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WAVE OF RETROFIT PROJECTS BUILD METHANOL'S MOMENTUM

By **Daniel Johnson**

It would be fair to say that 2023 was a breakout year for methanol as a marine fuel. New orders for methanol-capable vessels saw a sharp increase, putting them ahead of those for other dual-fuel ship types, and the fuel also featured prominently in figures for vessels booked for retrofitting to enable them to run on alternative fuels. According to analysts, more than 100 methanol conversions were ordered last year.

Whether looking to reduce exposure under the EU's Emission Trading Scheme, comply with emissions intensity requirements under the FuelEU Maritime regulation entering effect next year, or adhere to IMO's interim and long-term GHG reduction strategy, converting in-service assets to methanol dual-fuel engines is increasingly seen as one of the ways shipowners and operators can achieve their environmental targets and news of retrofit projects has continued in 2024 with a flurry of announcements.

It has been reported that French shipping company CMA CGM, which so far has mostly invested in LNG-fuelled ships, has signed a contract with China State Shipbuilding Corporation for its first methanol conversions. The deal is expected to cover two 9,300TEU vessels built around a decade ago, with the commencement of the contract set for the beginning of 2025. Also in the container ship segment, vessel owner Seaspan has detailed plans for the first five of a potential 45 methanol conversions. The retrofits are scheduled to begin in the first quarter of 2026.

CMA CGM and Seaspan join a growing list of container ship owners moving to convert existing tonnage to operate on methanol that includes COSCO and Maersk – the world's first container vessel methanol dual-fuel retrofit, on the Danish shipping giant's 14,000TEU *Maersk Halifax*, is scheduled to start next month.

In other segments, Stena Line announced in May that it has selected two fast ro-ro vessels for methanol conversion. The retrofit process will convert two out of the four main engines aboard the ferries *Stena Superfast VII* and *Stena Superfast VIII*, which operate between Scotland and Northen Ireland, to run on methanol alongside MGO. The ships' bunkering, storage, fuel supply and supporting systems will also be adapted to methanol.

Stena Line's latest retrofit programme follows in the footsteps of the company's pioneering methanol conversion of the *Stena Germanica* in 2015. Classed by Lloyd's Register (LR), the ro-pax cruise ferry was the world's first methanol-fuelled passenger ship and is currently the only large vessel in service retrofitted for the alternative fuel.

Engine maker MAN Energy Solutions (ES) has said that it considers the potential market for retrofit dual-fuel engines, including methanol, as huge. It estimates some 1,900 ships with MAN two-stroke engines and up to 900 ships with four-stroke engines are eligible for conversion today and could save more than 97 million tons of CO_2 emissions annually when run on green fuels. The firm also notes that with an average ship lifetime of 25 years, from an economic perspective retrofitting for methanol can be much more efficient than building a new vessel.

STENA LINE IS TO CONVERT *STENA SUPERFAST VIII* TO METHANOL PROPULSION. SOURCE: STENA LINE

According to Michael Petersen, head of PrimeServ Denmark at MAN ES: "We are in the early days of a huge wave of dual-fuel retrofits and see many concrete projects coming online with the capacity to meet shipping's demand for green fuels such as e-methanol. We expect that owners who have opted to wait and watch over the past few years will ultimately also convert their tonnage to dual fuel."

The recent surge of interest in retrofitting for methanol dual-fuel operation has raised some safety concerns (see p.24) and if Petersen is correct about an imminent ramping up of conversions, stakeholders and regulators will need to come together to address those. Lessons from real life are important, so perhaps a good first port of call would be the *Stena Germanica*.

Building on the success of the 2015 conversion project, Stena Line has chosen to work with LR again on the retrofits of *Stena Superfast VII* and *Stena Superfast VIII*. The class society has already issued approval in principle for the retrofit design based on its ShipRight Risk-Based Certification Stage 2 and says that shipowners and operators can draw important lessons from the *Stena Germanica* project and its long-term collaboration with Stena Lines that has seen the vessel using methanol as a fuel safely for the past nine years.

