TANKERS OFFSHORE EASTERN EUROPE ECO SHIP TECHNOLOGY FERRIES

THE NAVAL ARCHITECT

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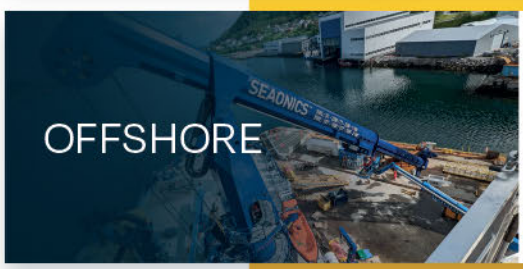

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FUTURE FUEL ANSWER – OR ANSWERS – STILL A GOOD WAY OFF

By **Daniel Johnson**

The question of which alternative fuel will come out on top in the race towards cleaner shipping is one that divides the industry more than any other issue. Much of the debate is guess work at present and as Richard Halfhide points out in his report on SRC Group's innovative new Methanol Superstorage solution on pages 24-25, the answer to the question is unlikely to become apparent for a number of years yet. What we can be sure of is that there won't be just one winner – the maritime industry is massively diverse and what fuel works for one vessel will not be suitable for another.

According to the latest data from DNV's Alternative Fuel Insights (AFI) database, methanol continues to gain traction as a favoured future fuel option with a total of 14 orders for methanol-ready ships recorded in October. The data also reveals six more LNG-newbuilds – a pragmatic choice that is likely to continue to dominate the transition phase towards 2030 – as well the first firm orders for ammonia. Developments in the ammonia space continued into November as North Sea Container Line and Yara International announced plans to develop the world's first container ship to be powered by pure ammonia as fuel (page 7).

The future fuel pendulum does seem to have swung towards ammonia in recent months and the fuel has achieved some significant milestones in 2023, with WinGD's two-stroke ammonia having received Lloyd's Register (LR) approval in principle as well as MAN Energy Solutions' successful completion of the first test engine running on ammonia. These technology advancements are highlighted in the LR Maritime Decarbonisation Hub's October 2023 update of the Zero Carbon Fuel Monitor, which tracks technology, investment and community readiness of prominent alternative fuels for the maritime energy transition. The Monitor update reports that technology progress across a number of fuel supply chains is evident, but especially for ammonia.

There's also good news for the growing army of ammonia proponents in the Hub's recent 'The Future of Maritime Fuels' report. The report presents a review of a wide range of fuel mix projections and has identified two alternative paths that will steer shipping's course to greener horizons – hydrogen-based fuels scenarios and biofuels scenarios.

In the hydrogen-based fuels scenarios, e-ammonia is projected to emerge as the most highly adopted maritime fuel in the long term, with an average share of 35% of the shipping fuels market by 2050. Such adoption yields significant energy demands, which will potentially drive the shipping industry to be the largest user of ammonia worldwide. It is projected that blue and e-ammonia will capture between 20% to 60% of total shipping fuels by 2050, with total consumption by shipping increasing on average from 0.79 exajoules (EJ) in 2030 to 6.06EJ in 2050.

SOURCE: SHUTTERSTOCK

In the biofuels scenarios, liquefied bio-methane is projected to capture on average 34% of total shipping fuels by 2050, with total consumption by shipping increasing from 0.5EJ in 2030 to 4.58EJ in 2050. However, the expected supply of bio-methane needed for shipping is projected to vary between 0.3EJ to 2EJ during the time period under review, falling far short of demand.

The report also finds that methanol is projected to have a lower market share of the shipping fuels market than ammonia and bio-methane, which runs counter to current trend of ordering dual-fuel methanol vessels. Combined bio- and e-methanol fuels are projected to capture on average a market share of 13.4% of total shipping fuels by 2050.

These fuel mix projections underscore the industry's pivotal role in driving alternative fuel adoption while grappling with unique challenges in balancing demand, supply, and investment in alternative fuel pathways.

At the release of the report, the Hub's Carlo Raucci commented: "Our scrutiny of fuel mix projections shows that investors and shipowners will face the dilemma of choosing from different alternative fuel pathways. It is uncertain if one category of fuel will dominate the maritime fuel mix in the short and long term, and investors face risks, such as stranded assets, which have limited the investment readiness level of low- to zero-carbon fuels."

He went on to conclude that first movers' initiatives such as green shipping corridors will therefore be pivotal in reducing the uncertainty by scoping out multi-sector fuel supply projections that could potentially help to aggregate demand and lower risks.

As always, it's clear that collaboration across all stakeholders is a priority if answers are to be found in the constantly evolving zero-carbon marine fuels landscape. ■

NEWS

SHIPBUILDING

MEYER AND C-JOB ENTER STRATEGIC PARTNERSHIP

SIGNING OF THE STRATEGIC PARTNERSHIP. MEYER GROUP WILL TAKE A 50% STAKE IN C-JOB

MEYER Group and independent ship design and engineering company C-Job Naval Architects have announced the two companies have entered a strategic partnership that will see MEYER Group acquire a 50% stake in C-Job.

The move solidifies MEYER's focus on sustainable solutions and allows the group to diversify its portfolio, according to a spokesperson.

C-Job operates worldwide with offices across five countries and has its headquarters in the Netherlands. The company is considered a thought leader when it comes to sustainability in the maritime industry, having been at the forefront of alternative fuels research. It was the first company to prove ammonia can be applied safely as a marine fuel, continued with other renewable fuels such as methanol and last year shared a brand-new class of liquid hydrogen tanker powered by hydrogen fuel cells. Moreover, the firm has a strong track record in dredging, offshore wind, mega yachts and passenger vessels.

MEYER Group is an international consortium including MEYER Werft with three shipyards in Papenburg, Rostock (Germany) and the Finnish city of Turku.

The strategic alliance will allow MEYER Group to utilise C-Job's knowledge of and experience in applying renewable fuels to its portfolio focusing on cruise vessels in particular – which in turn diversifies C-Job's own portfolio.

Job Volwater, CEO and co-founder of C-Job Naval Architects, says: "We started C-Job in 2007 and we have been making waves ever since. We haven't been afraid to do things a bit differently which has led to our successes. In MEYER Group, we have found a partner who aligns with our values and culture, making our partnership a natural fit. I'm proud MEYER and C-Job have combined forces and I am certain this union will fortify our position in both the Netherlands and internationally even more."

WIND PROPULSION

WFW JOINS WIND SHIP IN FRANCE

Watson Farley & Williams (WFW) Paris has announced it has joined industry association Wind Ship in France, part of the International Windship Association (IWSA), to help the energy transition and decarbonisation of the maritime sector by developing and deploying wind power-propelled vessels.

WFW is the first law firm to join Wind Ship which the company says reflects its commitment to both the maritime sector and sustainability. This was demonstrated when the WFW took a role in helping develop the industry-wide Poseidon Principles in 2019 to support the IMO's goal to reduce shipping's total annual greenhouse gas (GHG) emissions by at least 50% by 2050.

WFW PARIS FINANCE PARTNER PHILIPPE MONFORT. SOURCE: WFW

Founded in 2019, Wind Ship gathers 30 wind power technology providers to support and promote innovation. Wind Ship coordinates the 'Europe-Atlantic' hub of the IWSA, a network with 180 industry members who support IMO and EU decarbonisation plans.

The organisation is also the initiator of the 'Decade of Wind Propulsion' declaration of intent, dedicated to the decarbonisation of both current and future vessels. Wind Ship also includes amongst its members both financial institutions, such as Crédit Mutuel and Banque Populaire Grand Ouest, and technical advisors.

Paris finance partner Philippe Monfort and associate Vincent Cossavella will lead on WFW's relationship with Wind Ship to promote the firm's expertise in helping it and its members achieve their goals.

CONTAINER SHIPS

YARA AND NORTH SEA CONTAINER LINE TARGET WORLD'S FIRST AMMONIA-FUELLED CONTAINER SHIP

Norwegian operator North Sea Container Line has joined forces with Yara International and its subsidiary Yara Clean Ammonia to build what is slated to be the world's first ammonia-fuelled container ship.

Yara Eyde is set to enter the market in 2026 and will operate between Oslo, Brevik, Hamburg and Bremerhaven.

The ship will be 149m long with a capacity of 1,300TEU. It will be fitted with an ammonia-fuelled engine and fuel storage and supply systems. It will also have a 250kWh battery pack and the ability to connect to onshore power while at port.

In order to realise the vessel, Yara Clean Ammonia and North Sea Container Line are establishing a joint venture, NCL Oslofjord AS. Upon establishment, the joint venture aims to become the world's first line operator to focus exclusively on ammonia-powered container ships.

The project has been awarded just over NOK40 million (US$3.6 million) from the Norwegian funding organisation Enova. Establishment of the joint venture and ordering of the ship is conditional on the completion of binding agreements and the necessary approvals from the authorities.

SOURCE: YARA INTERNATIONAL

"The world is in the middle of a climate crisis and all good forces must now come together to quickly cut emissions. We are happy to be able to collaborate across sectors and show that decisive emission cuts are possible. The green journey started with the *Yara Birkeland*, the world's first self-driving electric container ship, and now we continue it with the *Yara Eyde*, which will be the world's first container ship running on pure ammonia," says Svein Tore Holsether, CEO of Yara International.

ALTERNATIVE FUELS

WALLENIUS WILHELMSEN PCTC TRIALS HSFO-BIOFUEL IN SOUTH KOREA

Norwegian shipping and logistics company Wallenius Wilhelmsen has conducted its first biofuel bunkering involving the use of a B30 HSFO-biofuel drop-in blend in South Korea. The bunkering of the PCTC M/V *Torrens* was undertaken in collaboration with GS Caltex at Masan Port.

A drop-in fuel which can be used in existing engines without any modification or tank cleaning, B30 HSFO-biofuel is a HSFO blended with bio feedstock UCOME. The number of suppliers worldwide offering this particular fuel is currently very limited and the issue is compounded by the general lack of demand for marine biofuel blending in Korea.

"Despite the growing demand and supply of biofuels around the world, the preparation of biofuels in Korean ports has been somewhat slow," says Jang Hongseok, manager of energy sourcing, Wallenius Wilhelmsen. "As Korea is one of our major bunkering ports, stable biofuel supply is essential to secure flexibility of tonnage allocation, so I am pleased to have a B30 HSFO trial with GS Caltex, one of Korea's major fuel suppliers, and I hope close cooperation will continue in the future."

Cha Hyungmin of the GS Caltex Biofuel team adds: "GS Caltex has paved the way for developing bio-marine fuels in Korea, and we expect this trial with Wallenius Wilhelmsen will be a meaningful step for scrubber

M/V *TORRENS* IS THE FIRST WALLENIUS WILHELMSEN VESSEL TO BUNKER B30 HSFO-BIOFUEL IN KOREA

installed vessels of global shipping companies to reduce their carbon emissions when calling Korean ports. We hope to expand the relationship with Wallenius Wilhelmsen and support as a carbon reduction solution partner in Korea."

In the meantime, Wallenius Wilhelmsen is currently assessing the viability of both HSFO-biofuel blends and VLSFO-biofuel blends in the Asia region as part of its global deep-sea trade decarbonisation strategy.

BULK CARRIERS

AASEN SHIPPING ORDERS THREE HYBRID METHANOL-READY SELF-DISCHARGERS

Norwegian owner Aasen Shipping has placed an order with the Netherlands-based shipyard Royal Bodewes for three new hybrid powered methanol-ready self-dischargers.

Delivery of the vessels is set for December 2025, April 2026 and September 2026.

The order of three vessels follows Royal Bodewes successfully building the *Aasfjell* and *Aasfoss* for Aasen in 2021 and 2022, respectively. The new ships will have a similar design as the previous new buildings, however with some upgrades.

AASEN SHIPPING'S *AASFJELL*. SOURCE: ROYAL BODEWES

"They will feature a large battery pack, which will enable peak shaving for both main engine and auxiliary engine. The cargo handling machine will be electric, which will again reduce noise and emissions. In ports where shore power is available, these ships can both self-load and self-discharge completely free of emissions," says Royal Bodewes.

The combination of a modern hull, battery pack and variable frequency drive reduces emissions and fuel consumption to a much lower level than any comparable ships in the market, according to the shipyard.

"The ships will hold class notation methyl/ethyl alcohol fuelled ready. Once green methanol is available, these ships can easily be rebuilt to consume green methanol. In that case the ships can operate completely emission-free, both in port and at sea," it added.

The ships will be 120m long with a 16m beam. The main engine will be a 2,250kW Wärtsilä 6L25 type.

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NEWS ANALYSIS

MORE CONTAINER SHIPPING WOES

By **Malcolm Latarche**, Correspondent

After a very profitable two years during the Covid pandemic, container ship operators have had a particularly bad couple of years since and early in October the European Commission snatched away a pillar of support that the sector – at least that part serving Europe – appeared to be particularly reliant upon with the scraping of the block exemption rule that enables container liners to closely cooperate within alliances.

In reaching its decision, the EC concluded that rule had created the impression that carriers had an advantage, while other supply chain stakeholders were treated unfairly. The impact of the ending of the block exemption which expires on 25 April 2024 has yet to be seen but there has been plenty of discussion about it.

Despite the global containerised trade having increased virtually every year for almost half a century, operators have not really been able to capitalise on that growth due to fierce competition. Consolidation, grasping at economies of scale by growing ship size around sixfold since the turn of the century, and slowing operating speed over time to save fuel costs have allowed a dwindling number of operators to stay in business. The crash in 2008 accelerated those trends.

But the pandemic and soaring freight rates for two years left owners cash rich and true to form they rushed out to order new ships hoping perhaps that a permanent change in fortunes had finally arrived. In 2022 as freight rates dropped like a stone it began to dawn that things were returning to normal – something that this year has been confirmed.

Prior to the covid pandemic, container ship ordering did look to be finally adapting to a more realistic market view and fewer ships were ordered particularly in the smaller sizes. Today, the ships ordered during the 2020/21 spree are mostly still undelivered and according to BIMCO, quoting Clarkson Research data in early October, that has meant that the average age of container ships in service has risen to 14.2 years – the highest average age of the three main shipping sectors behind bulkers (11.9 years) and tankers (12.8 years). Since 2010 the average age of the container fleet has increased 4.3 years. Perhaps more importantly, nearly 70% of all container ships are over 10 years old.

Even with the significant freight drop from the heights reached in 2022, recycling of ships during 2023 has remained low compared with the past 10 years. From January to September only 57 ships were scrapped compared to 81 on average during the previous 10 years. The order book contains 750 ships to be delivered before the end of 2025. If all are delivered on time, then an imminent scrapping spree is almost inevitable.

MAERSK AND MSC HAVE ALREADY ANNOUNCED AN END TO THEIR 2M ALLIANCE

One of the driving factors behind container ship building in recent years has of course been the need to meet IMO efficiency regulations. Container ships were targeted back in 2019 when the IMO brought forward the implementation date and increased the reduction for Phase 3 EEDI from January 2025 to April 2022. It is arguable whether any further significant efficiency improvement can be made until the introduction at scale of alternative fuels but the push to decarbonise has not diminished and there is a general consensus that ports too have a part to play.

In a joint white paper published towards the end of October by APM Terminals and DP World acknowledged that ports must play their part and set out four levers for unlocking the necessary technology to make port decarbonisation possible. Three of those levers are probably quite reasonable but the fourth much less so.

First, the authors suggest, is that equipment manufacturers need to develop appropriate technology. Secondly there needs to be a standardisation of the technology allowing for reductions in cost to the terminal operators and thirdly the terminal operators will need to employ the new technology, electrify terminals and undertake worker training.

The last lever is that governments need to incentivise terminal operators. The incentives envisaged include requiring all new terminal bids to be zero emission, only operators agreeing to decarbonise being allowed to bid for new concessions and favourable financial incentives including direct financial support for early movers.

It would appear that just as one element of the supply chain is being obliged to be more competitive, another part is seeking subsidies which ultimately come from taxpayers thus meaning that for the man in the street what is given by one hand is taken back by the other. ■

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NEWS EQUIPMENT

ENGINES

LATEST WÄRTSILÄ ENGINE DEBUTS POWERING NEW LUXURY CRUISE SHIPS

RENDER OF *ORIENT EXPRESS SILENSEAS*. SOURCE: ACCOR/ MARTIN DARZACQ

Technology group Wärtsilä is supplying its recently introduced Wärtsilä 25DF dual-fuel (LNG) engine for two new sail-assisted luxury cruise ships.

The vessels are being built at the Chantiers de l'Atlantique (CdA) shipyard in France for Orient Express Silenseas, part of French hospitality group Accor. There is an option for an additional two vessels.

The Wärtsilä 25DF engine features a two-stage turbocharging system, common rail fuel injection and cylinder wise combustion control. This enables increased power density and efficiency across the full operating range, delivering low fuel consumption and reduced emissions.

