weather routing, or reduce speed, you reduce CII but not the EEDI / EEXI.

To add to the complication, you can improve your EEDI / EEXI by setting a maximum speed for the vessel, since this is seen to be changing the ship itself. But your CII will only change if you actually change speed.

If you were never operating at this high speed which is now restricted, this restriction doesn't change the emissions, and so your CII does not change.

The word 'intensity' is used because we are talking about emissions per tonne mile. If it was about absolute emissions, countries would complain it denies them of the right to grow their maritime industries.

DNV held a webinar on Sept 16 to explain further.

So we can say that EEDI and EEXI sit on the technical side and CII sits on the operational side, said Tore Longva, Principal Consultant, DNV.

The CII requirements apply to all cargo, ropax and cruise ships above 5000 gt. It does not cover offshore support vessels, other passenger ships, fishing vessels and other service vessels such as supply vessels, anchor handlers and construction vessels.

Cruise ships are defined as "a ship with overnight accommodation". Ropax is defined as a "passenger ship with cargo space". So a ship without either overnight accommodation or cargo space is not included.

CII does not distinguish on propulsion type or age, it looks purely at emissions per tonne

of cargo carried per mile over the year.

It comes into force on January 2023. During the 2023 calendar year, ships need to gather data, and make a report in early 2024 for the calendar year.

The carbon intensity will be used to determine their score, with enforcement action if they get a D for 3 consecutive years, or a single E rating.

If this happens, the ship will need to show its flag authority its plan for getting a C. If a ship has a C or better rating, or an approved corrective action plan, it gets a "Statement of Compliance" which is valid for 1.5 years. Each ship will need to have this from 2024.

The emissions levels for the various scores have been defined up to 2026. The scheme will be reviewed by January 2026, with potential tightening from 2027, and perhaps also "strengthening the corrective actions", i.e. making more serious consequences for failing ships.

Mr Longva expects IMO to finalise the guidelines for calculation of CII, including correction factors, by June 2022, the time of the MEPC 78 meeting.

Note that using biofuels will not reduce the carbon intensity using this equation, because it looks only at emissions from the vessel itself, known as tank to wake. It does not cover fuel lifecycle emissions, such as including CO₂ absorbed when the plant is grown, or CO₂ emitted in the processes of producing fossil fuels, which is known as well to wake.

"There is an intersessional working group addressing these guidelines," Mr Longva added. "We see a lot of questions around applying biofuels." But this is not expected to be reviewed until 2025.

Calculations and graphs

The CII is calculated as (fuel consumption x CO₂ conversion factor) divided by (annual distance travelled x capacity). So it is g Co₂ per deadweight tonnage mile.

The formula for CII was chosen because all of this data is available and already reported.

It does not yet have any coverage of ballast trips.

Ballast legs could give complex incentives, because if a ship has an opportunity to go a long distance carrying no cargo, and so using less fuel, that would give a better CII over the year. Although shipowners may prefer to take a cargo if it is available, because they can earn money from it.

If you reduce speed, you will reduce the fuel consumption, but may also reduce the annual distance travelled, so a reduction on both the numerator and denominator of the equation. But overall, your emissions per dwt mile should be reduced.

There may be correction factors to take into account the extra emissions from vessels travelling through ice, or the reduced distance travelled by some ships which spend a lot of time in port. "It's undecided which will be taken onboard."

IMO will develop a "carbon intensity code", showing in more detail how the calculation must be done.

Then to determine which category or band a ship falls into, IMO has drawn a graph for each ship segment, bulk carrier, tanker, container vessel, passenger. There are separate lines showing where the A, B, C, D, E criteria are, as a function of deadweight or gross tonnes.

For each line, the intensity reduces by 5 per cent over 2019 to 2023, and then a further 2 per cent each year, to 11 per cent in 2026.

The graph begins with an analysis of the 2019 fleet, so that in 2019, 30 per cent of vessels would have been C, 20 per cent each B and D, and 15 per cent each A and E.

There is no requirement that a certain number of ships should fall into each rating every year.

DNV calculates that if the 2019 fleet was still floating in 2030, and no changes made, and tightening rate increased to 3 per cent a year over 2026 to 2030, then 70 per cent of the tankers would fail, scoring D or E,

The audience was asked in a poll what

the average CII of their ships was based on today's operations. 4 per cent said A, 9 per cent B, 25 per cent C, 13 per cent D or E, and 49 per cent did not know.

The SEEMP

An important component of the CII scheme is the requirement to create a Ship Efficiency Energy Management plan (SEEMP), with upgraded requirements on Jan 2023 known as "SEEMP part 3".

It should include the methodologies of how the ship calculates the CII, the target for the next 3 years, an implementation plan, including a procedure for self-evaluation.

There will be company audits, probably including a check on how the 'implementation plan' has been implemented.

Public disclosure

The calculation is based on data submitted through IMO's Data Collection System (DCS), which is not public. The European Union has an equivalent scheme, called MRV (Monitoring, reporting and verification), which is made public, although it only covers vessels going to, from or between EU ports.

"I expect that there will be review

discussions on availability of DCS data," Mr Longva said. "In a couple of years we'll see."

DNV's services

DNV offers services to help shipping companies calculate their CII, or verify what they have done. It can put together roadmaps for your existing ships and newbuildings, explained Øyvind Sekkesaeter, consultant maritime environmental technology with DNV.

Its roadmap for existing ships has three steps – first to calculate the CII on a vessel, second to work out the most cost efficient way to reduce carbon intensity, based on its database of energy efficiency measures, and third to prepare your company "road map" for CII compliance.

For example, you may find that in a 5 ship fleet, 4 attain D and one attains C.

To do the work, DNV maps out what energy efficiency measures are already implemented on the vessel, typically through a questionnaire. It gathers operational data on the vessel, the fuel consumption and speed profile.

Then the decarbonisation measures are ranked according to cost efficiency, defined

as how much you pay to reduce one tonne of CO2 from the vessel.

Example analysis

In one example, the 8 most promising measures to reduce carbon intensity for a ship were estimated to be improving load on auxiliary engine, manual engine performance optimisation, voyage optimisation, propulsion efficiency devices (such as Mewis Duct), engine de-rating, energy efficiency lighting, a different hull coating, and variable frequency electric drives.

The study found that improving the load on the auxiliary engine could achieve a 1 per cent reduction by itself.

"We estimate that for this particular vessel, if all the measures are implemented, you would achieve a reduction of 18 per cent, without reducing the speed of the vessel," Mr Sekkesaeter said.

The roadmap for this particular vessel showed a carbon intensity of 4.5 g CO2 / dwt mile, equating to a C rating in 2023. If all the above measures were implemented in 2023, in line with the vessel's planned dry dock, it would stay in C rating until its expensive end of lifetime in 2028.



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DNV - planning newbuilds with a “decarbonisation stairway”

DNV has developed a “decarbonisation stairway” model to help shipowners plan their newbuilds

Decarbonisation a shipping company is not something which will happen all at once. It will happen as a sequence of steps, as you try to keep the emissions of your vessels within allowable limits, while being able to operate at normal speeds, and without overspending. As you make the steps over coming decades, the emissions limits will be gradually tightening.

The challenge will be working out what the right specific steps for your company are.

There are investments and operational changes you can make with your existing fleet, and choices you can make with newbuild designs. Complying with future emissions limits will require technology which is not available today, or is available but prohibitively expensive, such as hydrogen fuel.