Vessel owners and operators who have so far adopted a wait and watch approach to methanol retrofits will be closely following this early wave of conversion projects, as will *The Naval Architect*. ■

NEWS

FERRIES

BRITTANY FERRIES, INCAT AND WÄRTSILÄ PARTNER ON ZERO-EMISSIONS FERRY PROJECT

A CONCEPT DESIGN FOR THE NEW FERRY PROJECT. SOURCE: INCAT

Brittany Ferries, Incat and Wärtsilä have signed a partnership deal to explore design and technical requirements for a 137m zero-emissions vessel.

The project comes as Brittany Ferries nears completion of the biggest fleet renewal programme in its history. Five new vessels will have joined the fleet between 2020 and 2025, including two LNG-powered ships and two shore-power-ready LNG-electric hybrids.

The tripartite deal brings together heavyweight marine partners with complementary strengths. Expertise includes design and construction of fast craft, all aspects of engineering and technical needs, and experience in operating a large and diverse fleet.

Wärtsilä is a supplier to all five new ships in Brittany Ferries' on-going fleet renewal project. This includes LNG engines that power *Salamanca* and *Santoña*, which joined the fleet in 2022 and 2023 respectively. In addition, Wärtsilä is installing LNG-hybrid drivetrains for hybrid vessels currently under construction and set to sail for Europe by the end of this year.

Brittany Ferries took delivery of an Incat fast-ferry in 2005. The vessel served the company until 2021 under the name *Normandie Express* and is currently under charter from Brittany Ferries to Condor Ferries operating the St Malo-Channel Islands routes with the name *Condor Voyager*.

"This is an important project as we look at different ways to reach net zero by 2050," says Brittany Ferries CEO Christophe Mathieu. "All-electric power is a potential solution, best suited to shorter ferry routes. At this stage we don't know what is feasible, and upon which route, but what we can say is that trusted partners will help us scope it out."

GAS CARRIERS

DELTAMARIN AND ECOLOG PRESENT LCO_2 CARRIER DESIGN

Finnish ship designer Deltamarin and Greek mid-stream carbon capture, utilisation and sequestration (CCUS) service provider ECOLOG have unveiled a liquified CO_2 (LCO_2) carrier design with LNG dual-fuel propulsion.

According to Deltamarin, the intra-EU, short-range, low-pressure and shallow-draught vessel has been designed for the purpose of tendering in global shipyards.

The company says that during the initial design, various solutions had been studied to optimise the vessel for LCO_2 transportation, including different configurations of the cargo containment and handling system, considering the effect of the wide variety of CO_2 compositions.

In addition to dual fuel LNG, the vessel design also features onshore power capability and wind-assisted technology to help minimise the environmental footprint.

"The vessels will provide some of the lowest cost transportation of low-pressure CO_2 in Europe," says Deltamarin.

ECOLOG, a sister company of LNG shipper GasLog, plans to build and own a fleet of LCO_2 carriers to serve the emerging CCUS sector.

The company's strategy revolves around connecting hard-to-abate emitters with sequestration sites and re-use facilities, utilising its midstream infrastructure, including ships and terminals.

ECOLOG PLANS TO BUILD AND OWN A FLEET OF LCO_2 CARRIERS TO SERVE THE EMERGING CCUS SECTOR. SOURCE: DELTAMARIN

PEOPLE

FORESHIP APPOINTS NEW BUSINESS DEVELOPMENT DIRECTOR TO EXPAND COMMERCIAL SHIPPING VENTURES

Helsinki-based Foreship has appointed Jonny Berglund as its business development director, a newly created role aimed at enhancing the company's footprint in commercial shipping.

Berglund's extensive maritime career includes officer experience at sea and senior roles in ship energy and propulsion systems.

His appointment follows a strategic recruitment process by Foreship focused on expanding the company's high-value commercial design and project management services, particularly in container ships, LNG carriers and offshore support vessels.

According to the company, Berglund's role will leverage Foreship's expertise in environmental compliance, sustainability and ship decarbonisation to capitalise on new market opportunities.

With an initial target to grow Foreship's commercial ship presence in Northern Europe, UK-based Berglund will also be at liberty to develop opportunities elsewhere in Europe and in key maritime hubs in Asia.