"These will be very special cruise vessels and have been designed to operate with a high level of environmental sustainability. For this reason, the Wärtsilä 25DF engine was selected. It is silent, compact in size, yet powerful in performance, so it was the perfect choice for these ships," says Yann Penduff, Chantiers de l'Atlantique project manager.

The full Wärtsilä scope includes for each vessel four Wärtsilä 25DF engines, each developing 2,070kW at 1,000rpm, four gas valve units (GVUs), and four Wärtsilä NOx Reducer (NOR) emission aftertreatment systems. The equipment is scheduled for delivery to the shipyard commencing in autumn 2024.

The first of the 220m-long vessels will be named the *Orient Express Silenseas*. The ships are designed to accommodate approximately 116 passengers.

ENGINES

W&O SUPPLY ADDS LOW-LEAKAGE VALVES TO ITS PORTFOLIO

W&O Supply has partnered with BROEN Clorius Controls to add low-leakage valves to its portfolio of marine valves, actuated valves, pipes and engineered solutions.

The new product is a BROEN Clorius Controls ultra-low leak three-way valve especially designed for HT-systems on two-stroke main engines. It increases system efficiency, helping save fuel and reduce CO_2 emissions.

According to W&O Supply, the valve has a leakage rate of less than 0.01%, compared to most valves, which have a typical leakage of 2% or more. The valve controls the temperature in the HT-system of the main engine, which must be kept warm when not sailing and needs to be kept cool during normal operations.

The company adds that, with its compact design, the valve offers easy, time efficient replacements. It can be used on vessels to replace larger-sized existing valves. Retrofit and replacement can be done without the need to modify existing pipe work. Valve replacements can also be done in location at ports, without the need to drydock vessels.

THE ULTRA-LOW LEAK THREE-WAY VALVE IS ESPECIALLY DESIGNED FOR HT-SYSTEMS ON TWO-STROKE MAIN ENGINES. SOURCE: BROEN CLORIUS CONTROLS

"W&O Supply is committed to helping its clients reduce greenhouse gas emissions with the right marine valves and fittings. We are delighted to bring this valve to the marine market. We think it is a valuable piece of the decarbonisation puzzle, helping vessel owners and operators to minimise their carbon emissions," says Kristof Adam, managing director of W&O Europe.

WIND PROPULSION

ANEMOI AND HUDONG-ZHONGHUA COLLABORATE ON ROTOR SAIL DESIGNS FOR LNG CARRIERS

PICTURED, LEFT TO RIGHT: HZ DEPUTY DIRECTOR OF GENERAL OFFICE SRDD LONG CHAN, ANEMOI COO NICK CONTOPOULOS, HZ DIRECTOR OF RESEARCH AND DESIGN DEPARTMENT WANG JIAYING, AND ANEMOI CHINA GENERAL MANAGER SHUAI PING. SOURCE: ANEMOI MARINE TECHNOLOGIES

Anemoi Marine Technologies has entered into a joint design cooperation agreement with Hudong-Zhonghua (HZ) Shipbuilding Group in China for the design of rotor sails on board two LNG carrier newbuildings.

As part of the agreement, Anemoi will assess the feasibility and design of rotor sails for installation on LNG carriers and develop relevant specification requirements and designs that can be used for future installation projects in order to meet current and future environmental targets.

In addition, it is hoped the project will boost the confidence of rotor sail technology for gas carrier owners and enable the smooth introduction of a new generation of efficient and environmentally friendly LNG carrier design.

"Shipowners are seeking practical technology that can be easily installed on board vessels to improve their energy efficiency. Anemoi has been developing industry leading wind propulsion technology for years and this new venture is the next step in rotor sails becoming a critical component of shipping's decarbonisation journey," says Anemoi COO Nick Contopoulos.

Earlier this year Anemoi announced it was on track to have a production capacity to install up to 50 rotor sails a year by the end of 2023 due to growing demand for the technology.

BWTS

ERMA FIRST BWT SOLUTION GETS SOUTH KOREAN APPROVAL

Sustainable maritime solutions provider ERMA FIRST has received the coveted South Korean flag type approval for its FIT ballast water treatment system (BWTS)

Awarded by the administration of the Republic of Korea, the FIT BWTS is now one of the few non-domestic systems to hold such type approval, which is an essential requirement for systems being installed on South Korean flagged vessels.

Konstantinos Stampedakis, ERMA FIRST co-founder and managing director, says: "ERMA FIRST has been supporting shipowners in Asia for many years and this type approval opens up a whole new market for the ERMA FIRST FIT BWTS ahead of the D2 ballast water performance standard deadline in September 2024.

FIT BWTS HAS BECOME ONE OF A SELECT NUMBER OF NON-KOREAN SYSTEMS TO RECEIVE THE TYPE APPROVAL FROM THE ADMINISTRATION OF THE REPUBLIC OF KOREA. SOURCE: ERMA FIRST

"We are delighted to have received this approval from the administration of the Republic of Korea. The addition of the Korean type approval means the system is now triple-accredited where Korean-flagged vessels are concerned, as it also holds IMO and USCG type approvals."

ERMA FIRST is represented in South Korea by its agent Magna Mare.

According to Korean Ministry of Oceans and Fisheries, around 9,000 vessels fly the South Korean flag, 2,000 of which are merchant ships.

The FIT BWTS is an advanced modular system suitable for both newbuild and retrofit projects. Major components of the system include a high-end backwash filter and electrolytic cell that perform to the highest standard. Covering an extensive capacity range of 50-3,740m³/hr and certified for operation in the most challenging conditions, the system is the ideal solution for all types and sizes of ships, according to ERMA FIRST.

OPINION

BUILDING THE SMART VESSELS OF THE FUTURE WILL DEMAND A PLM APPROACH

By **Bruno Benevolo**, director, Enterprise Solutions, SSI

Construction of vessels and offshore assets is a process without prototyping. As a result, managing changes is a constant, making the capture and distribution of reliable data both essential and highly challenging.

Shipbuilders can hardly be blamed for struggling with this kind of complexity. Projects are unique; not only are there no prototypes, even a series of sister ships will have differences.

There is a saying that engineering and production planning are enemies in the shipyard. Engineering creates the design and only later does the production department find out they can't build it. Because most yards operate to compressed schedules, it is possible that they are cutting steel, procuring components and making changes before the design model is complete.

Early and continuing access to accurate data is needed to improve collaboration and help teams work together efficiently. The ideal model is one with full oversight in which changes to design and specifications are constantly communicated across multiple departments and suppliers.

A shipyard's reticence to invest in systems that can deliver this data can be traced to the fact that most non-specialist software vendors do not offer a straightforward path to platform adoption. Most want to completely replace systems and charge for every potentially disruptive upgrade when in reality, many tools and processes can be retained with incremental adjustments that provide continued value.

BRUNO BENEVOLO, DIRECTOR OF ENTERPRISE SOLUTIONS AT SSI

Shipyards have not stood still. Instead, they have sought to address their challenges with in-house systems. These can solve short-term problems but the resulting silos of information lead to longer term challenges.

Their need to engage with digital transformation initiatives is set to grow as more of their customers demand a data-led approach to vessel operations and maintenance. The need to manage and share the data that will populate the digital twin is driving the adoption of Product Lifecycle Management (PLM) within the shipbuilding sector.

PLM in practice

PLM is generally viewed as an automotive or aeronautical industry software application. This is hardly surprising since most available solutions are not shipbuilding-specific and their vendors normally don't understand the sector's specific challenges.

After all, creating the engineering design is not the area of highest cost expenditure, that comes from everything that follows. When changes are necessary, it's possible that the designers will get to the shop floor and find parts ordered and some of the structure already built. For larger components, the team can spend time putting out fires rather than managing the process in a way that delivers competitive advantage.

The trend towards PLM reflects the need to move from discrete functions to a cohesive approach to the business of shipbuilding. There is a constant flow of information, dynamic and in real time and all business functions need that information to be accurate, not least because it

is likely to change during the project lifecycle, but also because it will be relied upon for future maintenance and eventual decommissioning.

For vessel operators, it can provide traceability of components down to single part level. Operators can use the data within the digital twin to access characteristics and configuration within the 3D model, including vendor information.

The asset structure view available within the model provides a level of transparency that simply can't be gained from 2D plans. It's far more than a pretty model, it illustrates structural and component relationships, systems data and related documentation.

Unique approach

SSI believes PLM has a vital role to play in managing, configuring and controlling all the product data needed by stakeholders from concept to decommissioning. As an established provider of ship design and construction software, we recognised the challenge of providing seamless information flow across the lifecycle of a project, from design to delivery and operations.

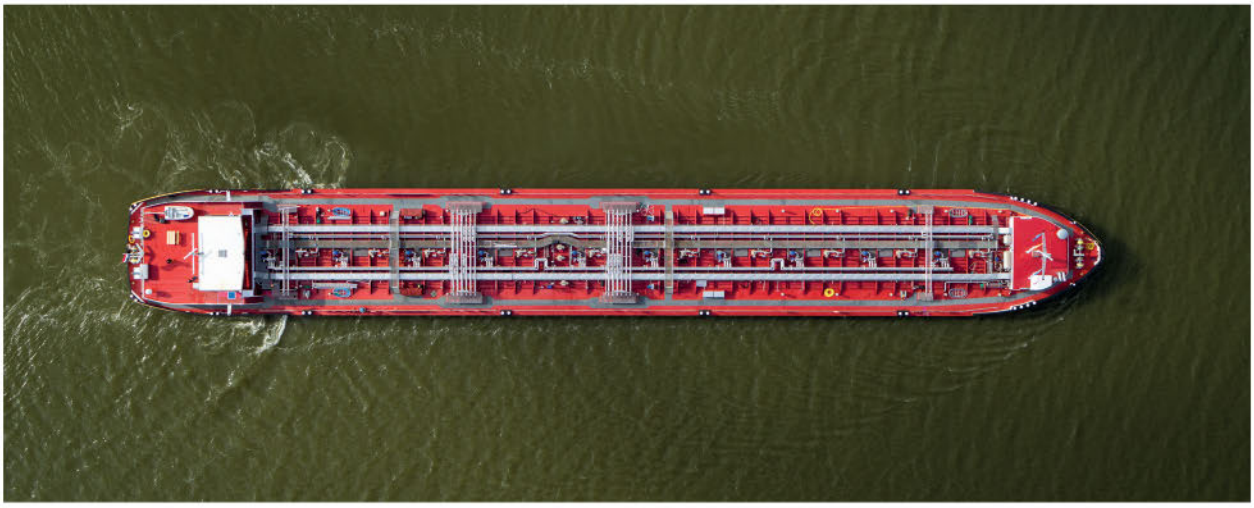
The industry also needed an industry-specific solution; our experience with shipyards and shipowners convinced us of the need for a vertical information management solution that can provide the data all stakeholders need. We chose Aras Innovator as a technology platform as this allows us to provide continuous upgrades at significantly lower cost than non-specific solutions.

We understand the need for compatibility with other systems – including our competitors – so that best of breed technology can be delivered in partnerships with clients as and when required.

The challenge of change during the design and construction phase makes PLM a necessity in shipbuilding. It's a process shipyards should adopt for efficiency and cost-saving but it will increasingly become a necessity for delivery of the digital twin.

In addition to monitoring performance and maintenance schedules, operators will increasingly demand greater visibility on the vessel's components. The digital twin can provide a useful digital auditing database to understand whether new technologies, fuels and systems are operating safely and in compliance.

Perhaps most importantly, the benefits of PLM are shared, accruing to shipyards during the construction phase and shipowners once they take delivery and are able to perform smarter maintenance and optimised operations across the vessel lifecycle. ■



THE LOW-WATER INLAND TANKER *STOLT LUDWIGSHAFEN* CAN NAVIGATE THE RHINE EVEN AT EXTREME LOW WATER LEVELS, WHICH OCCUR INCREASINGLY OFTEN DUE TO CLIMATE CHANGE. SOURCE: BASF SE

TANKERS

INNOVATIVE CHEMICAL TANKER DEPLOYED FOR LOW WATER LEVELS ON THE RHINE

By **Daniel Johnson**

Dry weather and low water levels on the River Rhine in Germany this year have again hindered inland shipping. Operations were disrupted on the waterway for several weeks over the summer and, after a brief recovery in September, the river's water levels fell once more in October, preventing vessels from sailing fully loaded. This latest disruption to the vital shipping lane follows extremely challenging situations in the summers of 2018 and 2022 when German companies faced supply bottlenecks and production problems after drought and heat wave led to unusually low water levels on the river.

According to Ralf Duester of supply chain management specialist Setlog GmbH, Germany must increasingly prepare for low-water situations in inland navigation. "Climate change has arrived in logistics. The forecasts of climate researchers show that it is high time for politicians and companies to take precautions," he informs *TNA*.

Duester adds that analyses by the Kiel Institute for the World Economy on the consequences of low Rhine levels have shown that industrial production in Germany falls by around 1% with 30 days of low water in a month. "For some sectors, such as the chemical industry, supply by barge is critical," he notes.

Duester advises companies, on the one hand, to focus on digitisation of supply chains and, on the other hand, to organise transport alternatives such as land bridges, i.e. the transshipment of goods from ship to rail or truck. In his view, innovative ships must also be used, and in this context points to the new chemical tanker *Stolt Ludwigshafen* which entered service earlier this year.

Built between mid-2021 and 2023 for chemical producer BASF SE and Stolt Tankers, the *Stolt Ludwigshafen* takes its name from the German city on the shores of the Rhine that is home to the world's largest chemical plant. The ship's innovative design, such as special lightweight construction, allows high payloads even during extreme low water levels.

Unbeatable efficiency

Raw materials and finished products in the 1,000tonne range are delivered and sent out from the Ludwigshafen plant every day, according to Uwe Liebelt, president European Verbund Sites, BASF SE. "About 40% of these are transported by inland waterway vessels, which are simply unbeatably efficient for the large-volume products of the chemical industry," he says.

Liebelt continues: "About 15 vessels are turned per day here at our port. If we wanted to shift the corresponding volume onto rail tank cars or trucks, we would need about 500 rail tank cars or 1,000 trucks. Not only would that be less efficient, but neither railways nor roads could handle this additional volume of traffic. Therefore, the Rhine is a lifeline for us."

Following the extreme low water levels on the Rhine in 2018, BASF SE initiated an extensive programme to improve climate resilience at the Ludwigshafen site, which has now been implemented. The programme consisted

of four building blocks: first, the company, together with the Federal Institute of Hydrology, developed an early warning system for low water which allows it to make level forecasts six weeks in advance; secondly, key loading points at Ludwigshafen were expanded to allow trimodal flexibility between ship, train and truck; and thirdly, compared to 2018, BASF SE has now more than doubled the number of vessels capable of navigating low water. The fourth and final building block are three vessels that are also suitable for extremely low water. The flagship of this fleet is the *Stolt Ludwigshafen*.

Breaking new ground

The low-water chemical tanker is the result of a successful partnership between BASF SE, Stolt Tankers, Mercurius Shipping Group, and a consortium comprising inland shipping research institute DST Duisberg, Technolog Services GmbH, and Agnos Consulting.

"In this project, we really wanted to rethink existing patterns and processes once more while breaking new ground, which is why we conducted very open planning and brainstorming for this ship and conceptualised with various experts from the shipbuilding industry," explains Dr Benoît Blank, head of bulk operations, BASF SE. "Different models were evaluated and in the next phase we then brought Stolt Shipping on board."

With 30-plus years of operational experience on the Rhine, Stolt Tankers has an enormous amount of technical expertise to not only create these types of ships, but to also operate them in the most optimal way, he notes.

The new inland tanker's unique design has been hydrodynamically optimised through model tests at DST. To achieve a high load-bearing capacity, the dimensions of the vessel are 135m in length by 17.5m in width, considerably larger than its peers on the Rhine, which typically measure 110m by 11.5m. To further optimise the cargo capacity the hull features "a special lightweight construction while ensuring high structural stability".

VAN DER VELDEN THREE-RUDDER SYSTEM. SOURCE: DMC

The vessel is powered by three electric motors which are fed by the latest generation of highly efficient Stage-V diesel generators with exhaust gas aftertreatment. These engines enable high efficiency and provide an optimised environmental footprint, leading to a reduction of CO_2 emissions of around 30% and NOx emissions of around 70-80%, according to BASF SE. In the future the existing diesel generators will have the potential to be modified to allow the use of methanol as a fuel source or will be able to be replaced by other generator types (e.g. hydrogen fuel cells) once these technologies achieve market maturity.

The ship's three propellers have been optimised for shallow-water operation and normal water conditions – the outer propellers have a smaller diameter than the centre propeller which ensures additional thrust at normal water conditions – and the hull form is equipped with three manoeuvring systems. The outer systems consist of a Damen Marine Components (DMC) supplied Van der Velden three-rudder system with a Van der Velden FLEX Tunnel in front, both on the left and right. These flexible tunnels are integrated into the hull and can be deployed and retracted at any time. When deployed they optimise the water flow to the propellers. If the water depth is sufficient the tunnels are superfluous and can be retracted. The centre manoevring system has a single rudder to improve course stability. A total of seven rudders is said to be unique in the industry.