To help you navigate all of this, DNV has developed a “decarbonisation stairway” model, which can be used to work out the best move that can be made at which time. Or in other words develop a decarbonisation stairway which is right for your company.

Factors which need to be considered in your decarbonisation stairway include cost of various methods, fuel storage options onboard, choice of propulsion fuel, required level of flexibility in design, whether you want “fuel ready” solutions which are ready for a not-yet-available fuel, and your overall strategic approach.

Shipowners may want to take a leading position with respect to competitors to get preferentially chartered.

“Owners must identify their own decarbonisation stairway, to stay under the required GHG emission trajectory,” said Linda Sigrid Hammer, Principal Consultant, Maritime at DNV.

“Understanding the costs is vital to stay competitive.”

DNV's service

DNV's service has two parts, firstly assessing the economic potential of different fuel strategies (to choose one), and secondly assessing the impact of your chosen fuel strategy on the ship design.



Linda Sigrid Hammer, Principal Consultant, Maritime at DNV (screenshot from webinar)

The results can be fed into your ship building specifications.

Ms Hammer presented an example of how it was done for a bulk carrier operator.

The first step of the study was to translate regulations and commercial drivers into trajectories.

In this case, it was expected that cargo owners (charterers) would demand a tighter trajectory than the one demanded by regulations.

DNV looked at 7 different design options for this bulk carrier operator, starting with a ship which could also use ammonia fuel (dual fuel).

It could calculate the cost of different fuel strategies, with the defined carbon trajectory, ship specification and trade inputted into the model.

The study found that the lifecycle costs for a “more fuel flexible design” would be 8 per cent lower than a conventionally designed ship, and ammonia designs were “most favourable.”

Although “this result is highly dependent on fuel prices and other assumptions,” she said.

Once the “ammonia ready” design was chosen, the next step was a structured engineering review, looking at the implications of ammonia storage onboard, and an ammonia fuelled engine, and the integration of the ammonia fuelling system into the ship design.

Because ammonia has a lower density than hydrocarbon fuels, “the main design challenge is to allocate sufficient space for fuel storage while retaining cargo carrying capacity,” she said.

The best place for the ammonia fuel tank was thought to be in the aft deck, behind

accommodation. “It is not in conflict with the cargo area.”

“If it requires a complete re-arrangement the conversion costs are likely to be too high to justify a fuel change.”

“The ship can be considered ‘ammonia ready’ by incorporating the tank location and basic measures.”

The company could have chosen LNG fuel, in which case it could have switched more easily to biodiesel, synthetic fuel, and LNG made from biofuels or renewables.

DNV wants to assist shipowners in developing their decarbonisation stairway, understanding the costs associated with different options.

The evolving landscape

DNV expects IMO's first phase of regulations, taking effect from Jan 1 2023, “to have a significant impact on design and operations of all ships,” Ms Hammer said.

In the short term, “energy efficiency measures and energy harvesting may be sufficient. In the long term, use of new fuels may be necessary.”

The number of ships on order with alternative fuels has grown from 6 per cent in 2019, including 2.73 per cent LNG, to nearly 12 per cent in 2021, of which 6.1 per cent is LNG.

DNV expects to see the first demonstration projects with hydrogen and ammonia fuels in 2025, and these technologies available for commercial use in 4-8 years. Methanol technologies have already seen commercial use, she said.

“Our outlook shows that fuel transition in shipping has started but key technologies are 4-8 years from commercialisation. Be prepared for several possible fuel transitions.”

“In the future, the fuel landscape will likely comprise several different fuels. There's a great deal of uncertainty over which fuels they will be,” adds Knut Ørbeck-Nilssen, CEO, DNV GL – Maritime. “At DNV we want to turn that uncertainty into confident decision making. We can assist in [providing] a practical path to beat the carbon curve.”

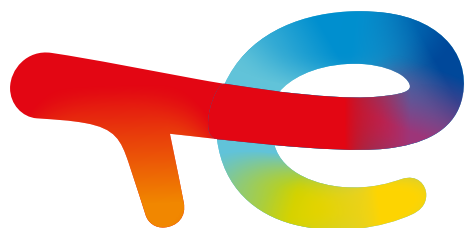
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EU, Cargill, TOTAL, MISC, Hapag on decarbonisation

Senior maritime representatives of the European Union, Cargill, Total, MISC and Hapag Lloyd shared perspectives on where the maritime industry is going with decarbonisation, in a webinar organised by DNV on September 1

The maritime industry needs an ecosystem of decarbonised fuels, said Magda Kopczynska of the European Commission, speaking at a DNV webinar on September 1, 'Energy Transition Outlook 2021.'

"We need to look beyond the ship, beyond the fuels, we need to ensure all pieces work together," she said.

"We need an ecosystem where companies are comfortable to embark on use of new fuels, not [just] as 'late pilot stage'. We need to make sure the fuels are available and produced in a sustainable manner."

Ms Kopczynska is director for Waterborne Transport in the Directorate-General for Mobility and Transport within the European Commission. She was speaking at a webinar organised by DNV on Sept 1.

"At the same time we need to make sure that companies understand that this ambition has to happen and has to be implemented."

"We need to make sure all of that is supported by a proper regulatory framework, stable, predictable, with a proper pricing mechanism."

In addition, Ms Kopczynska said, "I hope IMO will start the discussion about lifecycle analysis of fuels on a well to wake basis.

"We [also] need an upgraded international framework for training of seafarers."

The European Commission has been criticised for setting tougher decarbonisation targets than the IMO.

"Everybody looks at the European Commission, some with a friendly eye, some people don't," she said.

But a regional framework is not necessarily incompatible with an international one. "What we have seen is that some things can happen faster at the EU level. I never thought I'd say that, but I actually do."

"We have very clear political cycles at EU level [which set] where we need to go and

how ambitious we need to be when it comes to shipping."

For example, "we put on the table a proposal requiring ships coming into EU ports to gradually reduce the carbon content in fuels they will be using all the way to 2050."

The IMO is also discussing "so-called midterm measures to implement the strategy," and they are considering the same thing, she said, with ever tightening standards of carbon in fuel.

There needs to be a predictable, stable legal framework to drive the gradual decarbonisation of shipping, since it cannot happen overnight, she said.

The EU would also like a mechanism to reward companies that go further than the requirement. "We know there will be companies already operating zero emission vessels in ocean shipping as early as 2025."

"What I hope, [COP 26] will leave no other choice but to revise IMO's strategy upwards."



Screenshot from DNV's maritime panel. Top row: Knut Ørbeck-Nielsen, CEO, DNV GL Maritime; Yee Yang Chien, CEO, MISC Group; Jan Dieleman, president, Cargill's ocean transportation business. **Bottom row:** Dr Maximilian Rothkopf, COO, Hapag Lloyd; Luc Gillet, Senior Vice-President Shipping, Total; Ms Kopczynska, director for Waterborne Transport, DG Mobility and Transport, EC

“The tone of the discussion is changing at IMO. There are many questions that have to be answered, including how to assist developing countries.”

Jan Dieleman, Cargill

Jan Dieleman, president of Cargill’s ocean transportation business, agreed that availability of decarbonised fuels is the issue now.

“Today the problem is not so much technical availability, or the possibility to use these fuels, it is the scale.”

We need to get beyond the trialling with different low carbon fuels which is happening today, to the point where fuels are widely available. “The risk is that we stop here.”

Cargill is a private food company based in Minnesota, described as “the largest privately held corporation in the United States in terms of revenue”.