"Being tasked with expanding Foreship's activities outside its market-leading position in the cruise industry is an exciting prospect," he says. "There is a huge opportunity for commercial owners to benefit from what Foreship is doing to assist cruise and ferry ships now to manage energy spend, reduce emissions and make progress on decarbonisation."

Berglund adds that he will look to leverage the ties Foreship has already established with commercial owners. Last year, for example, the company completed the concept design for Seaspan Corporation's ammonia-fuelled 15,000TEU container ship, working with the Maersk Mc-Kinney Møller Center for Zero Carbon Shipping.

FORESHIP'S NEW BUSINESS DEVELOPMENT DIRECTOR, JONNY BERGLUND. SOURCE: FORESHIP

IMO

IMO CONDEMNS RED SEA ATTACKS ON COMMERCIAL SHIPS, CALLS FOR IMMEDIATE END

The International Maritime Organization has condemned the recent attacks on commercial ships in the Red Sea and Gulf of Aden, deeming them "illegal and unjustifiable".

Meeting in May, IMO's Maritime Safety Committee (MSC) passed a resolution demanding an end to the assaults, which have significantly disrupted global trade and endangered seafarers.

The resolution comes in the wake of the Houthis' seizure of the vehicle carrier *Galaxy Leader* in November 2023 and marks the first official response from the IMO since then. Approximately 50 maritime attacks have occurred since the seizure, resulting in multiple seafarer casualties and the ongoing hostage situation involving the *Galaxy Leader*'s 25 crew members. IMO has called for their immediate release.

The resolution states: "The Houthis' reckless actions are putting innocent lives at risk, disrupting the delivery of urgently needed humanitarian aid, and destabilising the region." It urges influential parties to promote dialogue and diplomacy to resolve the crisis and highlights the obligation of all 176 IMO member states to prevent the supply of arms to the Houthis under a UN arms embargo.

The MSC's 108th session stressed the necessity for ship operators to carefully consider the risks of future transits in the region. The IMO has pledged to continue monitoring the situation and work with international stakeholders to seek a resolution.

IMO HELD ITS 108TH MEETING OF THE MSC IN MAY. SOURCE: IMO

NEWS ANALYSIS

DALI BACK AT BERTH AND FIRE CONCERNS HIGHLIGHTED

By **Malcolm Latarche**

INVESTIGATING BODY NTSB HAS ISSUED ITS PRELIMINARY REPORT INTO THE *DALI* INCIDENT. SOURCE: NTSB

Dali, the container ship that caused the collapse of the Francis Scott Key bridge in Baltimore along with six fatalities, has been removed from the scene of the incident and is now back at berth in the port for discharge of its cargo.

On 14 May, the US investigating body NTSB issued its preliminary report into the incident from which it is clear that the vessel's electrical power management system is considered as being the primary cause of the power loss that put the ship on collision course with the bridge.

Tests on the fuel on board have indicated that this should not have been a problem as some have conjectured. There had been some power loss incidents on *Dali* while the vessel was in port before leaving on its fateful voyage, but the NTSB report clarifies that this was not connected to fuel type rather a mistake by a crew member closing an exhaust damper on the sole running generator. This action effectively blocked the engine's cylinder exhaust gases from travelling up its stack and out of the vessel, causing the engine to stall. A second generator immediately kicked in but later cut out due to insufficient fuel pressure.

In re-establishing power, the crew did change over the breakers and transformers used on the power distribution system and it was with the newly configured arrangement that the ship put to sea the following day. The NTSB is continuing to investigate issues with the power distribution system and has said it will issue its final report within 18 months.

A perennial spot check of shipping safety is provided by the annual Safety and Shipping Review issued by German-based insurer Allianz. The report for 2023 published in May this year shows how the industry has improved its safety record. During the 1990s the global fleet of vessels over 100gt was losing 200-plus vessels a year. This total had halved by 10 years ago and is now down to a record low of 26 as of the end of 2023, a decline of more than one third year-on-year and by 70% over the past decade.

Cargo ships accounted for over 60% of vessels lost globally in 2023. Foundered (sunk) was the main cause of all total losses, accounting for 50%. Extreme weather was reported as being a factor in at least eight vessel losses around the world in 2023, with the final total likely higher.