Stolt Ludwigshafen is equipped with 10 stainless steel tanks and three separate loading systems for maximum flexibility with respect to chemical products to be transported – it can also be used for products with high density, such as acids and alkalis.

Navigating the Kaub chokepoint

The ship's design allows it to pass the critical chokepoint in the Rhine near Kaub, the shallowest part of the river, with a cargo payload of 800tonnes even at a gauge level of 30cm (corresponding to a water depth of 1.6m). At moderately low water levels (e.g. Kaub gauge of 100cm), its loading capacity of around 2,300tonnes is twice that of conventional inland vessels. Overall, the *Stolt Ludwigshafen* features a maximum loading capacity of 5,100tonnes.

The hull of *Stolt Ludwigshafen* was manufactured by Mercurius Shipping Group in Yangzhou, China. It was then transported late last year to Den Breejen Shipyard in Rotterdam, the Netherlands, for the outfitting of the ship to be completed. The vessel has been successfully navigating the Rhine since April 2023, initially as part of test runs and more recently as part of the regular traffic. It is one of the largest vessels to have ever navigated the Rhine, says BASF SE.

"With this project, we have shown what is possible... that we were able to go into developing our own ship design," notes Blink. "This makes the project stand out, and we also see that this initiative has fuelled other developments in the market with other shipping companies."

"We have set a new standard with the *Stolt Ludwigshaften*," adds Liebelt. "Together with our partners, we have succeeded in developing a completely new type of ship." ■

GAME-CHANGING REFINERIES POISED TO RESHAPE THE TANKER MARKET

By **Anshika Prajapati**, research analyst, Drewry Maritime Research

The ongoing global push for decarbonisation, switch towards cleaner fuel, expanding fleet of EVs and rising fuel efficiency of vehicles are likely to decelerate the oil demand in the coming years, hampering the prospects of growth in the tanker market. Moreover, the upcoming oil refineries in key crude oil-producing countries will hurt the oil trade, squeezing tonne-mile demand for oil tankers. Mexico's Olmeca oil refinery, which is scheduled to run at full capacity (340,000bpd) by the end of 2023 and Nigeria's long-awaited Dangote refinery will be the main game changers for the tanker market in the short term.

Despite being major crude oil producers and exporters, Mexico and Nigeria rely on refined products imports to meet their demand. However, the commencement of these new refineries will reduce their dependence on imports, hurting the tonnage demand for product tankers. At the same time, increased domestic crude demand and a corresponding decline in crude exports from these two countries will squeeze tonne-mile demand.

Impact on crude tanker market

Mexico exports crude oil and imports refined products as domestic refinery runs are insufficient to meet local demand. As the Olemca refinery will now consume the domestic crude oil, Mexico's crude exports, especially to its biggest partner, the US, will decline. Most Mexican crude oil moves to the US on medium-sized Aframax tankers and only a minor share of Panamax vessels. Assuming the round voyage of Aframax tankers from the Port of Coatzacoalcos to Houston sailing at 13knots per hour, the higher domestic refinery runs will wipe out the demand by at least six Aframaxes in a year.

Meanwhile, Nigeria – the largest crude oil exporter in West Africa – caters to European and Asian crude oil demand. As Nigerian National Petroleum Corporation (NNPC) imports refined products from Europe through swap deals in exchange for crude oil, the start of Dangote refinery this October will dent the Nigeria-Europe crude trade.

Suezmaxes will be the most affected as these vessels are used to ship Nigerian crude to Europe. If we assume a round trip from the Port of Bony (Nigeria) to Rotterdam (TD20) with 13knots per hour speed, the demand for around 25 Suezmaxes per year will be reduced as the mega refinery in Nigeria comes online.

Impact on the product tanker market

The two new refineries will reduce the dependence on imports, hurting tonnage demand in the product tanker market. In the case of Mexico's Olmeca oil refinery, which plans to produce about 290,000 barrels a day of road transportation fuels (170,000bpd of gasoline and 120,000bpd diesel), will cut the imports by half. As the US is the main supplier of refined products to Mexico, exporting around 600,000bpd of clean products, we expect the domestic capacity expansion to squeeze Mexican imports. Moreover, new coker units in Tula and Salina Cruz, which convert residual oil into light distillation products, are expected to come online by 2024, further reducing CPP imports by the North American country. On the other hand, US refiners will have to reduce the throughput by the equivalent amount if assumed ceteris paribus condition. While the distances for this trade are not quite long, losing such a big volume will still have a noticeable impact on MR tanker demand.

Dangote refinery, on the other hand, will start operating in phases from around 350,000bpd in October 2023 to its full capacity of 650,000bpd by mid-2024. The plant will produce 327,000bpd of gasoline, 244,000bpd of diesel and 56,000bpd of jet fuel when it runs at full capacity. The giant refinery will not only wipe out Nigeria's refined products imports, but it will also reduce imports of other West African countries from Europe as Nigeria will be in a net surplus of diesel and jet fuel.

When assessing the repercussions of this diminished trade activity on MR tankers, those frequently plying the Europe to West Africa route it becomes evident that there would be a reduction of more than 60 MR vessels in a year once the refinery reaches its full operational capacity. This shift in demand has the potential to significantly disrupt the product tanker market. However, there will be a slight increase in intra-Africa trade.

In short, the tanker market is poised for significant transformation as refineries ramp up their operations to full capacity, squeezing tonnage demand. Countries that have lost their primary buyers may experience lower refinery runs, putting pressure on the tanker market. ■

SIGNIFICANT DISRUPTION IN MR TANKER DEMAND CAN BE EXPECTED. SOURCE: SHUTTERSTOCK

OFFSHORE

SEAONICS' ECMC CRANE AND GANGWAY BRINGS NEW CHARGE TO ACTIVE HEAVE COMPENSATION

By **Richard Halfhide**

Electrification of the offshore sector has been steadily advancing for a number of years. In June this year, Norwegian owner REM Purus took delivery of the Vard-built 85m diesel-electric/battery hybrid CSOV *REM Power*, the first vessel to be equipped with Kongsberg Rim azimuth propellers as main propulsion.

But arguably the vessel's most striking innovation is to be found above decks. Developed by Vard subsidiary Seaonics and originally announced last year, the telescopic Electric Controlled Motion Compensated (ECMC) crane is the world's first fully-electric 3D compensated active heave crane.

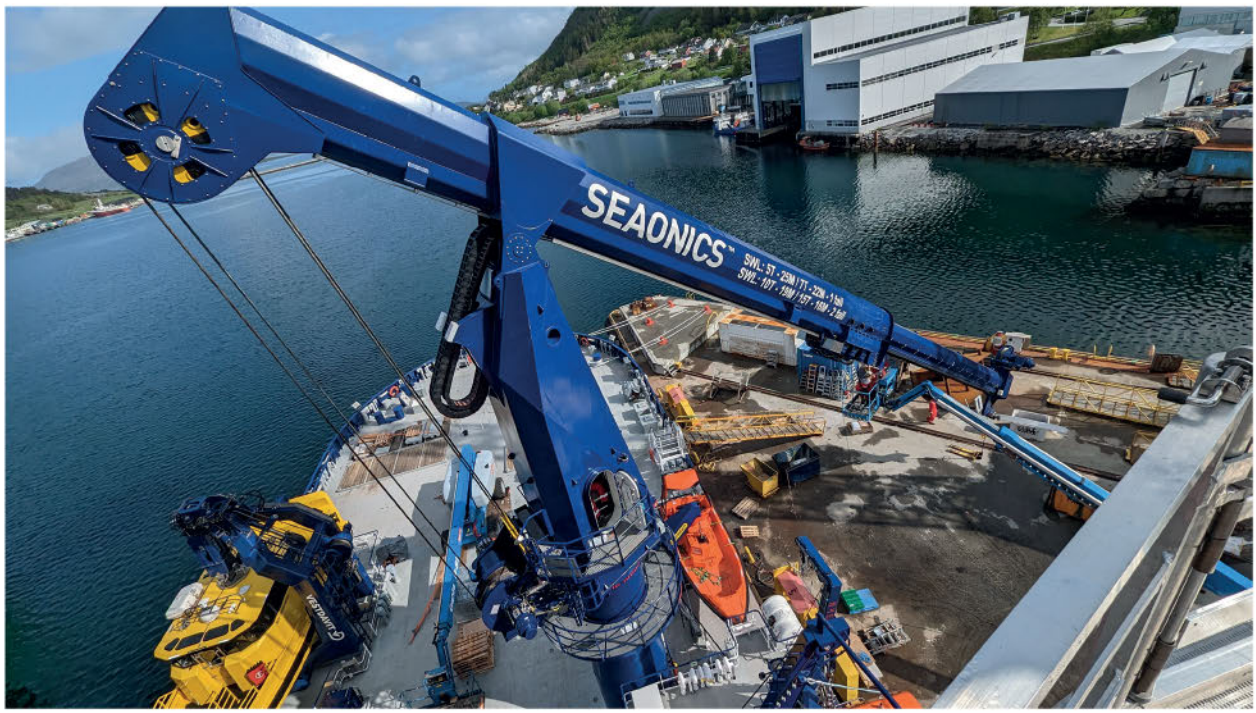
Although utilising Seaonics' active heave compensation (AHC) control system it's in essence a reimagining of its earlier hydraulic AHC crane, offering greater responsiveness and entirely negating the risk of a polluting oil spill. A ECMC telescopic gangway – utilising Seaonics' proprietary solution for achieving active motion compensation control of an articulated gangway using signals from a Motion Reference Unit – has also been launched.

Tom Jørann Giske, SEAONICS' senior systems engineer and product manager for the ECMC crane and gangway, says the crane, which has a capacity of 5tonnes at 25m in 3D compensated mode, has been designed with everyday SOV use in mind.

He explains: "A lot of the operation that's done in these vessels' daily life is cargo that's less than a tonne. We really wanted to make a crane that's effective in operation on deck and towards the TP [transition piece]. With the way that we do our motion compensation, it's the tip of the crane and the gangway that stand still during operation, then you rule out a lot of other issues. Other cranes achieve heave compensation with a winch but we didn't want to go to the market with a cascade of systems working together."

Stig Espeseth, SEAONICS' chief technology officer and also founder, adds that when they arrived at the telescopic solution it soon became clear that electric motors were the best means of simplifying the design.

He says: "We wanted to have the strength of the knuckle boom crane, which means getting close to the cargo when picking up, and we achieved



SEAONIC'S ECMC CRANE IS THE WORLD'S FIRST FULLY-ELECTRIC 3D COMPENSATED ACTIVE HEAVE CRANE

CSOV *REM POWER* WAS THE FIRST VESSEL TO HAVE THE NEW CRANE INSTALLED

this by rearranging the telescope and making new arrangements. It was obvious to us it was a good solution and that was also the comment from our customers when we started presenting this to them."

Outperforms hydraulic

Given the difficult sea states in which motion compensated equipment is often required to operate it's critical to have a drive system that's responsive; even a low-cost electrical solution will outperform the top-shelf hydraulic options, delivering full torque from zero speed.

"By using electric drive solutions, which have closed-loop monitoring, we know from all our experience that it's reliable and gives us the action we want to have. In an operation it amps up the safety. When the vessel is so close to the structure, if you mess it up then you risk incidents and you really don't want that," says Giske.

A significant downside of hydraulic cranes is the lubricating oil, which can be anything up to 10,000litres for large cranes. Although the oil is contained at pressure, with monitoring to warn of any leakage, it only takes a few seconds to spill a lot of oil. An electric crane has no such requirements and therefore negates the risk of pollution.

That's not to say there aren't some challenges with electric cranes. Giske notes that more space is required to accommodate the various drive units with an electrical system, while Espeseth adds that – as with the early days of developing active heave compensation and gangways – they needed to work closely once again with class societies to establish the rules and regulations and matters such as manual and automatic overload protection systems.

But like past innovations, such as feeding surplus power from the crane back into the vessel's electrical grid, what may once have been greeted with scepticism could eventually become commonplace. What can be said with confidence is that the ECMC crane translates into significant fuel savings; approximately 100-200tonnes per vessel per year.

So far Seaonics has signed contracts for six ECMC cranes, with the two delivered so far both going to REM Purus. Giske says the latter's faith in them, as well as that of Vard, has been vital to the project's success: "Just the fact that they really believed in how we wanted to simplify this operation. Simply looking at the crane it's not easy to understand how it's achieving this complexity in an operation that's moving. With our competitors you would see a lot more equipment but I think that's our strength."

Long history

Although founded 12 years ago, Seaonics' origins actually date back to the formative years of the offshore wind segment in the early 2000s. In 2004, Danish engineering company Vestas, which was building the seminal Horns Rev wind farm in the North Sea, was contracted by Norwegian shipowner Fredrik Odfjell to supply a small catamaran, *FOB Junior*, that would be used to service the turbines and to change the blades.

To assist him, Odfjell partnered with a small Ålesund-based company, ICD [Industrial Control Design] Projects AS, which developed the first 3D active heave compensated (AHC) work deck.

Stig Espeseth, who was ICD Projects' founder and managing director, is credited as one of the masterminds behind the technology and it established ICD as the go-to authority on AHC systems. ICD Projects was acquired by TTS Marine in 2007 and was the foundation for TTS Offhore Handling. In 2011 ICD jointly founded Seaonics with Norwegian shipbuilder Vard.

"We saw there were openings and changes in the market after 2008 and saw the possibility to take a position as a company with strong foundations in a large yard," says Espeseth. However, while Seaonics supports Vard to serve as a one-stop-shop for clients, much of its market lies elsewhere and the company operates independently.

The company's growth has been an organic process. In its early years the company focused heavily on supplying electric winches for fishery vessels, capitalising on the need for extensive fleet renewal programme at the time. Launch and recovery systems for offshore service and construction vessels – in which Vard had a large market

STIG ESPESETH, SEAONICS' FOUNDER AND CTO

TOM JØRANN GISKE, SEAONICS' SENIOR SYSTEMS ENGINEER

share – also proved a fruitful segment. From there it was a short stepping stone into developing other solutions, particularly as a means for extending the working window for vessel operations.

Seaonics prides itself on its design-centred approach to developing its solutions. Espeseth explains: "First we do the investigation where we talk with our customers and get an in-depth understanding of the customer needs, what kinds of operations they need to carry out and what equipment should be used and what conditions.

"Then we go into the definition stage where we define the customer needs and problems and get the visual description with illustrations. After that we have idea generation within the interdisciplinary team, and that is the main purpose for the concept solution team."

After that comes prototyping, where ideas are transformed into practical solutions, followed by factory-, harbour- and sea-acceptance trials (FAT, HAT and SAT). Although around 90 staff are based at the company's Norwegian offices, a further 70 work at facilities in Gdansk, Poland, where the company's electric switchboards and cabinets and control system units are also manufactured.

Espeseth comments: "We have focused on having outsourced the production model. We do the design of the equipment and the production drawings, and a follow-up team for our sub-suppliers, service and aftermarket. We have cooperation partners doing the steel production and the facilities for testing. Since the beginning we have focused a lot on using our simulation toolbox to ensure that the products are working correctly."

Through its wholly owned subsidiary CDP Technologies it created CDP Studio, the core platform for its software and control system development, which makes it possible to replicate the kinematics of different systems and then use the feedback from that to make further adjustments. Training simulators incorporate the crane or gangway's actual control system and then build the physical and virtual environment around that.

By Espeseth and Giske's own admission, Seaonics' equipment isn't always the cheapest, but does represent a competitive solution built to last the 20-30 years of a vessel's operational lifetime, which in turn reduces maintenance costs and improves sustainability.

"Yes, it is good to see that the customers that enabled us to develop innovative products a decade ago, are also the ones taking on our new ECMC products now. And it is fun to see that the first systems we delivered sometimes are sold to new customers. It's important for us to support these [second hand] customers and ensure these systems remain cost effective and profitable for them also," says Giske ■

EASTERN EUROPE

RUSSIAN SHIPYARDS FACE EFFECTS OF SANCTIONS AND SEARCH FOR ALTERNATIVE BUSINESS

By **Tom Barlow-Brown**

Even before the country's full-scale invasion of Ukraine in 2022 and the resulting western sanctions Russian shipyards were facing hard times. This has only been exacerbated further by a sharp decline in orders, parts and funds across the board.

The last available data on shipbuilding in Russia, published in the *Kommersant* newspaper, recorded a marginal decrease of 5% in 2021, equivalent to 246 billion roubles. The largest markets for Russian-built vessels were western Europe and South Korea. However, as a result of the war in Ukraine and the effect of sanctions shipyards have found themselves facing steep decline.