The price differential with decarbonised fuels, or the ‘green premium’, is the problem. “The alternative, fossil fuels, need to become more expensive. If we’re not going to bridge the gap with some kind of regulation, we’re going to continue in this kind of pilot phase we’re in today.”

But some charterers will find it easier to get a business case for paying this green premium than others. The closer a charterer is to the end user, such as a climate concerned consumer, the easier it will be, he said. “The green premium is easier to absorb for (industries) closer to the end user.”

Much improvement has already happened. “4-5 years ago, there were a lot of people questioning if we were an industry that should go ahead because we’re so ‘hard to abate’. We crossed that line. Everybody is saying, ‘yes we can do this, but can I get some help because I don’t know where to start.’”

“The regulatory framework is creating clarity, The EU / ETS scheme is one of them. There’s a lot of people supporting that scheme including ourselves.”

However, “there’s a lot of things I think we could make simpler than we have today.”

“I think it would be helpful if regulators were becoming a little more pragmatic and looking at subsectors in the industry. What works for containers or large ships is very different to what works for other things. We keep talking too much maritime in general, the subsectors are very different.”

We may see maritime targets increasing after COP26. “All countries have higher

ambitions themselves than they put on shipping. A lot of companies have higher ambitions than IMO has. So there’s clearly a move for higher ambition. I would expect that to come.”

“I think it would be helpful that IMO upped its ambition earlier than later.”

“This is a time when industry is moving faster than the regulator. IMO can be part of that or be the laggard. The train has left the station in my mind.”

Total

Luc Gillet, Senior Vice-President Shipping at Total, stressed the importance of starting on decarbonisation now. “The best immediate available solution today is to use LNG as a marine fuel. We see that in the order book today.”

“We think LNG will increase its share in the fuel mix for the next 10-15 years, until the low carbon will be available at a later stage.”

With carbon neutral fuel, “the first challenge is industrial,” he said. “Methanol, hydrogen, ammonia production already exists, [but] for conventional processes with a high CO2 footprint.”

“The carbon neutral fuels we are talking about will [need] new production and require significant investment, technology and processes. It takes time. The quantity and volumes needed by shipping are very significant if you compare to [current] production of methanol and ammonia.”

“We do not yet have the answer of [how much] production capacity of green electricity that could or will be dedicated [to maritime].”

“E-fuels [fuels made with electricity] will be more expensive, you need a mechanism to incentivise the production. The cost of CO2, the carbon tax, is a key element.”

There are also safety challenges with ammonia, including vessel design and the bunkering operation, he said.

MISC

Yee Yang Chien, CEO of MISC Group, was asked for his predictions on whether the industry will meet IMO’s goals.

“I would say it is somewhere between possible and definitive,” he replied. “If I was a betting man I would bet definitive.”

MISC the largest shipping company in Malaysia, and has Malaysian oil and gas company PETRONAS as its main

shareholder. The Group includes tanker operator AET.

Mr Yee expects prices of low carbon fuel to come down, just like solar power did. In solar, “everyone was under forecasting the trajectory. Low and behold - the cost came down so fast, the rate of adoption was exponential.”

Seafarers have experience with many low carbon fuels as cargoes, he said.

The challenge is “the ability to deal with a new propulsion system around these new fuels.”

Hapag Lloyd

Dr Maximilian Rothkopf, COO of container shipping line Hapag Lloyd, said he thought that “overall, the industry is on a reasonably good path.”

“The numbers show our industry is working quite extensively.”

Hapag Lloyd itself has “invested more than \$2bn in ships to accelerate decarbonisation,” he said.

“I have to admit, I’m not the only one concerned about availability of green fuels going forward. Will they be available in sufficient amounts? Will they be regulated accordingly from a safety and operating perspective? There’s so many open questions out there.”

“Research and development will play a huge role for the industry. This calls for further collaboration from the value chain, not only from operators but beyond.”

The propulsion mix “will also diversify,” he said.

Mr Rothkopf had views on regulation. As companies consider big investments in technology, it is important “they are not confronted with a changing regulatory framework and bits and pieces,” he said.

“It would make sense to include other stakeholders, such as ports, terminals and producers [in regulation]. There’s a strong belief that only together we can be successful.”

“Whenever revenues from a carbon pricing scheme are generated, it is important that they are re-invested into research and development for the industry, into developing at scale availability of e-fuels,” Mr Rothkopf believes.

In terms of financing, “we can see we are entering a new era, ESG is here to stay” he said. “When we look at capital markets, we see a dramatic increase on sustainability topics.”

Rotor sails on tankers

Rotor sails on tankers could save 17 per cent of fuel, estimates wind technology provider Anemoi
By Nick Contopoulos, COO, Anemoi

Rotor sails are tall cylindrical sails that can be installed on the main deck, bow or elsewhere with sufficient space

Anemoi Marine, a provider of wind technology, has reimagined the concept as a modern-day solution that can help facilitate the push towards industry-wide decarbonisation.

Anemoi believes rotor sails- offer an immediate and compelling solution for tanker owners.

Anemoi estimates that a 50,000-dwt MR Tanker with two Anemoi rotor sails installed and travelling between New York and Rotterdam would save 16.9 per cent of fuel, equating to 557 tonnes of fuel saved per year and 1786 tonnes of carbon avoided.

A 300,000-dwt VLCC with six Anemoi Rotor Sails installed and travelling between Bonny (Nigeria) and Ningbo (China) would save 17.3 per cent of fuel, meaning 2197 tonnes of fuel saved per year, and 7044 tonnes of carbon avoided.

How it works

An electric motor is used to rotate the sails in order to harness the power of the wind and propel the ship.

The Rotor Sails make use of the aerodynamic phenomenon known as the ‘Magnus Effect’.

As the cylinder rotates within an airflow, a forward thrust force perpendicular to the apparent wind direction is created, which delivers additional thrust to the vessel.

The thrust generated can either provide additional vessel speed or maintain vessel speed by reducing power from the main engine. The obvious benefit from this is less fuel burned and reduced emissions.

Installing on tankers

Installing Anemoi technology on a tanker can be a straightforward process.

This is because wholesale changes to the vessel structure, or dry docking, is not necessary.

Rotor Sails and all associated equipment are delivered to the dockside, ready for installation. Our specialist and highly trained team then supervise the full equipment installation.

Each Rotor Sail is installed in a single crane lift and connected to the foundation on the ship’s deck. Each Rotor Sail can be fitted to the deck in less than a day, once the vessel’s structural, mechanical and electrical integration work is complete.

Prior to this taking place, a feasibility study, unique to each vessel, will have been conducted to determine the optimal size, number and position of the Rotor Sails.

This is to maximise performance within the vessel’s operational constraints and identify whether a Deployment System (equipment which allows the rotors to be moved on the deck of the ship) is required for the vessel.

Compared to other vessel types there are additional considerations for tankers, such as hazardous areas /explosion-rating, port working areas (hose crane/manifolds), navigation and helicopter ops, deck pipework and out-fittings and deck space and structure.

However, there is vast potential for tankers, with the available deck space. This results in a lower complexity integration design and plan approval.

The CAPEX and maintenance requirements for a tanker installation are also typically lower compared to a bulkier as the additional Deployment System equipment to address cargo handling is not required, making tankers ideal candidates for wind propulsion.

The vessel integration stage is crucial to the process and we support clients at every stage, including the design and installation supervision of the structural foundations and the electrical cabling from the vessel main switchboard to each Rotor Sail.