A key takeaway from the report highlighted fire as a persistent risk. Although the number of fires in 2023 declined very slightly to 205, it remains the second highest total for a decade exceeded only by 2022's 209 incidents. There have been 55 total losses in the past five years due to fire.

Although there have been some well-publicised fires on vessels carrying EVs, of particular concern in recent times have been fires in engine rooms – especially on container ships. Last year both the Paris and Tokyo Memorandum of Understanding (MoU) on Port State Control carried out a Concentrated Inspection Campaign (CIC) on fire safety running from September to November.

The Tokyo MoU put out a preliminary report in March and Paris followed up in May with its final report. Both reports said there had been a high level of compliance, which given the advance notice of CICs should not be unexpected. Nevertheless, Tokyo detained 88 of the 7,190 ships subject to the CIC and Paris detained 151 ships from 3,856 inspections.

Fire safety was also on the agenda at the IMO's MSC 108 meeting held from 15-24 May where a number of new measures were approved entering into force in January 2026. These include amendments to SOLAS Chapter II-2 to reduce the risk and consequences of fire in ro-ro and special category spaces on new and existing ro-ro passenger ships, related amendments to the FSS Code were adopted to include new requirements for fixed water-based fire-extinguishing systems on weather decks intended for the carriage of vehicles and specifications for linear heat detection systems, and combined smoke and heat detection systems.

MSC 108 also adopted amendments to SOLAS Regulation II-2/7.5.5 to extend the fire detection requirements for cargo ships to include control stations and cargo control rooms. This means consequential amendments to the FSS and FTP Codes. ■

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NEWS EQUIPMENT

CLASSIFICATION

WÄRTSILÄ PROPELS RO-PAX VESSEL TO SILENT FIRST

Stena RoRo's new E-Flexer *Ala'suinu* has become the first ro-pax vessel to fulfil the DNV Silent(E) notation, satisfying the criteria in the operating conditions at 11 and 18knots.

The environment class notation from DNV was introduced to protect sensitive marine ecosystems and applies to vessels that demonstrate the ability to effectively reduce emissions of underwater radiated noise (URN).

The *Ala'suinu*, which was built at CMJL Shipyard (Weihai) in China, is equipped with dedicated controllable pitch propellers designed and delivered by Finnish technology group Wärtsilä.

The vessel is on a five-year lease to Marine Atlantic, a Canadian operator based in the province of Newfoundland and Labrador. Environmental sustainability was a prime consideration in the design of the 203m-long ship, according to Captain Anderson Noel, Marine Atlantic's director of fleet operations.

He says: "The *Ala'suinu* is a specially designed vessel for Marine Atlantic. We are fully committed to reducing the environmental impact of our operations, and in this vessel another dimension of sustainability has been added.

RO-PAX VESSEL *ALA'SUINU*. SOURCE: STENA RORO

The dedicated Wärtsilä propeller design enables us to minimise underwater noise for the benefit of marine life off Canada's coasts."

Bernd Bertram, vice president of propulsion at Wärtsilä Marine, adds: "For this project, we have designed and delivered propellers where vibrations and noise have been given the highest attention, in combination with the vessel design and operations. The vessel being awarded with the Silent(E) notation by DNV after successful testing at sea verifies the environmental benefits."

The *Ala'suinu* will sail between Nova Scotia and the island of Newfoundland from June 2024.

WIND PROPULSION

SPANISH SHIPOWNER OPTS FOR BOUND4BLUE WIND-ASSISTED PROPULSION TECHNOLOGY

Marflet Marine, a Spanish private shipping company, has announced a new step in its decarbonisation strategy by signing a contract with bound4blue to install four 22m-high eSAILs on its oil and chemical tanker *Santiago I*.

Scheduled for mid-2025, the installation will make Marflet the first Spanish shipowner to integrate wind-assisted propulsion (WAP) in its merchant fleet.

The eSAILs, a fully autonomous 'suction sail' technology, generates propulsion by drawing air across their aerodynamic surfaces, thus reducing conventional fuel use, optimising operational costs, and cutting greenhouse gas emissions.

THE SUCTION SAIL TECHNOLOGY WILL BE INSTALLED ON *SANTIAGO I* IN 2025. SOURCE: BOUND4BLUE

The technology requires no operational input from the crew and has already been adopted by industry leaders such as Eastern Pacific Shipping and Odfjell.