ZVEZDA SHIPYARD. SOURCE: ZVEZDA SSC

In 2022, 20% fewer vessels were produced in Russian shipyards than in the previous year. This is due to several other factors that have compounded the already dire economic situation, such as a lack of parts, and the withdrawal from cooperation agreements by nations such as South Korea. Company executives at Russian shipyards described this steep decline as the biggest crisis facing the industry since the fall of the Soviet Union in 1991.

Russia's top shipbuilder, United Shipbuilding Corporation (USC), built a total of 16 vessels and made a profit of 161 billion roubles in 2021 but in the following year only managed to produce four vessels. Company spokesmen stated that issues with the procurement of parts and a lack of foreign parts has become 'systemic.' In order to deal with the company's financial woes Russian president Vladimir Putin announced in summer 2023 that the state-owned VTB (VTBR.MM) bank was to manage the state's 100% stake in USC, effectively transferring control to the bank. "The decision will contribute to the long-term stabilisation of the financial condition of the largest state-owned shipbuilding holding" and "attract extra-budgetary funding" to "bring the corporation into profit", according to Russian Trade and Industry Minister Dennis Manturov.

The Russian government is also set to provide increased funding for the industry as a whole. In 2024 subsidies for the nation's shipbuilders are to increase by over US$68 million from US$122 million to approximately US$190 million. Salvation for the industry may also come in more specialist projects that are on order like icebreakers and ice-class vessels as Russia seeks to exploit the Northern Sea Route to ship goods to China.

Shipbuilding company Zvezda SSC has also continued to produce vessels, albeit at a much lower volume than before. In January 2022 the company launched the 114,000dwt oil tanker *Vladimir Vinogradov*, the second in a series of 10 LNG-powered Aframax tankers for energy company Rosnefteflot. Russia's Sovcomflot also ordered two tankers, both of which were launched in 2023.

The first vessel is designed to transport oil and is capable of independently navigating without an icebreaker support in the Arctic circle as is equipped with a bow-loading device to receive oil directly from a floating storage and production offloading vessel. The second vessel is designed to carry LNG and was named after the Soviet politician and statesman Alexei Kosygin. Zvezda claims the ice-class LNG carriers ARC 7 are designed to operate in ice up to 2m thick.

The 250m-long and 44m-wide vessels were being built in cooperaton with Hyundai Samho Heavy Industries and were due to feature WinGD LNG propulsion. However, it is unclear if this is still the case, due to the effects of sanctions.

Russia is also seeking new trade deals with India in a joint venture involving maintenance and shipbuilding in the Caspian Sea. The Indian ambassador to Russia, Pawan Kapur, has stated that the two nations are "working on an intergovernmental agreement on shipbuilding and ship repair". The deal, if finalised, would also involve USC which owns the Lotos Shipyard on the Volga, the Astrakhan Shipbuilding Production Association, the Third International Shipyard, and the Red Barricades shipyard. These would all be merged to form a single industrial complex.

As a result of these new investments, it is possible that Russian shipbuilding will recover somewhat from losses sustained over the last two years. Yet it remains to be seen if new investments will bear fruit in the coming year. ■

RO-PAX ORDERS ENRICH POLISH BALTIC SHIPPING FLEET

By **Tom Barlow-Brown**

Poland's largest shipping operator Polska Żegluga Bałtycka, or PolFerries, is due to expand its capacity for passenger and cargo operations in the Baltic Sea. The company has signed new contracts for several new vessels from a number of international and local shipyards.

In August the company signed a contract for the 10-year charter of a new ferry built by the Italian Visentini shipyard. The vessel will be operated by PolFerries but remain formally owned by Visentini. PolFerries will equip and crew the vessel which the company is obliged to keep on the Świnoujście-Ystad route for five years.

The new vessel, which has not yet been named, will have around 3km of loading line allowing it to carry over 100 trucks and 200 passenger cars, making it the largest vessel operated by PolFerries to date. It will be able to carry a total of 920 passengers and a 60-person crew. The ferry has has a bow and stern designed to reduce hull resistance by approximately 13% compared to the previous series of ferries built by Visentini from 2016-2019.

Loading of the vessel has also been simplified as well as the hydraulic and electrical systems, which will reduce overall operational costs. The ship will be powered by energy and a conventional propulsion system without azimuthal thrusters. This is also designed to keep costs low during docking and during the installation of the vessel's systems.

PolFerries has also signed a contract with Polish shipbuilder Polski Promy for the construction of one of three ro-pax vessels currently under construction at the Gdańsk Remontowa Shipyard. The two other vessels from the same order will be operated by Unity Line. The three vessels on order will be mainly used to carry freight and will have a 4,000lane-metre capacity and smaller space for passengers. The vessels will all be powered by LNG.

The company has is focusing taking delivery of the new vessels for 2024, one of which will possible serve the Gdańsk-Nynäshamn from Ystad. PolFerries plans to sell its older vessels in its fleet as it continues to modernise. ■

ECO SHIP TECHNOLOGY

COMPOSITE FUEL STORAGE SOLUTION COULD BE THE ANSWER FOR METHANOL RETROFITS

By **Richard Halfhide**

Whether or not methanol should prove to be the winner (or one of them) in the great rush towards cleaner fuels is one of many questions unlikely to become apparent for a number of years yet. What is clear is that many shipowners are already prepared to hedge their bets. Over the summer Maersk, whose pro-CH_3OH stance has been abundantly clear from its newbuilding programme, announced that it was in discussions with potential shipyards about converting an in-service container ship for dual-fuel capability.

Not wanting to be left out, rival boxship operators Seaspan and Hapag-Lloyd were also revealed to be in discussions with MAN Energy Solutions about converting a combined 15 engines to methanol capability, with an option for a further combined 45. According to market analyst Clarksons some 1,200 ships could be methanol powered by the end of the decade.

But there's a problem. As a low flashpoint fuel methanol is subject to the more stringent fire precautions of the IGF Code, in particular the installation of cofferdams of up to 600mm thickness to mitigate the spread of any conflagration. Given that methanol's lower energy density – less than half that of HFO – already necessitates carrying significantly more fuel, the resultant loss of further fuel storage space begins to create a challenge.

Methanol Superstorage

But a solution could be at hand according to SRC Group, an engineering, procurement, construction and installation supplier headquartered in Estonia but with offices across Europe, the US and Asia with a strong emphasis on refits. Currently in a scale-up phase the company offers knowledge-related services and innovative solutions to a variety of high-profile clients in maritime and offshore, among them Carnival Corporation, Maersk Supply Services and ABB.

SRC Group recently received approval in principle (AiP) from Lloyd's Register (LR) for Methanol Superstorage, which negates the cofferdam obstacle by instead constructing tank walls made of composite Sandwich Plate System (SPS) technology. According to SRC, its solution can boost methanol storage volume by as much as 85% and be retrofitted with minimal impact to a ship's general arrangement.

Esa Häkkinen, SRC's head of design, says the story of Methanol Superstorage's development began in the middle of last year while conducting a feasibility study for a major cruise operator. He explains: "We've been working together for more than 15 years with SPS Technologies, a producer of sandwich panels that are normally used for ship repairs, vibration dampening and additional impact strength.

"We started to investigate if that same SPS technology could be utilised in methanol storage tanks so we can get rid of the cofferdams which is the main challenge with refits. Newbuildings are a different matter because you can accommodate within the general arrangement with existing regulations."

SPS is already approved as a permanent repair method by most classification societies, having been subjected to extensive testing for fire and chemical resistance. The

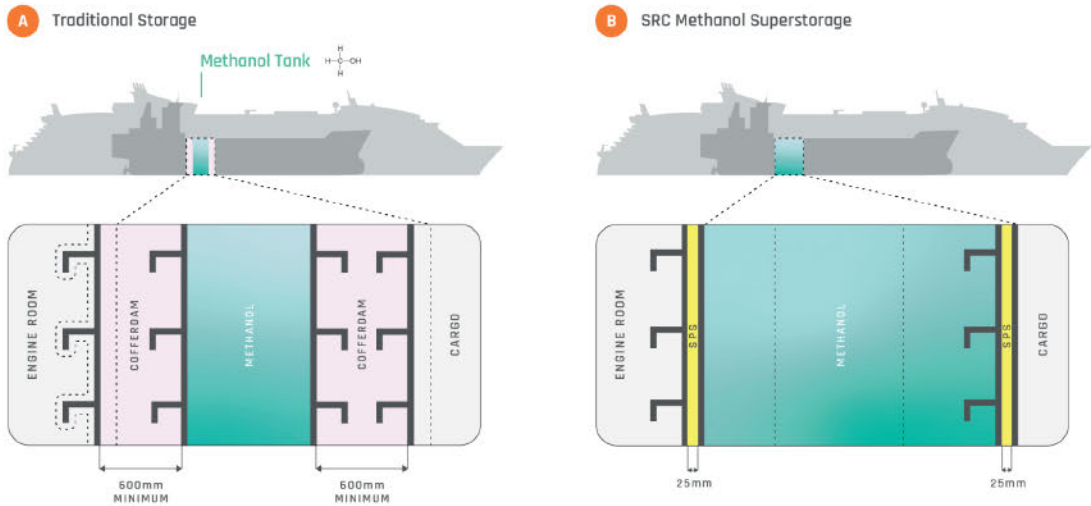


FIGURE 1: SRC'S METHANOL SUPERSTORAGE OFFERS SIGNIFICANT FUEL CAPACITY GAINS COMPARED TO A COFFERDAM-BASED METHANOL RETROFIT

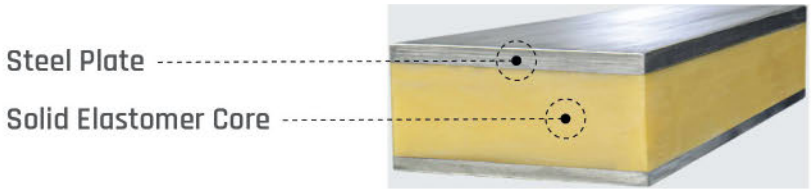


FIGURE 2: SPS TECHNOLOGY'S SANDWICH PLATE SYSTEM (SPS) IS A CLASS-APPROVED STRUCTURAL COMPOSITE SHIP BUILDING MATERIAL

investigation team first ensured that an SPS panel could meet the functional requirements for the proposed usage before contacting LR, which they had previously worked closely with in other applications of the composite. With LR's assistance SPS began the five-step risk-based certification process, limited specifically to the tank structures.

The first two steps – the designer safety statement and the risk assessment – were completed earlier this year, together with the preliminary appraisal of rules template. Based on these findings LR granted the AiP over the summer. Because SOLAS Chapter II-1 Part F defines a goal-based approach, with low-flashpoint fuels specifically referenced as suitable for alternative designs, there is scope for the solution within existing regulatory tools without the need for amendments.

Various shiptypes were assessed for their viability by doing comparison studies of what would happen if the HFO tanks were replaced by methanol ones using either cofferdams or Methanol Superstorage. SRC's solution proved particularly beneficial for passenger ships; cruise vessels gained in the region of 60-70% more volume, while ro-paxes gained 55-65%.

With regard to container ships the original example vessel achieved a 42% increase, although an arrangement where fuel tanks are positioned between the cargo base would yield gains closer to 60%.

Subsequent research found that vessels which already have a limited fuel capacity, such as supply ships and superyachts, also record significant improvements. In the case of bulk carriers and tankers retrofitting was generally not considered cost effective compared to simply ordering new vessels.

Cost benefits

In capex terms retrofitting with Methanol Superstorage compares favourably with a cofferdam arrangement, according to Hannes Lilp, SRC Group's chairman and CEO. "We're adding less steel weight and although we're adding this polymer in between instead the cost would be in a similar range. There are also opex benefits later on with maintenance and the inspection needs for cofferdams," he says.

Häkkinen adds: "The sandwich arrangement is lighter, weight wise, and quite light in density. So we don't need to have additional stiffeners for the second plate or frames for the cofferdams. Retrofits will also require fewer modifications to arrangements and keep the functionality of the ship's cargo areas intact."

A similar solution could even be viable for other alternative fuels, with Häkkinen indicating that SRC is currently investigating the feasibility of its use to store ammonia. "There are challenges in applying it to ammonia, but we are exploring all the possibilities where an invention like this could be utilised in the future," he says.

The team is also keen to point out that the technology is by no means restricted to retrofits. "Although as a company we are mostly focused on retrofits it extends to newbuilds as well. Even the classification societies we've been in contact with don't see a competitive solution like it today," says Alex Vainokivi, SRC Group's innovation manager.

Lilp concludes that since the solution was announced at the beginning of October the levels of interest from potential clients in Methanol Superstorage has surpassed even what SRC had been anticipating.

"Every day our sales team is holding many meetings related to Methanol Superstorage, ranging from naval architects up to shipowners and builders from around the world including South Korea, China, Europe and America. We are seeing really big interest," he notes. ■

CANOPÉE WILL START COMMERCIAL TRANSATLANTIC OPERATIONS TOWARDS THE END OF 2023. © UNI PROD AYRO

NEW RO-RO USHERS IN THE WINDS OF CHANGE

By **Giorgio Provinciali**, CTO, AYRO, and former America's Cup Performance Predictions leader

The belated decision to implement a groundbreaking rigid two-elements mainsail solution on the BMW Oracle Racing Americas Cup 2010 trimaran has emerged as the pivotal moment in the creation of a new ship poised to significantly reduce its environmental footprint. The French ro-ro cargo vessel *Canopée* was designed from the ground up to use an industrial version of the same wing sail design principle and when it starts commercial operations on its fixed transatlantic course towards the end of 2023, it will use 30% less fuel and produce 30% less greenhouse gas (GHG) emissions than a standard vessel without wind-assisted propulsion on the same route.

Owned by Jifmar and operated by Alizés, a joint-venture between Jifmar and Zéphyr & Borée, the *Canopée* will soon become the world's first fully operational commercial ship with wind-assisted propulsion. Created to carry Ariane 6 rocket components for ArianeGroup from Europe to the launch site in French Guiana, *Canopée* was built by Neptune Marine in the Netherlands, with the initial design by French naval architects VPLP Design, whose founder Marc Van Peteghem was one of the driving forces behind the use of a wing sail on BMW Oracle Racing's boat 13 years ago.

Based on this experience, Marc began to think about how to transpose this high-performance wind energy harvesting system to commercial vessels, with the aim of reducing their fuel consumption and therefore their GHG emissions. He co-founded AYRO in 2018 to realise this ambition and the result was OceanWings, a unique and highly efficient wing sail solution to address the climate challenges faced by the maritime sector, especially as regulatory constraints are increasing to speed up green transition in the industry.

Designed from the ground up

The overriding objective of building the *Canopée* around the use of four OceanWings 363 wingsails was to maximise fuel savings and minimise carbon emissions. While OceanWings can be retrofitted, there are advantages of a ship being designed from the ground up to accommodate wind propulsion. For instance, it made the decision to place the wheelhouse at the front of the ship easy, as this ensures that visibility would not be impacted by the wingsails. The designers were also able to optimise the hull while considering the ideal position of the wings to unlock the best performance under sail.

The OceanWings 363 on the *Canopée* are new generation technology based on the design and long-term testing of smaller scale wing sails installed as an industrial demonstrator on a zero-emission catamaran, called *Energy Observer*, which has already undertaken an extensive global voyage spanning over two and a half years, sailing tens of thousands of nautical miles and facilitating the accumulation of a substantial amount of empirical data. This data played a pivotal role in enhancing the accuracy of AYRO's computational fluid dynamics (CFD) modelling techniques, particularly in evaluating the performance of the wing sail systems against the backdrop of real-world data acquired during their deployment on the *Energy Observer*.

Collaborating closely with Jifmar Offshore Services, the team at VPLP Design meticulously scrutinised the vessel's behaviour. Their objectives extended beyond merely determining the optimal wing positions; they ventured into the forefront of CFD advancements, encompassing the intricate modelling of the complex interaction between multiple OceanWings. Assessing the performance of a single wing sail or rotor on a vessel contrasts with evaluating the performance of a more complex configuration involving four to six such wingsails, the latter likely to be the configuration seen on more vessels as the use of wind power grows. Data from the *Energy Observer* and subsequent work also contributed to the improvement of the control algorithms governing automation of the wingsails.

Automatic adjustments in real time

The number of wingsails installed on a vessel depends on several factors, including its general structure, the nature of its activity, performance targets in terms of fuel savings, and the shipowner's budgetary constraints. The OceanWings 363 on the *Canopée* are 11m wide and 37m high, with a surface projected area of 363m^2 (hence the model designation). They can operate at apparent wind speeds of up to 70knots and are designed to withstand wind speeds of over 100knots. The structure, which is made of composites materials and steel, has an estimated lifetime of 25 years while the membranes, made from flexible polyester with PVC coating, are expected to last up to 10 years.