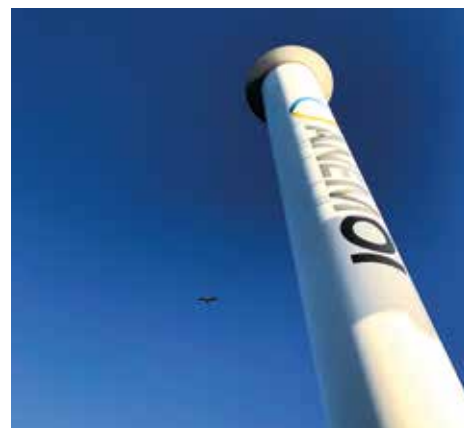
The vessel integration can be completed during the construction phase of a newbuild vessel, or during a survey at a shipyard for a retrofit vessel. Once the Rotor Sails are installed and all cables are connected, we complete final commissioning of the system, and crew training, prior to handover.

Ease of use

The Anemoi Rotor Sail System is comprised of the Rotor Sail itself, the Foundation, Deployment System (if required), wind sensors and Electrical, Control, and Automation systems.

The main components of our Rotor Sails are the “Rotor” (the cylindrical, rotating part), the tower, upper and lower bearings, and the electrical drive system.

The rotor is built from advanced lightweight composite material and the tower is a steel column structure. We use these materials to ensure maximum performance of our rotor sails and to withstand all weather conditions. The lightweight materials that are utilised also means that our systems minimise reduction in cargo carrying capacity and are typically less than



A rotor sail from Anemoi

0.2% of vessel deadweight.

The Rotor Sails have a control station located on the bridge. This automatically controls the speed and direction of the Rotor Sails, as well as monitoring the performance and status of the system.

Our control system is designed to maximise performance and minimise crew input with automated speed and direction setting, equipment monitoring, safety features and performance reporting to stakeholders using a ship to shore data transmission.

Regulation

The International Maritime Organization (IMO) wants considerable cuts in ship emissions as part of its 2030 and 2050 targets.

The goal is to reduce GHG emissions from vessels by at least 40% before the end of this decade and by at least 50% by 2050 (compared with 2008 baseline figures). The best-case scenario is full decarbonisation, although this will likely require a range of solutions.

The Energy Efficiency Design Index (EEDI) is already in place and has been created to ensure newbuild vessels meet requisite levels of efficiency. The Energy Efficiency Existing Ship Index (EEXI) is due to come into force by January 2023.

Carbon Intensity Indicators (CII), meanwhile, are also on the cards. These measures mean shipowners already have to carefully weigh up the options available to achieve compliance.

Debate still surrounds the realistic timeline, availability and eco nature of alternative fuels. As a result, many shipowners are ready to take the plunge and invest in future proof technologies. Installing Rotor Sails as retrofit or newbuild could be the ideal answer for many tanker owners.

Future fuels – combustion and turbocharging

ABB Turbocharging is making plans for what kind of future fuels we will use, how they will be combusted, and how the engine will be turbocharged, they explained in a webinar

Turbocharging, basically, is pushing compressed air into the combustion chamber of an engine. It is a critical component of combustion engines, and will also be important in combustion engines with future low carbon fuels, such as ammonia, hydrogen and methanol.

But the turbocharging needs to be set up for the fuel which is being burned.

On a volume basis, different fuels require different amounts of air to combust, with ammonia needing less air and hydrogen needing more air.



Christoph Rofka, Senior Vice President, ABB Turbocharging.

On an energy release basis, the amount of air for different fuels is fairly similar. In terms of litres per minute / lower heating value, ammonia is 0.33, hydrogen is 0.29, diesel is 0.34, ABB says.

But different fuels will work best with different pressures, temperatures and injection systems.

“It is these changes which will have a significant impact on turbocharging for alternative fuels, rather than the fuel combustion properties,” says Christoph

Rofka, Senior Vice President, ABB Turbocharging.

“We can begin preparing turbochargers for cleaner fuels today, considering which combustion concept will be used for each fuel.”

“We don’t need to wait to see which fuels emerge in each sector before preparing the turbocharger design. We can confidently say turbocharging technology will be available for whatever fuels shipping decides to use.”

“We know enough about this concept to simulate combustion and explore how different parameters will affect it,” adds Dino Imhof, Head of Application Engineering and Product Management, ABB Turbocharging.

One option for an ammonia engine is to use exhaust gas to power the air compression. “Low exhaust temperatures could mean materials with lower heat resistance can be used in the turbine,” Mr Imhof said.

A challenge with ammonia engines is that it needs a high temperature and pressure to ignite. But the temperature in the combustion cylinder can be increased by increasing its pressure, by adding compressed air, he said.

So this means that turbocharging is also playing a role in making the combustion more efficient.

For a hydrogen engine, the favoured concept is “lean burn” – burning fuel in an excess of air – using a spark to ignite.

It is possible to adjust the output / load from the engine by using a 2 stage turbocharging system. “Even a challenging variable speed application with hydrogen can be satisfied,” Mr Imhof said. “This is not a solution typically applied to high speed engines today.”

Mr Imhof noted that the work is not yet completed, other research may show that a different combustion ‘concept’ is most suitable for hydrogen and ammonia, and the fuel of choice in future may still be something else.



Dino Imhof, Head of Application Engineering and Product Management, ABB Turbocharging.

Future combustion fuels

ABB Turbocharging, like many in the industry, strongly believe that the internal combustion engine will be the main engine in a zero carbon era. Oliver Riemenschneider, President, ABB Turbocharging points out that one litre of fuel can carry the same energy as 40 kg of battery.

Short sea shipping is the only segment which can use direct electrification, because the distances between port calls are shorter, so the size of battery needed is manageable. These batteries could be charged by electricity from renewables.

But it means that “only niche maritime applications will be able to use renewable electricity directly,” adds Dino Imhof, Head of Application Engineering and Product Management, ABB Turbocharging. “Certainly not the biggest 30 per cent of vessels which account for 80 per cent of shipping’s greenhouse gas emission.”

In a zero carbon era, “internal combustion

engines are a perfect fit thanks to starting capabilities and efficiencies over a wide operating range,” says Christoph Rofka, Senior Vice President, ABB Turbocharging.

In terms of the fuels which will be used in future, biomass has been considered by some to be a possible maritime fuel, but it has many uses other than maritime, including providing food, Mr Rofka believes “there will not be enough biofuel available to support global shipping.”

Mr Rofka believes that hydrogen “cannot be [directly] used for the majority of shipping applications due to the low density.” So we are likely to see “processed hydrocarbon fuels” dominating shipping, such as methanol, ammonia, synthetic methane.

If we are using green hydrogen, sourced

from renewables, it will take a long time to develop a supply. Consider that a 20,000 TEU container vessel might use 45,000 tonnes of fuel per year. This would need a 350 MW wind farm, just for the fuel for one vessel, he calculates.

“We are talking about decades to build sufficient renewable electricity to feed power generation and shipping.”

However blue hydrogen, made from fossil fuels with carbon capture, is “gaining momentum”.

“It is not the long term goal, but it could help achieve a faster impact.”

A useful first step might be to make hydrogen from fossil fuels without carbon capture, to supply shipping.

“For me this pathway has strong possibilities rather than waiting decades for

hydrogen based fuels from renewables to be available.”

“What can we conclude so far? There’s no doubt that shipping will rely on green or blue hydrogen. It is clear that there are several viable options how hydrogen is produced. Industries and companies need to make their choices.”