José Miguel Bermúdez, bound4blue's CEO, says that the easy installation of the eSAILs minimises additional engineering work and limits downtime, providing a clear advantage over other emission reduction technologies.

Modelling by bound4blue predicts a 10-15% reduction in annual energy consumption for *Santiago I*.

Juan Cremades, fleet manager at Marflet, says: "With bound4blue's eSAILs on board, *Santiago I* has a cost-effective means to optimise fuel efficiency and really drive down emissions, benefiting all our stakeholders. We see huge potential in wind, and we're thrilled to be the first mover in the Spanish merchant market to adopt such a breakthrough solution."

VALVES

NEWLY CERTIFIED METHANOL VALVES BRING GREATER FLEXIBILITY TO SHIP DESIGN

Advanced venting and valve solutions specialist Pres-Vac Engineering reports it has obtained certification of its high-velocity methanol valves under the IMO 1621 standard.

According to the Denmark-based company, the newly certified valves enable greater flexibility in ship design, accommodating long vent-pipes up to 128m for DN 65 size, with allowances for even longer pipelines.

This development offers shipbuilders and owners unique options in creating more efficient and compliant dual-fuel systems, the firm says.

"This certification marks an important moment for Pres-Vac as we provide the only valves on the market that meet such stringent standards," adds Sofia Alexandra Grave, R&D manager at Pres-Vac.

The valves, including the PV-ECO and PV-VOC models, incorporate advanced technological features such as improved flow control and minimised gas emissions and operate without electronic controls, adding a layer of safety to their functionality.

"Our products not only comply with but also exceed existing regulations, aiding shipowners in the transition to greener technologies and helping the industry meet stricter environmental standards," says Harshith Venkatramana, R&D engineer at Pres-Vac.

PRES-VAC ENGINEERING'S HIGH-VELOCITY METHANOL VALVES

PROPULSION

KONGSBERG AND SOLSTAD UNVEIL ENERGY-EFFICIENT UPGRADE FOR *NORMAND SENTINEL*

SUBSEA CONSTRUCTION VESSEL *NORMAND SENTINEL*. SOURCE: SOLSTAD

Kongsberg Maritime and Solstad have announced a major upgrade for the subsea construction vessel *Normand Sentinel* aimed at enhancing energy efficiency.

Solstad's 143m-long vessel will be equipped with Kongsberg Maritime's new electric rim-drive azimuth thrusters during its next scheduled drydocking.

Replacing the existing AZP 120 CP mechanical thrusters with the advanced RD-AZ2600 rim-drive thrusters is expected to significantly reduce fuel consumption, improve operability and decrease maintenance requirements.

"This strategic move supports the green shift by significantly reducing fuel consumption. Additionally, the technology improves the vessel's operability and capacity, while reducing the maintenance scope," says Tor Johan Tveit, chief operating officer of Solstad.

A detailed analysis by Kongsberg Maritime reveals that the new thrusters could deliver energy savings of up to 16% during transit operations and a substantial 40% in dynamic positioning mode.

James Poulton, SVP of aftermarket sales at Kongsberg Maritime, says: "Solstad's investment in this 10-year-old vessel is a bold statement of their commitment to providing energy-efficient and environmentally friendly maritime solutions. The anticipated energy savings, particularly in DP mode, will ensure the vessel remains a preferred choice in the market."

In addition to the energy savings, the transition to rim-drive thrusters should lead to a significant reduction in maintenance costs for Solstad. The rim-drive technology simplifies the propulsion system by minimising the number of mechanical components, which in turn reduces the frequency and complexity of maintenance interventions, according to Kongsberg Maritime.

THE *ROALD AMUNDSEN*, ONE OF A 1,000 SHIPS BUILT ON KONGSBERG MARITIME DESIGNS AND TECHNOLOGY. SOURCE: OSCAR FARRERA/ HURTIGRUTEN EXPEDITIONS

NORWAY

KONGSBERG MARITIME'S DRIVE FOR INNOVATION UNDERPINNED BY 50 YEARS OF PIONEERING SHIP DESIGN EXPERIENCE

By **Daniel Johnson**

From establishing the benchmark that set the standard for offshore supply vessels to advanced anchor handlers that transformed the oil and gas industry and a growing reference list in fishery and merchant ships, Kongsberg Maritime's ship design history can be traced back 50 years with its origins in the heart of what is today's maritime cluster on the west coast of Norway.