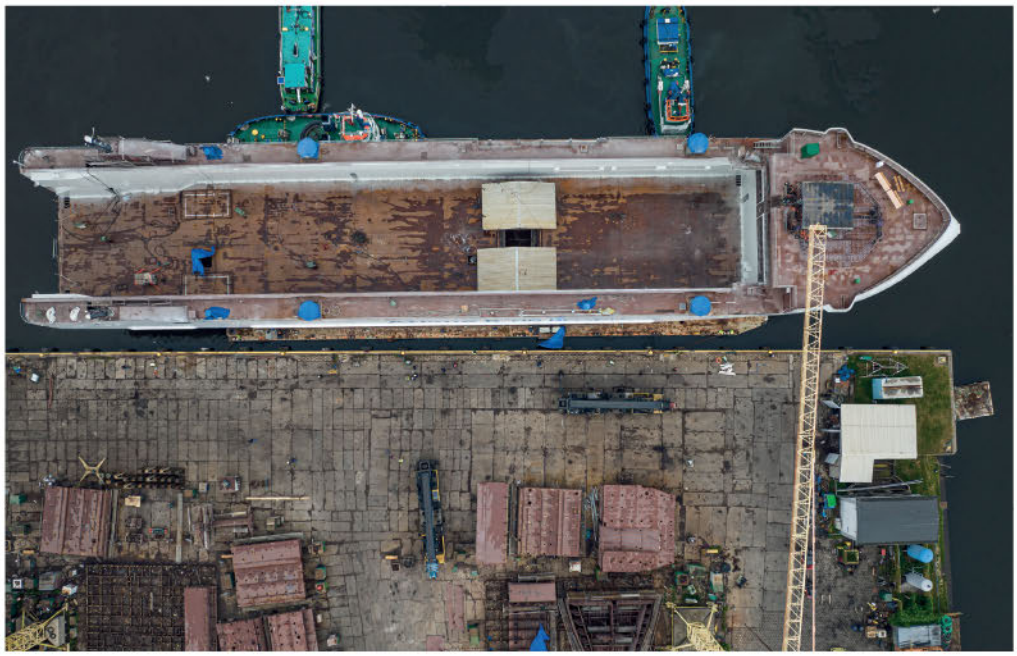
The technical characteristics that position rigid two-element wing sails as ideal for high performance racing yachts – all America's Cup entrants have used the same or similar designs since 2010 – also make them perfectly suited for use on commercial ships of any size. Built for generating the most power possible, OceanWings are composed of a main mast and a secondary mast, with two primary adjustments: (a) rotation of the main mast by 360 degrees thus adapting the angle of incidence of the wingsails with respect to the wind and (b) a rotation of the secondary mast bringing the appropriate camber to the system for optimum aerodynamic efficiency and maximum power.

The interaction of the main and secondary wing elements combine to deliver high performance across a wide range of weather conditions. A slot between the two elements allows the air to flow from side to side, which accelerates the flow at the extrados of the wing, i.e. its leeward part. This principle is inspired by the way aircraft wings operate. Through this unique architecture, OceanWings generate far more power per unit area than conventional sails or single element wing sails.

While complex yet elegant in design and execution, the OceanWings on the *Canopée* can be operated with only minimal human intervention. To adjust the trim to the local weather conditions, sensors on the wing sails measure the wind direction, and speed as well as all other relevant parameters such as ship motions in real-time. This data is streamed to an onboard computer equipped with the AIUTO algorithm developed by AYRO, which controls electric actuators on the wingsails to adjust the angle of incidence and camber in real time.

These adjustments make it possible to optimise the aerodynamic thrust of the wingsails to maximise the efficiency and propulsion of the vessel. One of the key aerodynamic characteristics of the wing sail is the ability to provide propulsion even at narrow apparent wind angles. This is critical for ships already travelling at speed, where apparent wind, as opposed to true wind, becomes most important. The wing sails on the *Canopée* deliver thrust at apparent wind angles as low as five degrees, which makes it able to cope with 95% of weather conditions at sea.

The entire process is automated, with crew interaction needed only for monitoring and oversight. The system also addresses the problem of additional drag caused by the wingsails when not operational, with the ability to enter flag mode automatically and immediately, so



CONSTRUCTING *CANOPÉE*. © JIFMAR GROUP LIBRARY

THE OCEANWINGS 363 ON THE RO-RO ARE 11M WIDE AND 37M HIGH. © JIFMAR GROUP LIBRARY/MADFLY – Y. DERENNE

the wingsails have very small impact on the vessel and enable safe operations and sailing in all conditions.

Unlocking wind power for diverse vessels

The AYRO OceanWings system is certainly not the only wind propulsion solution, but its automation and two-element design positions it as one of, if not the most technologically advanced. The wings are by far the lightest in terms of absolute weight in the industry as most, if not all other solutions are based on complex and heavy steel structures that weigh circa three times more than an AYRO wing sail. This has important operational implications for shipbuilders because it means less constraints on the vessel.

As a 121m-long purpose designed ro-ro transport vessel, the *Canopée* is clearly well suited to accommodating 37m-tall wingsails, but it's clear that other vessel types have completely different operations than a ro-ro. AYRO is working on innovative new mechanisms that will allow the wingsails to be tilted or lowered into the superstructure to allow loading and unloading or navigating under bridges.

The Trade Wings 2500 is a revolutionary concept in 2,500TEU container ships. With a length of 197m and a beam of 32m, this trans-Atlantic vessel is designed to transport containers between secondary ports in Europe and ports in the Caribbean, Central America and China. A system based on six OceanWings 363 wingsails demonstrates the feasibility and practical potential of wind propulsion on this type of vessel. The system is mounted on a vertical sliding mechanism so that the wingsails can be retracted while the vessel is in port to avoid impacting cargo operations.

OceanWings will contribute up to 35% of a 57% total reduction of CO_2 emissions, with the remainder coming from LNG propulsion. Designed in cooperation with Alwena Shipping (France), SDARI (China) and VPLP Design (France), the Trade Wings 2500 preliminary design received approval in principle from Bureau Veritas in spring 2021.

Further, the Whisper project, announced in January 2023, is a collaborative initiative involving a European consortium of 14 partners. The aim of this project is to adapt the OceanWings technology to bulk carriers by adding an automated tilting system for loading and unloading, and to allow the vessel to pass under bridges. Consortium member Ant. Topic has been selected to host the installation of the wingsails on one of its vessels. The integration of this technology on a bulk carrier will demonstrate the effectiveness of AYRO's technology and its potential for wider adoption in the shipping industry.

This project is part of a wider drive by the European Union to promote innovation and the development of green technologies in the maritime sector, to reduce the environmental impact of the industry and encourage the transition to more sustainable shipping.

Matching this vision for green shipping, AYRO continues to innovate and adapt OceanWings technology to meet the specific needs of diverse ships. With the advantage of being fully automated and lowerable, OceanWings are showing how wind and conventional propulsion can be combined safely and effectively. AYRO's wingsails offer some of the highest aerodynamic performance in the sector, with modelling showing that up to 50% reductions on fuel and greenhouse gas emissions will be possible.

Considering that maritime transport is responsible for 3% to 4% of global CO_2 emissions, amounting to more than one billion tonnes of CO_2 per year, the shipping industry needs the kind of performance OceanWings offer if it is to succeed on its road to decarbonisation in the decades to come. The approach has plenty of validation, with AYRO announcing the closing of a €19.2 million (US$21 million) Series B round at the end of September 2023. Led by Blue Ocean and managed by SWEN Capital Partners, the latest investment brings the total funding for AYRO's work to help the maritime sector reduce its carbon output to more than €30 million. ■

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FERRIES

RO-PAX FERRIES CHALLENGE CRUISE FERRIES ON THEIR HOME TURF, IN THEIR OWN GAME

By **Kari Reinikainen**, Correspondent

This year marks the 30th anniversary of the introduction of the first ferry to become often referred to as a ro-pax – the *Majestic* of Grandi Navi Veloci. While the ship and its numerous sister ships featured high-quality passenger accommodation, ro-paxes soon became regarded mainly as ferry companies' response to budget airlines, providing a no-frills experience on board modern ships.

This contrasted sharply with cruise ferries that feature extensive passenger facilities, multiple dining options and high-quality cabins. On ro-paxes, the focus was on transport – of passengers, but of freight in particular: a ro-pax could carry 1,000 passengers and have 2,000lane-metres for freight. On a cruise ferry, the figures would roughly be reversed.

Three decades later, the picture has changed a lot and while these ships still have large freight capacity, many now feature very high-quality passenger accommodation, and some have features such as spas that would normally be expected to be found on high end of the market cruise ferries. Still, the passenger capacity of these ships remains low compared to cruise ferries.

However, ro-paxes are much cheaper to build than cruise ferries: the 68,460gt *Finnsirius* of Finnlines delivered earlier this year has a price tag of US$135 million, or US$1,972 per gross ton. In comparison, Viking Line's two-year-old, 65,211gt cruise ferry *Viking Glory* cost €194 million (US$205 million) or €2,974 (US$3,146) per gross ton. The Viking Line ship has accommodation for 2,800 passengers, all berthed, while the Finnlines vessel has a capacity of 1,100. Both ships operate between Finland and Sweden and were built in China.

An industry source *The Naval Architect* spoke to pointed out that Chinese yards that build passenger vessels do not have the same infrastructure of suppliers and contractors as European yards that specialise in ferries and cruise ships. Consequently, the Chinese builders may end up making a loss with at least some of their passenger ship contracts.

High-quality facilities needed in competition against airlines

"If ferry companies want to successfully compete with the airlines, the only way they can do this is to offer a type of transport that is actually part of the holiday," according to Finn Wollesen, managing director of the Danish consultant naval architect firm Knud E. Hansen. This echoes a slogan of Cunard Line from the 1950s – 'Getting there is half the fun' – and it resonates with today's travel market as well: Wollesen says several ferry company executives have made the same point in his conversations with them.

In practice, this means that ferries need to offer good quality facilities, such as bars and a choice of restaurants, but also amenities like a gym and a spa, various kinds of entertainment, plus activities. As passengers also work while aboard, it is essential that there is a right environment on board to cater for this as well. Access to the internet is a must for those who work while on board,

VIKING LINE'S CRUISE FERRY *VIKING GLORY*. SOURCE: VIKING LINE

FINN WOLLESEN OF KNUD E. HANSEN. SOURCE: KNUD E. HANSEN

OSK SHIP TECH'S ANDERS ORGAARD. SOURCE: OSK SHIP TECH

but it is also an important feature for passengers from other segments of the market.

On longer crossings, good quality cabins are an important element of the package. However, as ferry trips mostly only take one or two nights, cabins on these vessels do not need to be as large and luxurious as on cruise ships. While on the latter ship type people often spend quite a lot of time in their cabin, which has evolved into much more than just a place to sleep, on board ferries most passengers prefer to use the public rooms for lounging rather than their cabin.

Private facilities in cabins have been part of the demand list of ferry passengers for many years and these are also provided. However, on some routes some passengers prefer to spend the night in an aircraft-type seat. Access to the internet and charging points for electronic devices should be available in the reclining seat areas as well.

Wollesen says that in his opinion there could be exciting prospects for reviving overnight ferry services in e.g. the North Sea, where many of them were gradually closed after the disappearance of duty free sales in intra-EU trades in 1997. Ageing fleets also contributed to the demise of many of these services. "Many people fly from Denmark to Amsterdam – it only takes about one hour – and then take the DFDS ferry to Newcastle. There they go to watch football, enjoy the night life, or do shopping, before taking the ferry back and then flying home," he tells *The Naval Architect*.

Scalability needed to adapt for seasonality of demand

Anders Orgaard, chief commercial officer at OSK Ship Tech, also in Denmark, agrees. Although there are differences between e.g. the Mediterranean and the Baltic markets

in terms of details, ferries must provide good-quality experience and facilities to their passengers, he notes. "Food and the cabin are the main elements of this and there is growing attention to cost-efficient operations as well," he tells *The Naval Architect*.

Scalability of the operations is gathering attention from ferry companies. In practice, this means that it should be possible to shut down some parts of the public areas in shoulder seasons when passenger volumes are low. This reduces operating costs as staffing levels on board can be reduced as a result.

However, this should not happen at the expense of passenger experience – a bar and a restaurant, for example, should be open on board even during low season operations, Orgaard points out. "In the design of ferries, the focus has shifted to the business case as a whole, from focusing just on how to maximise revenue during the peak season," he says.

Johanna Boijer-Svahnstrom, head of corporate communications at Viking Line in Mariehamn, Finland, says that energy efficiency, flexibility, hybrid fuels and interesting concepts for the passengers are the key factors that would determine what kind of ferries will be used in the Baltic in the late 2020s and early 2030s.

Spa services and well-being in focus

"People have been travelling with our vessels since 1959. They will keep on travelling. Destinations will sell better as well as onboard concepts – spa, well-being, good restaurants, comfortable cabins, interesting shopping," she tells *The Naval Architect*.

"Our business model is to combine freight with route passengers, cruise passengers, conference passengers and cars. To optimise all legs is important for us. The groups may vary depending on week days," Boijer-Svahnstrom says, adding that passengers from outside the northern European region are a growing part of Viking Line's business. Many of these use the company's ships to visit Helsinki, Tallinn and Stockholm.

Viking Glory has more focus on spa and well-being than its running mate, the 2013-built *Viking Grace*: its design is focused more on entertainment on board. The Finnlines ro-paxes also have extensive spa areas on board.

SPA FACILITIES ON FINNLINES' RO-PAX *FINNSIRIUS*. SOURCE: FINNLINES

CAPTAIN TARVI-CARLOS TUULIK OF TALLINK. SOURCE: AS TALLINK GRUPP

Cost of green technology to affect quality of facilities on future ships

Tallink's chief captain and head of ship management, Captain Tarvi-Carlos Tuulik, says that most probably existing ferries will continue in the traffic with small modifications and mostly already existing fuels until early 2030s, after which the industry could expect new carbon-free technologies to have been tested and declared safe for use on board passenger ships.

The Estonian company operates both cruise ferries and ro-pax vessels on its services in the northern Baltic. As far as the future is concerned, Tuulik thinks technology will largely dictate what kinds of ships will be used.

"If it's the case that the green energy technology is massive and expensive, there will probably be a need for smaller and lighter vessels with less comfort. However, if the green technology is smart and light, the current well-accepted standards can be preserved for passengers on board the next generation of the Baltic Sea cruise ferries," he says.

Both freight and passengers will remain important at least for the foreseeable future as ferries remain one of the most sustainable modes of transport for moving cargo and passengers at the same time. Asked if cruise ferries would be viable from the newbuilding cost point of view in the future, Tuulik says: "Only time will tell, but we very much hope that the cruise ferries will also remain on the Baltic Sea."

It would seem that from a passenger point of view, convergence is taking place between cruise ferries and ro-paxes. Instead of being rather basic vessels with just a transport function in mind, ro-pax facilities are becoming more varied and also very well designed. The numerous E-Flexer type ro-paxes that Stena is building in China for its own use and for long-term charter to third parties and the 69,500gt *Moby Fantasy* which has recently entered service in the Mediterranean are good examples of this development. ■

FERRY COMPANIES GRAPPLE WITH RISING THREAT OF EV FIRES AT SEA

By **Tom Barlow-Brown**

Electrical vehicle (EV) fires have been an increasingly concerning topic for shipping companies of late. Since a spate of high-profile incidents from 2020 onwards – culminating in the *Fremantle Highway* fire in July 2023 – unease has been growing about whether current safety precautions are adequate.

Ferry companies, which carry both large and varied numbers of vehicles and a multitude of passengers, could be particularly at risk from fires breaking out onboard. This is likely to grow as more and more EVs, powered by lithium-ion batteries, are adopted for private and commercial use. The large numbers of passengers carried on ferry routes also present additional safety concerns not found on ro-ro vessels.

In 2023 several fires took place on large ro-ro vessels carrying sizable quantities of EVs. The most recent of these, onboard the *Fremantle Highway*, led to the death of one crew member and gutted the vessel. While it has not yet been fully ascertained whether an EV was the primary cause of the fire, the number of vehicles transported has led many to draw this conclusion. The *Fremantle Highway* fire follows several other cases. Some of these, such as the fire onboard the *Felicity Ace*, led to the total loss of the vessel when it sank off the coast of the Azores.

Complicating matters further is the fact that supplementary safety guidance released can be contradictory. A recent study from the International Association of Marine Insurers (IUMI) concluded that on ro-pax vessels passengers may want to charge their vehicles onboard and this should be permitted subject to relevant risk assessments and control measures. According to the study, this is because built-in safety mechanisms are usually activated during charging. Despite this, operators such as DFDS and Brittany Ferries have recently banned the charging of EVs onboard.

A proactive approach

Both DFDS and Brittany Ferries are companies who are taking proactive steps ensure they are providing for the safety of passenger and crew onboard vessels. The latter has a dedicated training and firefighting centre in St Malo, Brittany, which has served as the hub for its own research, firefighting training and firefighting exercises.