“I believe we should not exclude fossil fuels at the base for hydrogen. Producing hydrogen for fossil fuels will give opportunities for shipping to decarbonise faster until renewable sources of hydrogen are scaled up.

Putting this together, we can say that ammonia looks likely to provide the bulk of shipping’s energy needs by 2050, largely produced by using methane to make hydrogen, using carbon capture, he said.

TO

Pump news from Hamworthy and Framo

Hamworthy is developing ‘overhaul and seal kits’ for pumps – Framo is offering virtual reality training for pump maintenance

Hamworthy Pumps, a division of Svanehøj Group specialising in inline pumps, reported an increasing increase in demand for its “overhaul and seal kits” for pumps. They have been available since May 2020.

Hamworthy’s pumps are called ‘inline’ because the pump discharge and pump suction nozzles lie in a straight line of piping. The pumps are normally in a tanker pump room.

The kits ensure customers get everything they need when ordering spare parts. They are designed to fit the maintenance programs for specific pumps.

The customer provides the serial number of the pump to receive all the spare parts needed.

There are separate kits for pump overhauling and changing seals (called the overhaul kit and seal kit).

Like Svanehøj, Hamworthy Pumps is currently rolling out a new global service provider concept and has opened a large service centre in Singapore, together with its sister company Svanehøj.

Framo – VR training

Other news from the tanker pumps sector is that there are moves to develop digital training from Norwegian pump manufacturer Framo, owned by Alfa Laval. This move happened during the Covid pandemic.

Framo re-purposed its training department in its offices in Florvåg, to provide training over a digital platform, with a dedicated “webinar studio”.

“We haven’t changed the content, only the way we deliver the training,” says Training Manager Gaute Flatøy.

Framo is also developing a virtual reality training system, together with VR company NagellID, the maritime apprentice training office, Maritime Bergen and Bergen Maritime upper-secondary school.

Its VR glasses have an integrated computer, so there is no external PC.

“This VR technology makes it easier to carry out practical exercises with a group. Multiple participants can operate in the same world, even though they’re in different places,” Mr Flatøy said.

The technology enables students to “experience” a chemicals tanker and see how it is constructed and works.

“From a teaching perspective, using VR technology is a massive benefit – particularly when it comes to a subject like hydraulics, which is so abstract,” says Reidar Gjesdal, technical instructor at Bergen Maritime upper-secondary school.

“It can show what is happening and make the subject more interesting.

“Usually, when you look at a pipe, all you see is the pipe, and it’s inert. It’s difficult to envisage an oil flow, but this is where the VR technology can help.”

“Being able to take the pumps apart and put them together again, visualise the balance between hydraulic motors and centrifugal pumps, and get an idea of what’s happening inside the pipes is priceless too. Simply grasping output and efficiency and gaining a greater understanding of general physics is a big benefit. I think we’ll get more people interested in the subject by visualising it with VR.”

TO



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Svanehøj – growing desire for dual fuel pumps and services

Tanker operators are increasingly asking for newbuild vessels to be fitted with dual fuel pumps suitable for handling future gaseous fuels. The services business is also fast growing, says pump manufacturer and service company Svanehøj

We don't yet know for sure which fuels tankers will be using in a decade, but tanker operators planning new builds are already asking for pumps which can handle gas fuels like ammonia and other alternative carbon neutral fuels.

We spoke to Johnny Houmann, director, sales and projects with Svanehøj, a company which makes pumps and tank equipment, and provides supporting services, based in Aalborg, Denmark.

"For the operator it seems very important that the pumps are capable of being future proofed, they can pump whatever future gases need to be transported or used to fuel the engine," he says.

The same is seen from companies building and operating gas carriers, who don't know which cargoes they will be carrying in future, but want to be sure the vessels can handle many different possible cargoes, he says. LPG and LNG may be the most likely cargo today, but the cargo lists are being broadened to ammonia and widened with various ready-applications.

For a pump to handle a different fuel or cargo, you have to ensure the components

and materials are able to handle it. Different fuels and cargoes have different densities, and different chemical characteristics, which must be considered.

"It is not that expensive, to safe-guard the operations with our pumps. It is a modification of the known materials and components that we have today. So it is more or less a change of some of the components," he says.

Another factor is the capacity and power of the pump. If the energy density of the fuel is lower (as ammonia is less dense than hydrocarbon fuel), the pump will have to deliver more flow to fuel the engines.

The Svanehøj pump is also "the only one on the market capable of being retrofitted," Mr Houmann claims. This retrofit capability is achieved by making the pump components modular, so one can be more easily replaced by another.

"We can offer a retrofit package, so owners can buy a fuel pump which is future proof. That is something we are discussing on a daily basis."

Although the pumps involve sophisticated digital systems, they do not need a large amount of training to operate, Mr Houmann

says. "The systems are not that complex."

LNG measurement acquisition

In September 2021, Svanehøj announced that it had acquired Wärtsilä Tank Control Systems (TCS), a company formerly known as Whessoe.

Wärtsilä TCS makes measurement systems for gas tanks on LNG cargo ships, LNG fuelled ships, and land-based LNG facilities. It employs over 50 people in the UK, Singapore and France.

Providing pumps (or 'pumping') is increasingly becoming a service business as well as a product business. Svanehøj says its service business has tripled in revenue since 2018. Its service department will have over 70 employees after the acquisition, and it expects to increase its activity by 30-40 per cent.

Svanehøj is already a leading provider of services for cargo handling systems on LPG vessels. It aims to use Wärtsilä TCS acquisition to help achieve a similar position within the larger LNG ship segment, since there are round 500 LNG vessels with tank measurement systems from Wärtsilä TCS.

"The acquisition of Wärtsilä TCS is an expression of our desire to make Svanehøj a globally leading specialist in producing and servicing equipment for handling all types of liquefied gas – natural gas, biogas and not least the Power-to-X-based fuel of the future", said Søren Kringeltholt Nielsen, CEO of Svanehøj.

"It will be attractive for many customers to consolidate their service jobs and make use of our competencies within servicing pumps, compressors, valves, and instrumentation," adds Morten Christian Larsen, Director, Service & Aftersales, at Svanehøj.

In November 2020 Svanehøj announced that it has taken over Force Technology's Marine Equipment service department which employs 20 people in Frederikshavn, Denmark, also a move connected to gas pumps.



Svanehøj deepwell pumps



Johnny Houmann, director, sales and projects with Svanehøj

Condition monitoring

Another area of development, as part of the ‘services’ offering, is periodic pump condition monitoring. Svanehøj engineers typically monitor pump condition using handheld devices, shortly before the 5 / 10 year dry dock, to see if any more major work is needed whilst

at dry dock.

The condition monitoring typically includes a vibration and measurement test. This compares vibrations with the initial vibration analysis made during gas trial or commissioning, to see if there has been any change. From this, they can estimate the expected lifespan of components, and make recommendations, such as for certain components to be replaced or serviced.

Re-organising of brands

The two acquisitions, Wärtsilä TCS and Force Technology marine service department, followed a big re-organising of pump companies and brands.

In Autumn 2018, Danish / Swedish investment company Solix bought the then Wärtsilä Pumps with its recognized pump brands Svanehøj, Hamworthy Pumps, Eureka and Dolphin.

Solix renamed the company as “Svanehøj Group”, and set up headquarters in Denmark

and activities in Singapore, Great Britain, Japan and China. It set targets to triple revenue over a five-year period until 2023.