"Passengers and freight companies should be confident that this is an issue that has been – and will continue to be – monitored closely by technical and commercial teams. We take this issue extremely seriously and remain vigilant. We will work with relevant safety authorities such as Bureau Veritas in France on our position," notes Christopher Jones, communications manager at Brittany Ferries.

The company has also implemented various new safety measures based on its own studies and research by other organisations. For example, the identification of EVs pre-embarkation. Additionally, the company is installing thermal detectors (both mobile and fixed) across its fleet, starting with ships serving long routes to Spain, as well as fire blankets that all crew have been trained to use.

Existing guidance for the carriage of EVs onboard ro-ro and ro-pax vessels already advises vessel operators of necessary steps to take regarding increased safety. An updated Maritime Guidance Note (MGN), as of August 2023, from the UK Maritime & Coastguard Agency states that one of the main dangers from EVs stems from so-called thermal runaway. This is the occurrence most associated with EV fires and happens when heat generated within a lithium-ion battery exceeds the amount of heat that is dissipated to its surroundings. The resulting battery temperature will continue to rise considerably, further generating more heat and leading to fire.

The MGN notes that vessel operators should instruct onboard fire patrols to pay attention to evidence of black 'smoke' from vehicles as nanoparticles of heavy metals are discharged, followed by white vapour. Damaged high-voltage batteries will also create "popping sounds" which may be indicate a thermal

THE *FREMANTLE HIGHWAY* HAD 3,783 VEHICLES ONBOARD, INCLUDING 498 EVS, WHEN A FIRE BROKE OUT, RESULTING IN THE DEATH OF A CREW MEMBER. SOURCE: SOURCE: DUTCH MINISTRY OF DEFENCE

runaway event. Additionally, it states that operators use CCTV or thermal imaging to detect fires which patrols may have missed. A range of new firefighting methods are also recommended as standard pressurised fixed water drench methods may not be enough to deal with the fire suppression needs of EV incidents. Some of these include specialised water lances and upward facing hoses that can directly cool batteries from below, or devices such as water-curtains to reduce the risk of fire spreading to other vehicles.

EV bans

Major fires onboard ferries are currently rare. Nevertheless, they do take place. The first EV fire on a ferry occurred in 2010 on the *MS Pearl of Scandinavia* which was route from Oslo to Copenhagen. The Danish Maritime Authority responded by temporarily banning charging for EVs on vessels. Today some companies have gone further. Seeking to remove the source of the problem altogether Norwegian ferry operator Havila Kystruten has banned EVs completely. The company, which operates the scenic Hurtigruten coastal route between Bergen and Kirkenes, told Norwegian TV service NRK that the consequences of fires would be far too severe and have since banned EVs from this route.

Other companies, such as Stena Line, have been involved in research projects, such as the EU-funded LASHFIRE, to find solutions to the potential problems raised by EV fires. A spokesperson for Stena says that its onboard designated firefighting teams have also received training by an EV firefighting expert and that training is ongoing as more data and best practice procedures become available. The company has taken steps to provide EV specific firefighting equipment to its teams.

The threat of EV fires onboard ferries is not limited to larger seagoing vessels and passengers and crew on smaller routes are likely to be wondering what specific procedures smaller companies have in place. The Scottish government-owned Caledonia Macbrayne, whose ferries operate between the Scottish mainland and 22 major islands on Scotland's west coast, tells *TNA* it has procedures in place based on existing guidelines. However, the company declined to give specifics.

According to a CalMac spokeswoman: "Like all risks onboard a vessel, the risk of carrying electric vehicles has been assessed by trained personnel and we have developed procedures following the release of specific guidance issued by the MCA (MGN 653) and the European Maritime Safety Agency (EMSA). Guidance by the MCA and EMSA was developed through consultation with the industry, and specifically the industry body, InterFerry, of which we are a member."

Elsewhere, Danish ferry operator DFDS is also taking steps to mitigate the effects of EV fires and ensure the safety of its passengers. The company, which is Northern Europe's largest integrated shipping and logistics company, operating 30 routes, has installed firefighting equipment on board its vessels specifically for electric vehicles, including special fire blankets and cooling units. As part of its onboard drills DFDS crews also run fire scenarios that include fires in EVs, and all deck and engine officers are required to complete a mandatory E-learning module on the risks of fires in EVs and the firefighting techniques that can be used.

The company has also partnered with the Danish Institute of Fire Safety and Security Technology (DBI) which is also working with ferry operators Scandline and Molslinjen A/S. In 2021 DBI launched the Electric Vehicle Fires at Sea: New Technologies and Methods for Suppression, Containment, and Extinguishing of Battery Car Fires on Board Ships (ELBAS), supported by the Danish Maritime Fund. Initial results from this research initiative have proved optimistic.

"The positive message is that fires in electric cars on board ferries are manageable and not something we need to fear," according to Alexander Kleiman, maritime R&D project manager at DBI.

"All the fires in our tests could be extinguished, so with the correct firefighting technologies on board, the correct training of the crew and well-coordinated collaboration with the onshore emergency services, electric cars should not pose a safety problem in ferry traffic," he added.

Risks of lithium-ion battery usage needs constant re-evaluation

Investigations are still ongoing into the causes of recent fires onboard vessels such as the *Fremantle Highway*. However, the increasing numbers of EVs carried on both ro-ro and ro-pax vessels is likely to lead to increased incidents if more rigid safety measures are not adopted. A report published in summer 2023 by insurance agency Allianz notes that due to rapidly evolving technology and a lack of consistent regulation, the risks of lithium-ion battery usage will need to be constantly re-evaluated as they develop over time.

The report concludes: "If the maritime industry is to improve its incident record related to the transport of these battery types, all parties involved in the supply chain must understand the hazards involved, the most common causes and problems associated with transporting in commerce."

Ferry operators will be cautiously watching closely for any further regulatory developments and new safety measures as they are brought in. The IMO's Sub-Committee on Ship Systems and Equipment (SSE) will be starting work in March 2024 on the "evaluation of adequacy of fire protection, detection and extinction arrangements in vehicle, special category and ro-ro spaces in order to reduce the fire risk of ships carrying new energy vehicles". The results of this will no doubt prove useful to the industry but will likely take time to bear fruit.

Companies who are already taking a proactive approach, such as DFDS and Brittany Ferries, may help to set a wider trend. In any case involving safety of life at sea complacency in the face of new hazards cannot be afforded as the costs of a catastrophic incident will be too much to bear. ■

SOURCE: MILES COWSILL

HYBRID DOUGLAS-MAX RO-PAX FOR ISLE OF MAN LIFELINE SERVICE

The Isle of Man is heavily dependent on imports from mainland Britain with the Lancashire port of Heysham being the main gateway to the island. The 25-year-old Heysham-Douglas route mainstay, *Ben-my-Chree*, was recently replaced by the hybrid diesel-electric *Manxman*, a handy-size ro-pax ferry specifically designed to provide reliable year-round lifeline services during the next 25 years, boasting methanol-ready engines

By **Philippe Holthof**, Correspondent

The Isle of Man Steam Packet Company's ferry services to the Irish Sea's namesake island are the lifeblood of the local community with a 99.2% reliability and 88.8% punctuality during the 12 months ending August 2023. Ever since its introduction in August 1998, *Ben-my-Chree* has proved to be a reliable workhorse, but shortly after the Isle of Man Steam Packet Company (IoMSPCo) was taken into the secure ownership of the Isle of Man government in mid-2018, the world's oldest passenger shipping company embarked on a newbuild project to replace *Ben-my-Chree* as the primary 'lifeline ship'. The rather utilitarian *Ben-my-Chree* represented a typical 1990s off-the-shelf platform designed by its Dutch builders, Van der Giessen-de Noord. Especially throughout the 1990s and early 2000s, Van der Giessen-de Noord was a prolific and successful builder of ro-pax tonnage until its sudden demise in 2003. While an off-the-shelf design reduces the build cost, it comes with a lot of compromises. This was no exception for *Ben-my-Chree* which had been ordered when the IoMSPCo was still under Sea Containers ownership. While the vessel served its purpose, it definitely had its shortcomings, including a lack of decent passenger facilities.

Purpose-built

Replacing the User Agreement, a new Sea Services Agreement between the IoMSPCo and its owner was signed in spring 2019, entering into force in January 2020. In return for the exclusive use of the island's linkspans, the Manx government required the company to invest in a new vessel to guarantee robust sea links with its neighbours throughout the year, something fundamental to the economy and social wellbeing of the Isle of Man. So, the new Sea Services Agreement provided the contractual criteria for the design and characteristics of the newbuild ferry which had to be delivered and introduced within a fixed time frame. When ordered in July 2020, the initial delivery date was set for late November 2022. However, as the Covid-19 pandemic wasn't over yet when construction started, in August 2021, the Manx government ultimately accepted a later delivery. After having defined the new ship's dimensions, passenger capacity and vehicle intake, the IoMSPCo went out to the travelling public to obtain a good view on what facilities and services passengers expect during a three-hour and 45-minute crossing, also asking them what they would really use on board.

The draught limitations in Heysham and the length limitations to turn within the tight confines of Douglas determined *Manxman*'s hull envelope. The maximum allowable length for Douglas is based on the IoMSPCo's masters' experience and feedback with 135m deemed as the absolute maximum. A somewhat shorter 130m-long hull would have been preferable, but *Manxman* ended up at 133.25m length overall, 8m longer than *Ben-my-Chree*. The port of Heysham too has its length limitations with 147m being Heysham-max. Hitherto, 142.5m has been the Heysham-max standard but Stena Line's recently ordered 2,800lane-

metre (lm) NewMax class hybrid ro-ros for its domestic Heysham-Belfast freight-only service will further push the limits to 147m. As for *Manxman*, it was primarily the port's draught restriction caused by the silting of the approach channel that dictated the 5.2m moulded design draught. While Seatruck and Stena Line, the other port users, can base their schedules around the tide, the IoMSPCo has to maintain a fixed schedule based around convenient timings by virtue of offering a passenger and lifeline service.

British naval architect, South Korean builder

As per the Sea Services Agreement, the IoMSPCo had to squeeze 1,250 freight lane-metres and at least 800 passengers in this compact 'box size'. Although the freight intake more or less remained on a par with *Ben-my-Chree*'s, a higher vehicle deck headroom was specified as were wider vehicle lane widths, affecting the vessel's stability on the one hand and increasing the lightweight on the other. To meet peak demand, especially during annual milestone events such as the TT Races and Manx Grand Prix, the Sea Services Agreement called for a 30% higher passenger capacity but the IoMSPCo further increased this to just over 50%, equivalent to 949 passengers.

With the parameters set and all the boxes of the Sea Services Agreement ticked, the ferry operator went out to a number of naval architect firms to tender for the concept design and concept specification works. This job was eventually awarded to the UK's Houlder with whom it already had a long-standing cooperation. Houlder had also been instrumental in the design of Wightlink's hybrid *Victoria of Wight*. Completed by Turkey's Cemre Shipyard in July 2018, *Victoria of Wight* connects Portsmouth with Fishbourne, Isle of Wight. Although representing a totally different platform, *Victoria of Wight* somehow shares some design characteristics with *Manxman* on account of draught and length constraints.

BATTERY ROOM. SOURCE: PHILIPPE HOLTHOF

Both *Victoria of Wight* and *Manxman* have their passenger and vehicle capacities maximised with the ships' accommodation blocks extending very far forward. As a result, both vessels look somewhat 'stocky' and share a similar external profile although it was rather *Victoria of Wight*'s Wärtsilä diesel-electric propulsion system together with the hybrid element that served as a benchmark for *Manxman*.

Being a fairly small company with limited resources, the IoMSPCo felt that building outside of Europe would have been extremely resource-heavy in terms of manpower and cost. For this reason, the initial focus was on a handful of European and Turkish shipyards that had gained a strong foothold in the small to medium-size ro-pax segment. It wasn't until Affinity (Shipping) LPP came on board as brokers that the door was opened to the rest of the world with tenders from Asian shipyards, including several Chinese shipyards. While certain yards were way too expensive, others were way too cheap or had too long lead times. The list of 17 shipyards that

WÄRTSILÄ 8V31 GENSET. SOURCE: PHILIPPE HOLTHOF

had been approached was quickly whittled down to five which were all visited. Ultimately, only two yards were shortlisted: Poland's Remontowa Shipyard and Hyundai Mipo Dockyard (HMD) in Ulsan. Their offers were more or less equal and both had their pros and cons, but it was the South Korean shipbuilder that landed the £78 million contract in July 2020.

Optimised hydro- and aerodynamics

With the concept design completed, Houlder remained the shipowner's technical advisor throughout the further design and build process. Most of the hull optimisation was in the hands of HMD which saw the length of the hull increase from 130m to 133.25m and the breadth somewhat reduced to 25.7m. The optimisation concentrated around the bulbous bow and the stern, especially the shape of the part running up to the twin propellers and rudders which eventually led to the increased length. Besides hydrodynamic tests, MARIN also carried out aerodynamic tests. Thanks to the bulged form of the fully covered fo'c'sle, the curved front of the superstructure, bridge and bulwark atop of it as well as a shallow funnel with latticework replacing plating, the fuel consumption could be further reduced to up to one tonne per day.

TECHNICAL PARTICULARS *MANXMAN*	
Length oa	133.25m
Length,bp	122.00m
Breadth, moulded	25.70m
Depth to main deck	8.60m
Draught, design	5.20m
Draught, max. summer load	5.60m
Gross tonnage	24,161
Net tonnage	7,248
Deadweight	1,941t (design draught)/3,096t (max. summer load draught)
Lane-metres (gross)	1,298
Passengers	949
Passenger cabins/ berths	40/136 (+ 2 dedicated 6-berth freight driver cabins)
Main engines	2 x Wärtsilä 8V31 + 2 x Wärtsilä 10V31
Output	2 x 4,880kW at 750rpm + 2 x 6,100kw at 750rpm
Maximum propulsion power	2 x 7,850kW propulsion systems
Service propulsion power	2 x 6,070kW propulsion systems
Service speed	19.2knots
LSAs	2 x 430-person + 2 x 321-person Survitec Marin Ark MES – 3 x Palfinger Marine NPT60RA fast rescue boats
Class	Lloyd's Register
Class notation	+100A1, Roll on – Roll off passenger ship, ShipRight (ACS(B)), LI, *IWS, +LMC, BWTS, UMS, NAV1, IBS, Hybrid Power, PCAC 2,3 with descriptive note: ShipRight (MPMS, DIST(M), IHM, SCM, SRtP, SERS)
Flag	Isle of Man

Loading trailers and cars simultaneously

As the Isle of Man is dependent on imports and hardly exports goods, freight is typically moving in one direction only with most trailers returning empty to the mainland. So, one of the lessons learned from the freight-oriented *Ben-my-Chree* was to have enough ballast capacity and heeling tanks to assist with the loading. One of the key things that came out from operating *Manxman*'s predecessor and the passenger survey was the flexibility to load passenger cars and trailers simultaneously. Particularly for the Heysham-Douglas overnight crossing, car passengers wanted to get on board as soon as practical. To meet this demand, a three-panel hoistable car deck has been installed on the upper vehicle deck. Mounted on the starboard side of the casing, it has a capacity of up to 22 cars with the same number that can be parked beneath. Those car passengers who prefer a longer night rest in their cabins will have their cars parked on this lowered hoistable deck, arriving first and leaving last.

Highly efficient engines combined with ESS

Although not a government requirement, it was the IoMSPCo's desire to be ahead of the game and operate a vessel with the lowest possible emissions footprint, also guaranteeing zero emissions in port using the ship's own energy storage system (ESS) as none of the ports called at had onshore power supply (OPS). As LNG supply is totally lacking in this part of the Irish Sea, it was never considered as an alternative fuel with *Manxman* burning low sulphur MGO. But the ship's propulsion pack is methanol-ready with only a small part of the piping that needs to be replaced by double-walled pipes. Stena has announced that its NewMax class ro-ros to be introduced on the Heysham-Belfast route come 2025 will be methanol powered, so the IoMSPCo has high hopes to jump on the bandwagon and switch to e-methanol in the not-too-distant future. Initially, four identical eight-cylinder Wärtsilä 31 gensets were specified, allowing for one engine to be out of service. To achieve even better flexibility, a combination of two eight-cylinder and two 10-cylinder gensets was favoured. To comply with Safe Return to Port (SRtP) rules, the gensets are stowed in two separate main machinery compartments with one Wärtsilä 8V31 and one 10V31 in each compartment. The gensets haven an output of 4,880kW and 6,400kw, respectively at 750rpm and 100% MCR. The Wärtsilä 31-type engine is renowned for its very low fuel consumption, being recognised by Guinness World Records as the world's most efficient four-stroke diesel engine and an engine that can also utilise artificial

intelligence (AI) and machine learning in a condition-based maintenance regime.