Deepwell pumps

A core area for Svanehøj is deepwell pumps, pumps with a propeller at the base of tanks on a chemical and oil tanker.

The pump is connected via a shaft to an explosion proof electric motor on the main deck.

Deepwell pumps make the last stage of emptying tanks, known as “tank stripping”, much easier.

Also with deepwell pumps you don’t need any traditional pumproom on a tanker, and the pumping / stripping efficiency is higher. The components are all made from corrosion resistant stainless steel.

It doesn’t need any suction pipeline between the tank and the pump, which is needed if the pump is in a pump room. The suction pipeline is where “90 per cent of pumping problems lie,” says tanker blogger Capt Ajit Vadakayil. 

A simpler way to treat aft peak tank ballast?

Techcross has developed a way to treat aft peak tank ballast water in your main vessel ballast water system without mixing - with a different flow system

Treating aft peak tank ballast water is a headache for tanker operators.

Aft peak tanks are small tanks in the stern of the ship used to ensure the propeller is immersed, to dampen propeller vibration, and to cool the stern tube bearing, which carries the propeller shaft.

The water in them needs to be put through a ballast water system like any other ballast water on the ship, to make sure that any foreign organisms are killed before the water is discharged to the ocean.

Regulations state that the aft peak tank ballast water cannot be mixed with the main ballast water tanks. This is because of perceived risks that oil from cargo in an adjacent tank could leak through corroded tank walls into the main ballast water tanks. The aft peak tank is located in a ‘gas safe zone’ so there cannot be any possibility for it to contain oil.

This means that tanker operators have been forced to consider a separate ballast water system just for the aft peak tank.

But Techcross, a ballast water system manufacturer in South Korea, has developed a different option, where the water from both aft peak tank and main ballast tanks could be handled by the same ballast water system, by structuring the flows in a clever way.

In Techcross’ system, the ballast water system treats the water after it has been stored in the aft peak tank, but before it is loaded into the main ballast tank.

So during the ballast voyage, the water in the main ballast water tank is already treated, and afterwards it can be discharged to the ocean.

This process was approved by DNV in 2018.

In more detail, the steps are like this.

Step 1 - the Aft Peak Tank is filled with untreated water.

Step 2 - The ballast water in the Aft peak tank is transferred across the deck, in a ‘non-return connection’, to the ballast water treatment system, and then to an empty ballast water tank in the cargo area. The ballast water treatment system is in a hazardous area.

Step 3 - the water is held in the cargo ballast water area

Step 4 - the water is discharged using ‘neutralisation’.

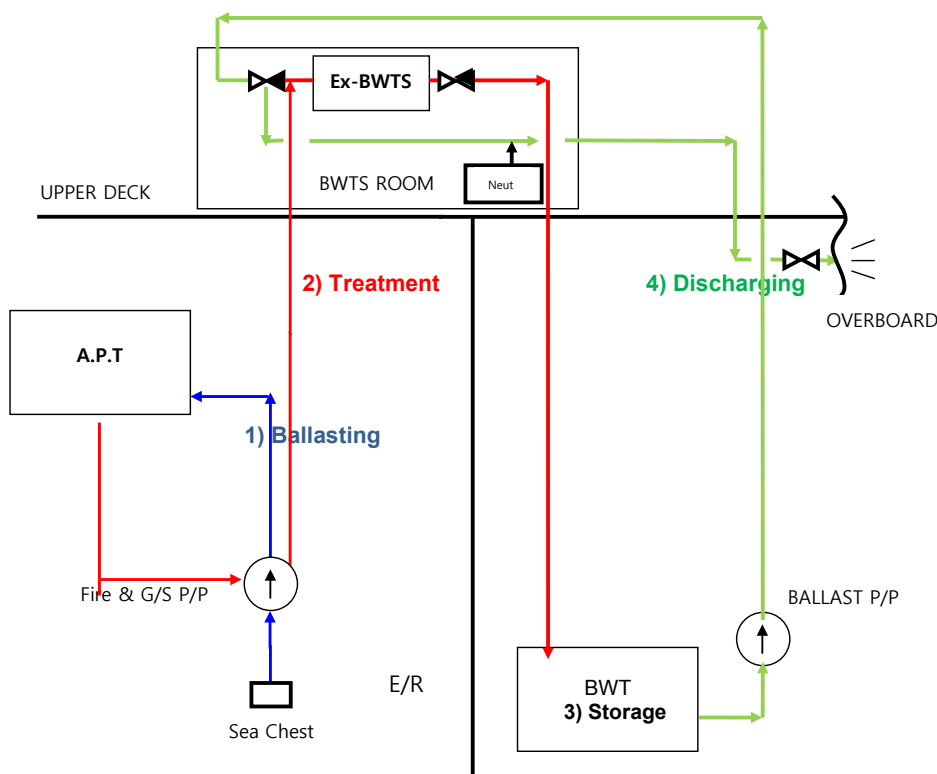
This is shown in the diagram.

Altogether, this arrangement can save customers the over \$100k cost of an aft peak tank system, the company says.

Since the Techcross system is electrochemical rather than ultraviolet, it does not need any filter, Techcross says.

Filters

This layout would not work if a filter was needed because of other complexities.



The flow arrangement for ballast water on an Aft Peak Tank

In a normal ballast water installation, the water is both filtered and treated before entering the ballast water tank. This means that any organisms caught by the filter can be discharged into water in the same place they came from, as required under the regulations. However, it is not allowed to be discharged in a different location from where it originated.

If you have a filter upstream of the aft peak tank (as it is filled with water), and a ballast water treatment system downstream of the aft peak tank after voyage (as the water is discharged), that is not considered equivalent to the type approved process, because organisms not separated by the filter can grow in size and volume during the voyage.

This would also make it harder for this water to be then flowed into the main ballast tank.

But with the Techcross system, no filtering is needed, all the killing of the organisms is handled by the electrochemical process.

Submerged pumps

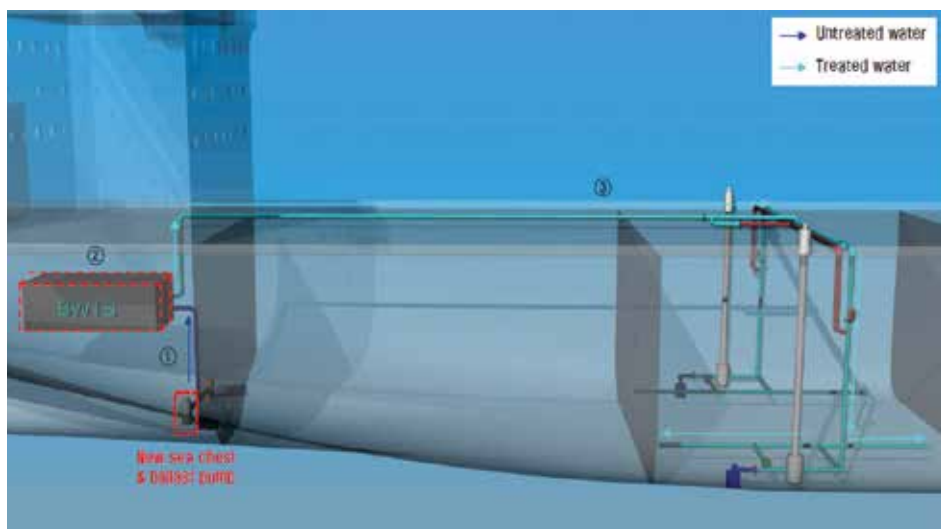
Techcross also has a system for tankers with submerged pumps, such as a Medium Range (MR) tanker, where there is no pump room.

The normal way to install ballast water

systems on these vessels is in a specially designed room on deck.

This involves safety concerns and a high cost of installation. Being on deck, the systems need to be explosion proof, which increases the cost.

The Tech Cross system can be installed in the engine room, which is not considered a 'hazardous' environment, so the system does not need to be explosion proof, and welding is much easier. This is possible because its systems are small.



Handling ballast water from a tanker with submerged pumps

The system has a modular design and small footprint.

This enables customers to save 20 per cent of the price of the system, and 30 per cent of the installation costs.

The submerged pumps are used only for de-ballasting. A different pump - a fire pump or general service pump - is used for loading the ballast tank.

This solution has been applied to over 50 newbuild medium range tankers at Korean shipyards, and a number of retrofits.

EPA's VIDA

The US Environmental Protection Agency (EPA) Vessel Incidental Discharge Act (VIDA) National Standards of Performance are new proposed ballast water regulations which could apply to small vessels (less than 79 feet in length) and fishing vessels of all sizes. Vessels above 79 feet are covered by existing legislation.

Techcross makes a very small ballast water system, ECS-150, which is supplied mounted on a skid, as a 'one size fits all' system for easy installation.

Techcross is currently researching ways to reduce the footprint and cost of this system.

About Techcross

Techcross supplies an electrochemical based ballast water system. It has 3762 systems installed in the maritime industry, as of July 2021.

It claims that its systems have a lower operating cost but the same performance as others in the market.

T.O.

Cargo claims related to tank coating

An increase in insurance claims related to tank coatings has led IUMI's Joint Hull Committee to form a subcommittee to investigate. Surveyor Paul Hill explained the issues

There has been an increase in insurance claims, or 'losses', relating to tank coatings, said Paul Hill, Managing Director, Marine at consultancy AqualisBraemar.

He was speaking at the International Union of Marine Insurance (IUMI) Annual Meeting held online during September.

In these claims, an important question for insurers, and shipowners, is whether the shipowner could be considered "grossly negligent", and so themselves to blame for any damage to the cargo, because of how the coating was applied or looked after, he said.

Mr Hill is a member of the IUMI Ocean Hull committee, which recently formed a subcommittee to investigate tank coatings losses, and produce guidance notes, he said.

Coating outline

Most tankers have tanks made with mild steel and a coating. Another option is stainless steel but that is "probably too expensive for a lot of shipowners," he said.

The coating on mild steel is commonly referred to a "paint" – but this can be a misleading term. "Paint is what we paint our living rooms, cars with. What we use on ships is a coating system, far more sophisticated products, a sophisticated engineering system," he said.

The coating prevents rust forming on the steel, but broken down coating can itself contaminate the cargo.

Ships are traditionally coated with epoxy coatings, which are usually applied in two parts. Types include pure epoxy, polyisocyanate epoxy and phenolic epoxy. "The data shows that most ships built in the last 10 years have this sort of coating."

It is the "cross link density" between molecules in the coating which provides the resistance to cargoes. This is lowest for pure epoxy and highest for phenolic epoxy.

There are also "high end coatings," including siloxirane, biomodal, and solvoxirane, sold by companies such as Marine Line, International Paints and Jotun, he said.

"They have low cargo absorption, they don't need so much cleaning and drying," he said.

"They have extended chemical resistance."

It means they can carry a greater variety of cargoes, and there are less restrictions on which cargo can follow another one. It also means that the coating is easier to clean and dries faster after cleaning.

However the coatings can require more surface preparation before they are applied, and have stricter humidity and temperature restrictions when they are applied.

Shipowners normally only use an expensive coating when the specific cargo they are planning for the vessel would require it, he said.

Coating manufacturers provide lists of products that a tanker with their coating is able to carry, put together from laboratory testing.

Application and maintenance

Before a coating is applied, steel surface preparation is of "paramount importance". The mild steel needs to be blasted to a certain standard. It must be clean but not totally smooth, because some roughness is required to allow the coating to bond to the steel, he said.

After the application, the coating may need curing. This is slightly different to drying, it is about the solvent being evaporated. The curing is considered complete when the coating reaches its "optimum hardness," which can be weeks later. Heating can make the process go faster.

A shipyard will provide the shipowner with a technical file with records of all aspects of the coating process. This file will be consulted if there is any investigation later.

During operation, the coating needs to be cleaned when the cargo is changed, usually with high pressure, high temperature water.

To know how a coating needs to be cleaned, and how much time is needed to dry, shipping companies could refer to sources such as the coating specification, instructions from charterers, or tank cleaning guides such as Dr Verwey, he said.

Common problems

Coating problems can occur before delivery of the ship, in the first year of service, and later on during life.

The most common problem seen before delivery of the ship, according to Mr Hill's experience as a surveyor, is "delamination" of

the coating (layers of the coating separating).

During the first year of service, the most common problem is blistering and cracking.

After 1-10 years you might see 'cathodic disbondment', which means loss of adhesion between the coating and metal due to a cathodic reduction reaction at the interface of coating, and delamination, described above.

After 10-25 years of service you see the above plus "stress concentration", cracking as the coating ages.

Much of this is linked to poor surface preparation right at the outset, he said. There can also be problems from an inconsistent coating application. If the vessel is in a part of the world with extreme temperature and humidity conditions, "they need to be managed properly".

In service, problems arise from poor tank cleaning methods. "The procedures I've described need to be followed. If they're not followed this can result in premature coating breakdown." For example, companies not following washing or drying procedures, carrying cargoes which are not compatible with the coating, or having an "incorrect" cargo cycling sequence.

Another source of problems is poor maintenance by crew. "The crew do their best as always, if there are isolated areas of breakdown, blistering, the crew will get the tin of paint and patch it up. That needs to be done properly."

It is the owner's responsibility to select the right vessel design, the right coating product, and ensure correct application of the coating. "It is prudent for owners to have their own paint inspector, or a superintendent with that experience," he said.

If a cargo owner thinks their cargo has been contaminated, they submit a claim, and a surveyor is sent to make an assessment. The surveyor will look at the coating technical file, records of the cleaning operation, and the shipowner's procedures.

Shipowners are sometimes reluctant to hand over files to surveyors acting for others. But once they have done this, this audit is "relatively easy" and something which could be done remotely, he said.

"Even the most experienced operators don't follow the procedures totally, there are shortcuts taken," he said.

T

Tanker technology update

Developments with ship to ship transfers, tanker loading software, hull integrity monitoring, CO2 emission estimating, disbursements accounting and prediction

Improving ship to ship transfer

UK ship-to-ship transfer technology and service company SafeSTS has developed two new technologies, an emergency relief system and a transfer by buoy system.

The emergency release system, called PTX Release, was developed together with Gall Thomson, a UK specialist and world leader in offshore liquid product transfer technology.

It is based on Gall Thomson's "flip-flap" technology already used extensively for 20 years across the oil sector and the leading technology in LNG transfer system.

It is designed to mitigate against the biggest risk in an offshore STS operation, which is the need for an active rapid disconnection system.

This means the need for a fast departure does not result in an injury or a hose parting with resultant pollution.

The PTX release Coupling is activated over the vessel's manifold drip tray, minimising the risk of spills with hydraulic activation provided through its own integrated Hydraulic Power Unit.

It requires no modifications on the vessels in order to function.

Future integration of the coupling into the vessel's Emergency Shutdown (ESD) system, through a connection situated near the manifold, brings it into line with LNG STS Transfer Systems.