Electrical losses characterised by the diesel-electric system are minimised thanks to Wärtsilä's proprietary Low Loss Concept (LLC) which guarantees higher efficiency, lower weight and volume, and a high system redundancy. LLC also reduces and eliminates the need for supply transformers to the frequency converters, in particular those supplying electric propulsion.

The engine room's aftmost compartment contains Alconza's twin electric propulsion motors on Deck 1 and one of two switchboard rooms on Deck 2, the other switchboard room being located in the forwardmost compartment, adjacent to the ECR. Driving the 4.3m-diameter controllable pitch propellers via Wärtsilä gearboxes, the electric propulsion motors each have a 7,850kW maximum propulsion power, standing out for their reliability, efficiency as well as their low operating costs. Wärtsilä's optimised propulsion and manoeuvring solution, EnergoPac, integrates the propeller and rudder design. Providing perfect manoeuvrability and lower vibration levels, its main objective is to further cut fuel consumption thanks to reducing the flow separation behind the propeller hub. With *Manxman*'s tight berthing conditions and large windage area, excellent manoeuvrability in all weather conditions is key. This is further enhanced by Becker Marine Systems' high-lift flap rudders and three Wärtsilä bow thrusters with a combined output of 3,600kW.

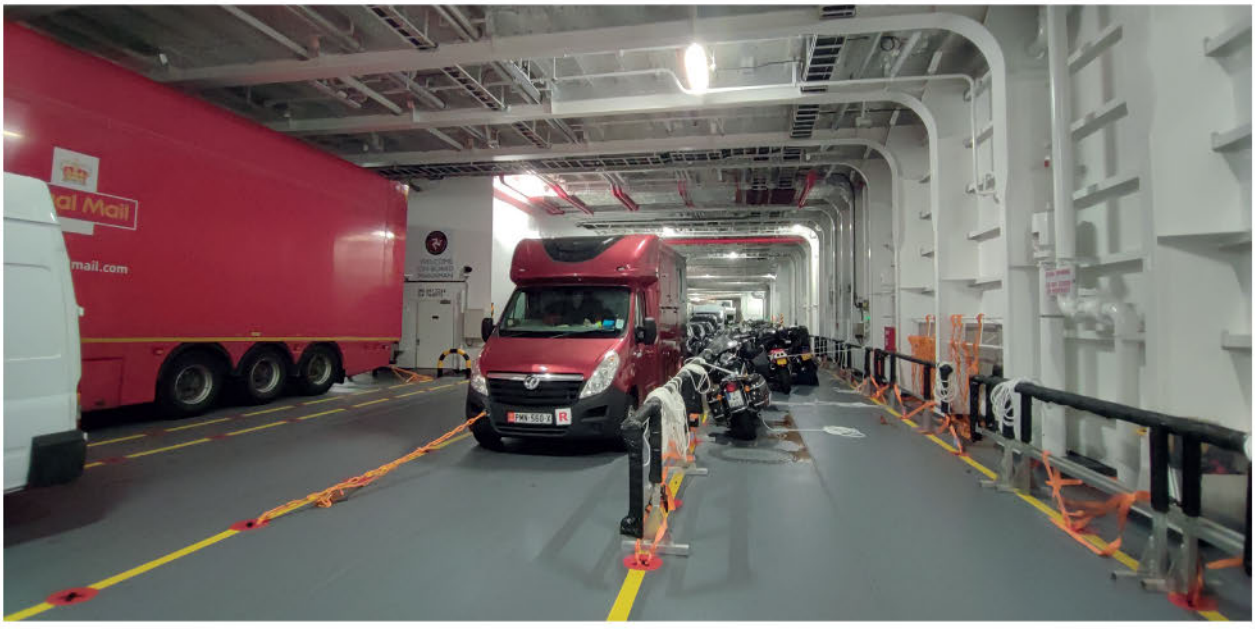
All four engine room compartments are confined between B/5 longitudinal bulkheads, yet the two battery rooms are located outboard of them. To offer more flexibility, the battery capacity was doubled during the design stage, totalling 3.146MWh. Manufactured by Spear Power Systems, the Trident lithium-ion batteries are charged at sea using peaking shaving, being charged to 85% during the last part of passage and manoeuvring. While manoeuvring, the batteries give an instant boost of power and once alongside with the stern ramp down and the generators switched off, *Manxman* turns into emissions- and noise-free battery mode.

To comply with IMO NOx Tier III regulations, the centreline exhaust casing boasts four Wärtsilä SCR units. Wärtsilä also supplied its latest NACOS Platinum integrated navigation system along with a newly developed Bridge Console Design.

Manxman's long list of energy efficiency solutions includes an air conditioning system that measures the CO_2 to define the occupation with the cooling and heating adapted to the number of occupants. The seawater cooling pumps have individually mounted variable frequency drives (VFDs) that regulate the pump speed and energy consumption according to the actual cooling capacity demand. *Manxman* has three elevators – one in each of the small forward side casings and one in the central casing. The elevator regenerative elevators capture the elevator's energy, returning it to the ship's power network. LED light has been used throughout and the ship's lighting control system adapts the light to the time of the day and the outside available light. Waste heat from the boiler exhaust gases is transferred through Heatmizer's heat recovery system to preheat the ship's hot water system.

Two vehicle decks

As most trailers are shipped unaccompanied, there is no drive-through access with a single hydraulic MacGregor stern ramp connecting *Manxman*'s main deck, Deck 3, with the linkspan. The 10.4m-long ramp (excluding flaps) has an 11.2m driveway width which is reduced to 5.58m with the two outer flaps raised. Up to 661.9lm of freight can be stowed on the main deck, spread over six lanes – three on either side of the central casing. Thanks to the increased deck height, 4.9m-high trailers can be stowed on both Decks 3 and 5 which are interconnected by a 48.16m-long and 3.1m-wide hoistable MacGregor ramp on the portside of the casing. The 636.4lm upper deck



MAIN VEHICLE DECK WITH DEDICATED MOTORCYCLE STOWAGE AREA. SOURCE: PHILIPPE HOLTHOF

MANOEUVRING FROM STARBOARD BRIDGE WING. SOURCE: PHILIPPE HOLTHOF

is open at the aft, allowing for the stowage of certain categories of hazardous goods that must not be stowed below deck. During the TT Races and the Manx Grand Prix, motorcycles can be block-stowed in dedicated zones. As part of the environmental stewardship embodied in *Manxman*, the IoMSPCo has moved away from self-propelled reefer units with each deck having 40 reefer plugs. Only 15 to 20 reefer units are carried on average, so no matter where a reefer unit is stowed, there is always a plug at hand.

A taste of the Isle of Man

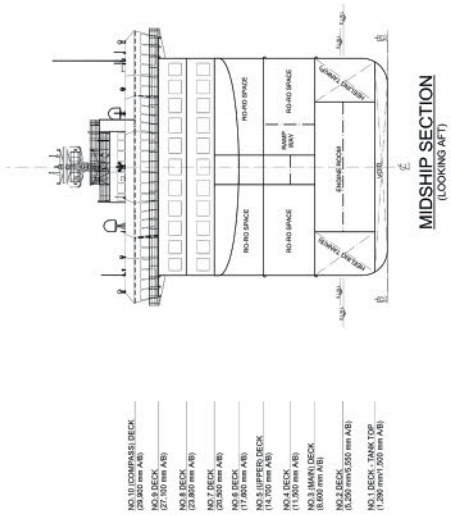
Probably the biggest improvement from a passenger perspective concerns the accommodation with more and far better facilities, a way higher space ratio and double the number of cabins, offering a greater choice of luxury cabins, including balcony cabins. When it came to onboard standards and quality of finishing, Irish Ferries' 2018, Flensburger Schiffbau-Gesellschaft-built *W.B. Yeats* served as the reference ship. The ship's interior architects, OSK Design, tendered for *Manxman* but the contract was awarded to SMC Design, the London-based interdisciplinary consultancy which was also responsible for the interior design of *Victoria of Wight*. SMC Design's team spent a lot of time studying the Isle of Man's rich heritage and culture with facilities named after 'touch points' around the island. South Korea's Sejin Marine Outfitting was responsible for the interior outfitting although a lot of loose furniture was shipped in containers from Estonia with most of the galley equipment supplied by Finland's Metos.

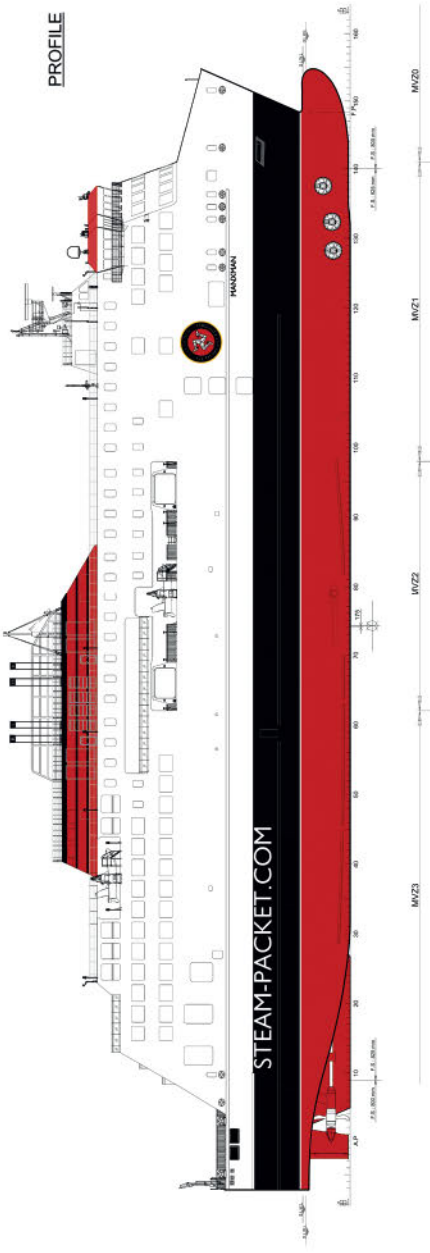
The tidal range in Heysham can be as much as 9m and also the port of Douglas suffers from tidal variations. Foot passengers enter or leave the ship using the portside stairway and elevator casing in Heysham and the starboard one in Douglas. To cope with the tidal ranges, there are shell doors on three decks: Deck 4, 5 and 6. The passenger facilities are concentrated on Decks 7 and 8 but forward on Deck 6 there is a pet exercise area integrated into the covered fo'c'sle, connecting to the CCTV-monitored kennels that are housed in the side casings. Passengers can also keep their four-legged friends with them in one of two pet lounges just aft of the side stair casings on Deck 7 while there are four four-person pet-friendly cabins on Deck 8, two of which are so-called accessible cabins for people with reduced mobility.

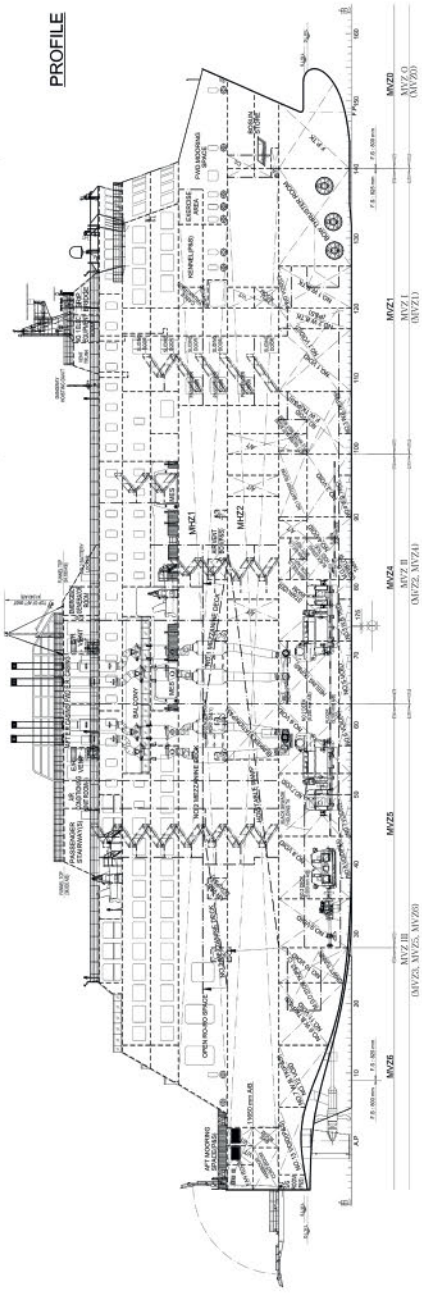
Decks 7 and 8 are divided into three fire zones with the central and side stair casings being a separate fire zones within fire zones and therefore accessed through automatic sliding fire doors. The reason for this solution is to make the most out of the public spaces. However, the main, wide staircase that connects Deck 7 with Deck 8 only is open, being integrated into the midship fire zone.

Forward on Deck 7 is the full-width Cornaa Café. A laidback space with panoramic views, it is the ship's main lounge, giving direct access to the side casings used by embarking/disembarking foot passengers. Deck 7's midship section narrows due to the MES and fast rescue boat stations on either side. Despite exceeding the 20-nautical-mile limit that allows passenger ships to replace lifeboats by an all-MES solution, an exemption was granted to deploy inflatable liferafts in combination with two 430-person and two 321-person Survitec Marin Ark MESs and three Palfinger Marine NPT60RA twin outboard engine fast rescue boats. Thanks to this solution, much-needed space has been gained. The open plan midship section on Deck 7 holds a walk-through shop on the portside and a children's play area to starboard. The information desk is integrated into

GENERAL ARRANGEMENT PLAN FOR *MANXMAN*







THE BAR IS ADJACENT TO THE EATERY WITH SELF-SERVE COUNTER. SOURCE: PHILIPPE HOLTHOF

the shop and doubles as one of the checkouts. Just abaft the shop is a quiet family zone with corridors on the starboard and port side of the casing leading to the U-shaped open plan aft section with central galley and storerooms. The Eatery self-service restaurant to port connects seamlessly with The Bar to starboard. Central automatic sliding doors give access to a well-protected, narrow aft terrace with fixed metal seating.

One deck up, on Deck 8, the aft fire zone boasts the 124-seat Barrule premium lounge on the port side. The small restaurant section with chairs arranged around tables offers waiter service but the food is identical to that served in The Eatery. Passengers can relax in reclining seats facing aft and to the port side, but there are also club-style chairs and deep sofas.

A partition divides the narrow open aft terrace in a zone that is exclusively accessible for Barrule premium lounge passengers and Executive Club Lounge passengers, respectively. The latter lounge is located on the starboard side and, as it names suggests, it is a tranquil and exclusive lounge for members only, offering a mix of different seat types, including fully reclining pod chairs and more standard reclining chairs.

The 42-cabin area is located midships with the twin corridors that separate the outside from the inside cabin leading to the Niarbyl reclining seat lounge forward. Just aft of Niarbyl, on the centreline, is the windowless Injebreck Exclusive Lounge with 26 fully reclining seats similar to those found in aircraft's Business Class. Forward on Deck 9 is the bridge with the SRtP bridge located on Deck 10, below the mast. The rest of Deck 9 is taken by crew cabins and facilities, including a gymnasium and cinema. The starboard part of the aft open deck is passenger accessible, yet the portside open deck is for the crew only.

With the hybrid diesel-electric *Manxman* the IoMSPCo has significantly raised the bar, bringing new standards of travelling to and from the Isle of Man. As per the Sea Services Agreement, the next in line to be replaced will be the high-speed craft *Manannan*. ■

250-RECLINING SEAT NIARBYL LOUNGE. SOURCE: PHILIPPE HOLTHOF

MARITIME HERITAGE

PORTSMOUTH DOCKYARD'S FORGOTTEN CANAL

By **Mark Barton**, RINA historian

In the maritime industry, we're used to large elements of infrastructure being constructed to support dockyards, and regular disruptions to the global supply chain regularly highlight the importance of assuring that infrastructure remains resilient.

This year marked the bicentenary of a project that was designed to do both of those but turned out to be a white elephant: a 20-mile canal specifically constructed so the French could not interrupt seaborne supplies reaching Portsmouth Dockyard. The supply route was also significant as being one of the earliest uses of a steam tug in Britain.

During the Napoleonic era it was feared that the ships supplying Portsmouth could be disrupted by the French. This was particularly applicable to guns and gunpowder, which came from London and needed to be transported in large, heavy quantities; something achieved far more expediently by water. To avoid sailing out of London and all the way round the coast the use of rivers and canals offered a logical solution.

A considerable part of the route was already in place. The River Thames has as one of its tributaries the River Wey and this is navigable for the first part. The River Arun, which enters the sea at Littlehampton, is also navigable for the first part and had been extended by a canal in 1787. Therefore, what was in effect an extension of that canal – turning it into the Wey and Arun Canal – linked London to the south coast by water and provided the means of moving cargo from London to the wharves at Littlehampton. This was formally approved by an Act of Parliament in 1813.