The Transfer Via Buoy (TVB) system, a separate development, is to improve the availability of ship-to ship transfer operations in rough offshore environments, with dynamic positioned shuttle tankers.

The shuttle tanker, using dynamic positioning, can be stationed approximately 150m parallel to the export tanker. A hose connects the shuttle tanker to the TVB (Transfer via Buoy Terminal), and a second hose connects the TVB to the export tanker.

The TVB Terminal has no subsea structure apart from anchors and chains which and makes it straightforward to deploy and decommission.

A "hold-back tug" can be used to assist in the control the export tanker whilst on the buoy and combines emergency response capability for the offshore terminal.

With no subsea structure and the hoses floating, the hoses can be inspected and maintained without any specialist underwater equipment or personnel as they are always visible on the surface.

Similar to with other Single Point Moorings, the hoses are "dual carcass" and the system is monitored using telemetry to maintain the highest standards of any SPM terminal worldwide.

A VLCC or Suezmax can stay moored to the TVB Terminal long enough to be loaded by multiple shuttle tankers which allows consolidation of cargo with minimal vessel movements.

There is a capability for modern DP tankers to discharge through the Bow Loading System (BLS) which would make the operation almost identical to the DP tankers' loading operation at the FPSO.

EvenCargO for tanker loading calculations

EvanCargO (www.evencargo.com) is a software tool for tanker loading calculations, developed by Ragnar Børresen, based in Oslo, who has a background as a mariner with thirty-five-years' experience at sea, including as master mariner and chief engineer.

The software is designed to do loading calculations for tankers - including for planning, loading and discharging. There are 67 different programs in the package, which cover most conditions and requirements for

It uses a buoy terminal.

It is designed to provide greater flexibility and efficiency for export of oil from offshore fields when transferring from a DP shuttle tanker to an export tanker.

It combines the benefits of a single point mooring terminal (SPM) for conventional loading and the capability of the DP tankers to discharge while station-keeping in dynamic position mode.

The buoy terminal is situated close to oil fields. It can minimise the transit to/from the production point which significantly reduces the carbon emissions and maximises utilisation of the dynamically positioned vessels in the supply chain.

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loading and discharging.

The software calculates how to load and discharge cargo to achieve your desired trim, also ensuring that the propeller gets maximum power in the water.

Mr Børresen emphasizes that the software is designed as a working aid, not a loading computer. However it includes tools which a loading computer does not have, and costs a “fragment of the price”.

The company says it will “guarantee” that the software will help reduce costs for any ship which uses it, including from helping vessels avoid cracking in the steel.

The company is seeking a partner tanker operator who can provide real life data about an operating tanker, preferably a VLCC or Aframax, including ullage (empty space above fluid in a tank), draft and displacement, which can be used to improve the models of the software.

DNV's hull integrity monitoring system

DNV reports that it has completed “the industry’s most advanced hull integrity monitoring system”, across the whole fleet of Altera Infrastructure (formerly part of Teekay), one of the world’s leading shuttle tanker operators, with a system it calls “Nerves of Steel.”

The system uses a mixture of sensors and digital models of the hull to build a model of hull integrity.

It can replace the normal means of evaluating hull integrity based on assumptions using age, design, and snapshot surveys.

The software can also be used to build trend pictures and make predictions about future degradations. This can also be done together with weather information, used to predict wave loads on the hull.

“By identifying our safety, operational and commercial priorities, which are unique to our shuttle tanker fleet, we have a solution that fits our needs,” says James Fowler, Structural Integrity Manager for Altera Infrastructure. “We have implemented the basic Nerves of Steel indicator service across our entire shuttle tanker fleet and are currently pilot-testing the digital-twin numerical services on four vessels.”

“We have a high utilization rate across the fleet, so taking a vessel out of service to carry out unscheduled steel repairs is bad for

business.”

“In addition to gaining a better understanding of how structural defects may develop on a particular vessel, this hindsight can be applied to sister ships for comparison purposes; it also helps inform us how we should design vessels, especially those expected to operate in areas with challenging weather conditions, such as the North Sea,” he says.

Signal – estimating CO2 emissions from ships

Tanker chartering information service Signal has developed a tool for charterers to estimate the CO2 emissions of ships they are considering chartering for a certain cargo voyage. It includes estimations of emissions from the laden voyage and the ballast leg, taking into account the technical ship characteristics, the age, design, yard, use of scrubbers and fuel. Also the anticipated vessel speed and operational conditions.

Signal has built up a database of real CO2 emissions from tankers, covering different vessel types and different regions of the world.

The software can also assess the CO2 impact of route deviations, speed changes, and other possible changes. Charterers can use the software to consider CO2 costs and benefits alongside other commercial considerations when making a decision.

The estimates are based on AIS data for the same voyage done with a similar ship in the past, so there is a realistic prediction of how much time will be taken in bunkering operations, and how much idle time there will be.

The tool could also be used to calculate the CO2 impact of taking on another cargo for the ballast leg. This would normally involve “triangulation”, moving the vessel from the discharge port for the first cargo to a different port to load a second cargo, but perhaps being able to discharge this second cargo close to the origin port.

Signal’s calculations show that the actual CO2 per ton mile, taking all factors into account, including any triangulation cargoes, is lowest for MR2 vessels and Aframaxes.

Harbor Lab – software for disbursements

Harbor Lab of Athens (harborlab.com) has developed online tools for tanker operators

to predict port costs and keep track of disbursement spending.

“Disbursements” capture all the expenses made by a ship agent during a port call on behalf of the vessel, such as port duties, port costs, tugs, deliveries, pilot boats, bunkers, agent fees, canal transit fees.

The disbursement tool makes it clear what expenses are being incurred in each port call and makes the calculations. Around 1200 agents and vendors are currently registered with the system and provide data. Their rates are imported directly into the system, for evaluation by the operator.

The software is built with a combination of data science and domain expertise, with models for all the methods used to calculate port expenses around the world.

There is a Port Cost Estimator tool, which can make estimates of costs, based on cargo type and quantity, port name, and vessel specifications. It went live in July 2021 as a compliment to the Disbursement Accounting tool. The estimates are based on published port tariffs.

The company founder and CEO, Antonis Malaxianakis, is a former disbursements supervisor with tanker operator Product Shipping and Trading. Before that he was a disbursements operator with tanker operator Thenamaris.

The work of a disbursements manager includes negotiating with port service providers, evaluating the proforma (upfront) disbursements accounts, checking the final account, issuing a claim to charterers.

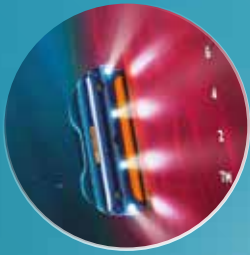
In July 2021 Harbor Lab announced it had signed up its 300th vessel, just 15 months after launching the company in March 2020. It said that the tool was used to process 4000 port calls during its first year of operation.

Payment for the system by tanker operators is based on a fee per port call. Vendors and agents can use the system free.

“Harbor Lab is a valuable tool which allows users to manage and process Disbursement accounts in a fast and efficient way. The platform is well-designed and easy to use. It transforms complex daily procedures to a simple and accurate operation,” said Theodore Belexis, managing director of Product Shipping & Trading S.A

“The Harbor Lab platform offers a unique architecture that gives our company full and easy control on all DAs of our fleet,” says Efi Sioziou, Commercial Operator, Swiss Chem Gas.

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