However, the cargo's journey along the south coast still represented a vulnerability where it could potentially be interrupted by an enemy and prevented from reaching Portsmouth Dockyard. To solve this problem, and protect national interests, a 20-mile inland water route was planned and constructed to link Portsmouth with the Arun. The challenge of getting financial approval for big projects is nothing new and it wasn't until 1817, just after the war finished, that assent was given, with work commencing the following year. So much of the last 800 years at this point had been spent fighting the French, no one doubted there would soon be another such war. The canal was completed relatively quickly and opened in May 1823.

The route used a canal constructed from the Arun to Chichester harbour, entering just upstream of Bosham. A side leg was built to go from the canal into Chichester. The route then made use of the islands and went through a dredged channel off the southern coast of Thorney Island, where it passed north of Hayling Island into Langstone Harbour and entered the second stretch of canal, the Portsea Canal, at its entrance at Milton. It was towing these barges, across Chichester and Langstone Harbours, that used a steam tug named *Egremont* after the Earl of Egremont, who was a major shareholder in the project.

LOCK ENTERING THE CANAL AT THE RIVER ARUN

But there were two major problems: first Britain did not return to war with the France, meaning there were no threats to this part of the supply route and revenue was not what was expected; secondly it contaminated local water supplies on Portsea Island, where Portsmouth is. Consequently the Portsea section was abandoned by 1830. The same did not apply to the Arun and Wey Canal which lasted as a working route until 1871, by which time it was losing out to a quicker railway completed in 1865 and operating on a similar route.

REMAINS OF STEWART SWING BRIDGE

The Arun and Wey Canal still remains a waterway, albeit no longer fully navigable, but with ongoing efforts to fully restore it. This has been making steady progress; the Chichester leg, where it came down to meet the canal, is now fully open, while the leg to Chichester Harbour section remains a waterway with the first part from Chichester still used for boat trips in canal boats.

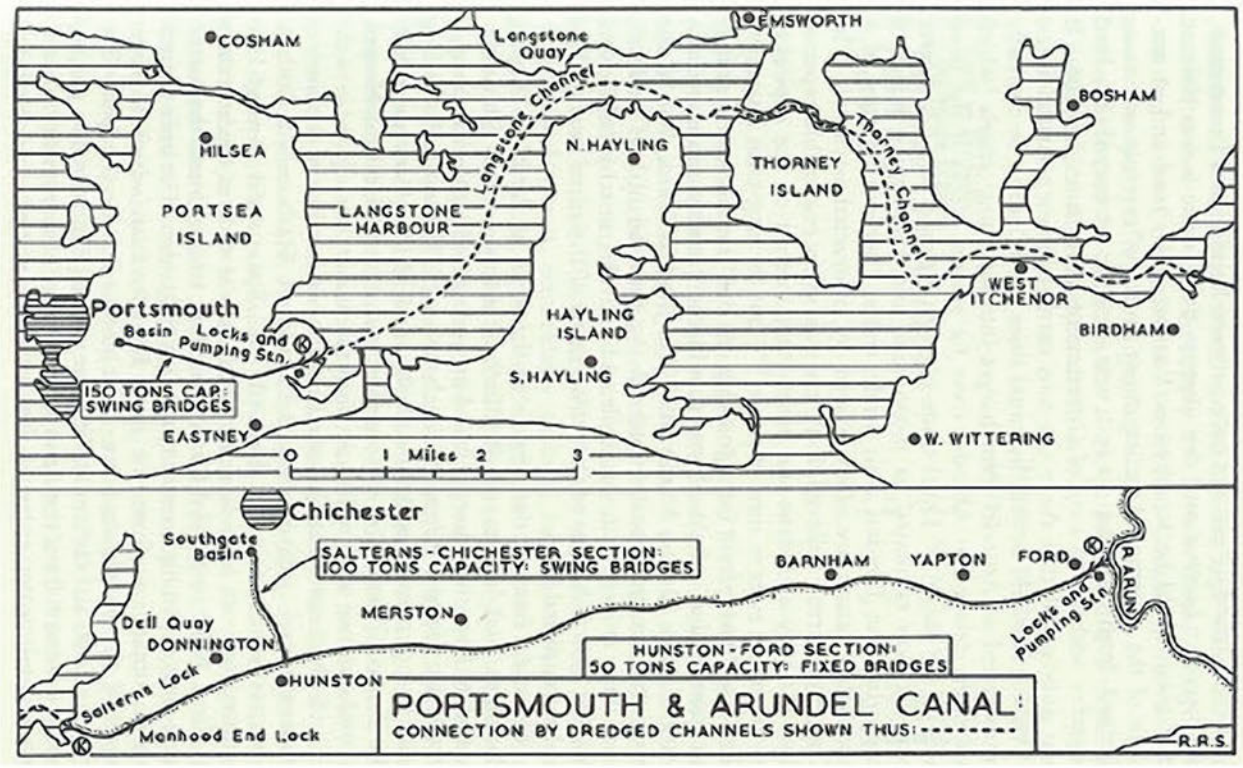
The section from the Arun to Chichester and the element across Portsea has now largely been obscured by other developments, among them fruit farms and housing estates. But, there are footpaths along the whole route, while the two locks where the route started at the River Arun and Langstone Harbour entrances are both extant, albeit they might easily be mistaken for old docks if their history were not known.

OLD CANAL INN

While so much of this major feat of engineering has now disappeared, the clues are there to be able to trace the route. There are many odd features that are explained by it from a towpath bridge in the middle of a housing estate; the strip of modern houses on raised ground along part of the Portsea leg; canal bridges in the middle of fields and buildings that do not fit the style of those around them (such as the old Lock Houses).

It is also features in both the names of roads, such as Locksway Road, Waterlock Gardens and Towpath Mead and the names of public houses such as the Old Canal Inn; all of which can be found in the Portsmouth section. At the Portsmouth end the basin built to allow the loading and unloading led to the name Arundel Street (as it was linked to the River Arun). The canal bed between Fratton Bridge and Portsmouth and Southsea station was later used for the railway hence the street alongside is Canal Walk. ■

LOCK ENTERING THE CANAL AT PORTSEA ISLAND



ENVIRONMENTAL REGULATIONS

EU WHAT? THE IMPACTS OF EU ETS AND WHAT ACTIONS CAN BE TAKEN TO MANAGE RISK AND REDUCE COSTS

By **Jacob Clausen**, performance director, NAVTOR

The EU Emissions Trading Scheme (ETS) for shipping landed with a colossal splash on 16 May this year, when it was officially adopted and finalised. But it won't be until 1 January 2024 that the industry feels the true ripple effects. So, is it time for owners and operators to batten down the hatches, or will adequate foresight and planning ensure these ripples don't turn into tsunamis?

What is it?

Firstly, it's important to recognise that the EU ETS isn't 'new'. The measure, which is seen as a key enabler in the body's drive to become carbon neutral by 2050 (with a 50% reduction in greenhouse gas emissions by 2030), was introduced in 2005 and already covers thousands of installations, such as power stations and chemical plants, in addition to airlines. In this sense it's tried and tested.

Essentially it works as a market-driven system that creates financial incentives for businesses, in this case shipping, to reduce emissions and transition to more sustainable practices. It does so by requiring a 'shipping company' – which can be the owner, manager or bareboat charterer – to buy Emission Allowances, with each allowance covering one ton of CO_2e emitted from 2024. In 2026 the scheme will be expanded to include CH_4 (methane) and N_2O (nitrous oxide) emissions.

As such it introduces the concept of carbon pricing for maritime operations to and from EU ports – obliging companies to pay for their emissions, and thus encouraging them to reduce carbon footprints.

How does it work?

The ETS is based on a cap-and-trade principle, limiting the total amount of greenhouse gas emissions in the system, ensuring companies can't just 'buy themselves out of trouble' by paying for ever-increasing pollution. Over time the cap will be reduced, with the cost of allowances rising.

The 'trade' element refers to the fact that allowances can be bought via official auctions or through spot, futures and options, with trading on exchanges such as ICE, EEX and Nasdaq. In this respect, companies have an opportunity to optimise their costs by buying (and potentially selling) at opportune times.

The need for allowances is worked out according to EU MRV reporting, presented to the EU by March (the following year) with the correct number of allowances then required to be submitted by the end of September. Be warned: a failure to do so will incur heavy financial penalties.

JACOB CLAUSEN, PERFORMANCE DIRECTOR, NAVTOR

In a bid to ease the implementation of what many see as a "watershed" regulation (others may use less charitable language), the EU will only require allowances for 40% of verified emissions in 2024, rising to 70% in 2025, and 100% in 2026.

What can shipowners and operators do?

Firstly, get solid foundations in place. An advanced fleet and vessel monitoring and management solution will allow you to 'know your ships' inside-out, automating the collection of critical data and giving you (literally) priceless insights into real-time operations.

This will allow you to constantly monitor, trouble-shoot and optimise performance, empowering decision making that delivers both environmental and business benefits. On single ships this can potentially slash the need for allowances, while across fleets it could be transformational.

Such systems should also cover your reporting needs. This delivers efficiencies in terms of automating tasks, and reducing human error, while ensuring that the data delivers an accurate picture of performance to regulators. With this in mind, validation is key.

Here at NAVTOR we'd recommend a dual validation process, with your specialist software of choice backed up by human validation from subject matter experts. It pays to be thorough when any deviations from compliance come at such a cost.

How can you minimise risk and financial exposure?

When you have optimal foundations in place you can look at building the best strategy for your business.

Establishing an overview of your forecasted allowances for the year ahead will allow you to understand your potential exposure, from which – perhaps in consultation with experts – you can define a sourcing strategy that allows you to optimise costs (buying and selling at the right time, across the right channels).

Alternative fuels are also a key consideration, with the cost of allowances potentially making biofuels, which on the face of it are more expensive, much better value for money (due to lower carbon factors).

And remember, your monitoring and management solution will allow you to regularly update your emissions profile, potentially helping you reduce your need for allowances.

Finally, it makes sound financial sense for owners to maximise the time their vessels spend under time charter, allowing them to pass the cost of allowances on to the charterer. On that note...

How can owners redeem allowance costs from charterers?

It's not vessel ownership that matters when it comes to paying for allowances, but rather which party provides and pays for fuel. Owners therefore need to ensure they deliver reliable, validated vessel emissions data to charterers in a timely manner (BIMCO proposes a clause whereby owners provide this within the first seven days of each month, covering the previous month's allowance requirement). But, to do that, we come back to the need to have a robust, reliable, real-time monitoring and management system.

This will create true transparency, and therefore trust, with regards to ongoing emissions data, monitoring progress (issuing statements under voyages and time charters) and ensuring allowances are transferred in accordance with requirements. There should be no room for argument with a system that, although complex at first glance, is based on pure, hard data. That is, of course, as long as you have high quality data in the first place!

Smooth sailing into 2024, and beyond

Although the introduction of regulations that potentially incur significant costs may not be universally applauded by the industry, it really does pay to see the bigger picture here.

The most important factor, naturally, is that we need to take action to reduce emissions and mitigate climate change. In this respect, any tool that incentivises businesses to do so is a step in the right direction.

However, we shouldn't lose sight of the commercial opportunity here too. With careful monitoring, management and informed decision-making compliance can come with a benefit rather than at a cost – paving the way for reduced fuel expenditure, more efficient energy use, and a strong business, rather than purely environmental, case to transition to more sustainable practices.

Time will tell how effective the EU ETS proves to be. But with the right, informed strategy in place, it needn't be something to be feared, but rather welcomed... by shipping industry stakeholders, as well as the rest of society. ■

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https://smp24.fds.tuhh.de

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The Royal Institution of Naval Architects Presents:

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As part of its commitment to addressing climate change, IMO has developed a Carbon Intensity Indicator (CII) for international shipping. The CII is intended to measure and drive improvements in the energy efficiency of ships. CII was adopted in 2021 as part of a package of amendments to MARPOL Annex VI, which were a response to the IMO's Initial Strategy on Reduction of GHG Emissions from Ships. IMO's Strategy sets out a vision to improve the carbon intensity per transport work of shipping by 40% in 2030 relative to 2008.

The CII has been designed as a key tool to assess and monitor the carbon intensity of both new and existing ships, with an emphasis on operational efficiency that was not addressed by other IMO short-term GHG measures. CII requirements took effect from 1 January 2023, so in early 2024 the industry is expecting to receive the first feedback of CII measures. A review of the effectiveness of the implementation of short-term CII and EEXI requirements must be completed by 1 January 2026, and it was agreed at MEPC 80 in July 2023 that this process would commence at MEPC 81 in March 2024.

"The conference is a great opportunity to learn about both successes and challenges in implementing the CII, and ideally timed to feed into the review of the short term measure." - Edwin Pang, Founder of maritime consultancy Arcsilea Ltd and Chair of the RINA IMO Committee.

Reasons to attend the Managing CII and Associated Challenges Technical Conference:

- Fantastic networking opportunities during discussions, coffee breaks and the evening drinks reception on Day 2 of the conference.
- Many insightful presentations and panel discussions on topics, including Owner Experience; Ship Type Specific; Operational and Technical Strategies; New Metrics; Legal; and Green Finance.

The preliminary programme features:

Setting the Scene – the Good, the Bad and the Ugly
Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping & Edwin Pang, Arcsilea Ltd

A Case Study on Using Voyage Optimisation Techniques for Improving a Vessel's CII Rating
Oliwia Galecka, Ardmore Shipping

CII - Impact on d'Amico Fleet
Cesare d'Api, d'amico società di navigazione spa

Managing CII Through Itinerary Optimisation
Ivana Melillo, MSC Cruise Management (UK) Ltd

Decarbonizing Bulk Carriers 2030 & 2050 Vision
Volker Bertram, DNV

Wind Propulsion for Tankers? - An Investigation Into the CII Reduction Potential for Ships Operating on the Spot Market
Frederik Gerhardt, RISE/SSPA

Evaluating the Impact of Biofouling Management on CII Ratings
Viktor Avlonitis, Hempel

Quantification of Biofoulings Effect Upon Performance
Tor Mikal Østervold, ECOsubsea

The impact of Hull & Propeller Performance to CII Ratings
Eirini Arvanitaki, Vessel Performance Solutions

Correction Factors for CII Calculations - Saving Potentials with High Quality Sensor Data
Uwe Altenbach, Hoppe Marine GmbH

Impact of Propulsion Improving Devices on CII: Current Challenges
Alessandro Castagna, Becker Marine Systems

Wind-assisted Ship Propulsion as a Versatile Tool for Boosting CII Score
Konstantinos Fakiolas, Finocean

Leveraging Rotor Sails to Support CII Compliance
Ville Paakkari, Norsepower

The Review of the Carbon Intensity Indicator and Possible System Improvements
Chris Waddington, International Chamber of Shipping

Improvement to CII Metric Based on Equivalent Transport Work Principle for Better Monitoring and Prediction
Sandip Patil, Indian Register of Shipping (IRCLASS)

Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping – CII Project

Proposal for a Revised CII Calculation Method for Cruise Passenger Ships
Cruise Safety & Sustainability Forum (CSSF)

A Maritime Regulatory Sandbox: Investigating the Carbon Intensity Indicator (CII) Regulation
Thomas Browne, National Research Council of Canada

What Should be Addressed in the CII Review
RINA IMO Committee

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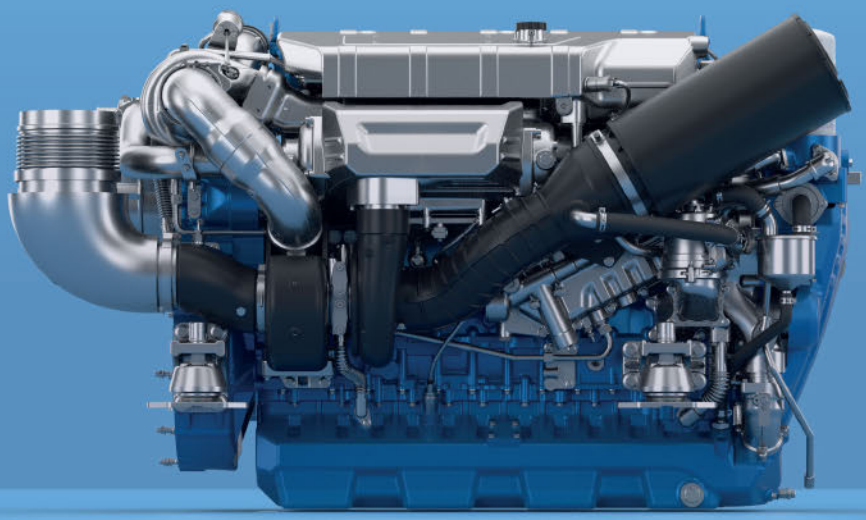

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