The company's renowned UT series of vessels began life in the 1970s when oil and gas companies started to venture into the North Sea. These early explorers soon found the only choice of offshore vessel – the simple service vessels used in the relatively shallow waters of the Gulf of Mexico – to be lacking in capability and seakeeping.

Step forward Ulstein Trading (UT), a small ship design company located on the wild and rugged Norwegian west coast. Consulting with local fishing fleet owners, who had extensive experience of working in the North Sea, the company, then part of Ulstein Group, set to work on the first vessels specifically designed for the area's harsh operating conditions. The result was the 'UT' design, and the first UT 704 platform supply vessel, *Stad Scotsman*, was delivered in 1974. This pioneering ship is still in service today, having gone through numerous changes of ownership and names.

Since 1974, more than 800 UT vessels have been built. While the majority are for offshore operations, the design has evolved to include a variety of other ship types including oceanographic research, coastal protection and most recently vessels designed specifically for operating in offshore wind farms. The latest UT delivery, the double-ended *IWS Skywalker*, is the first of six state-of-the-art wind farm service operations vessels for Norwegian customer Integrated Wind Solutions. The fully hybrid vessel, which can manoeuvre between wind turbines in either direction, features a range of Kongsberg Maritime equipment including main propulsion from four azimuth thrusters, various electrical systems and dynamic positioning.

In other markets, Kongsberg Maritime has delivered around 200 ships from its NVC family of designs. These include cargo ships, high-speed ro-pax ferries and an extensive range of vessels for the fisheries and

aquaculture market. The company's first exploration cruise vessel design, NVC 2140, is the latest addition to Hurtigruten Expedition's fleet of custom-built ships in the form of the *Fridtjof Nansen* and *Roald Amundsen*. The two ships are designed as Premium Class modern cruise vessels with a focus on high comfort with low noise, vibration and acceleration levels. Both feature advanced environmentally friendly technology to minimise emissions while they undertake expedition voyages in the Arctic and Antarctic regions, as well as traversing Norway's long coastline.

Like the UT, the genesis of the NVC portfolio also goes back 50 years and starts on the west coast of Norway, at a design house called Nordvestconsult specialising in fishing and dry cargo vessels. Nordvestconsult was acquired by the Ulstein Group in the late 1990s. Ulstein Group itself was subsequently sold to British company Vickers and then Rolls-Royce in 1999. In 2019 it became part of Kongsberg Maritime.

Huge pool of experience and data

Einar Vegsund, vice president of Kongsberg Maritime Ship Design, tells *TNA* that Kongsberg Maritime's 50-year journey in ship design puts it in a unique position to offer innovative solutions. "Our ship design portfolio is extensive, with designs for all market segments. With 1,000 ships designed so far, we can tap into a huge pool of experience and data," he notes.

Today, says Vegsund, the company's ship design philosophy is centred around three key pillars: safety, operational efficiency and sustainability. "The first is always safety," he stresses. "Many of our vessels operate in some of the world's harshest conditions, so safety is always at the forefront of our thinking for each design."

Operational efficiency is another crucial element. With shipowners and operators investing millions in vessels that can operate efficiently for decades, the design team works with them to fine-tune specifications and develop ships tailored for their exact needs.

The most significant driver impacting how Kongsberg Maritime designs ships in the present day is sustainability, according to Vegsund. "It's not only regulators that are demanding ships have lower emissions," he explains. "Owners, faced with higher fuel costs, want vessels that use less energy, so there is a shift towards more electrification and battery-hybrid solutions. The use of alternative fuels is another exciting area for us and we've already had approval to proceed with ships using methanol and ammonia fuels."

Based in Hjørungavåg and Ålesund, the Kongsberg Maritime ship design team includes naval architects and technology specialists within all disciplines, including extensive experience and understanding of hydrodynamical optimisation. With advanced design tools and AI, the team has an effective way of calculating the key elements of a ship's design, especially hull form.

A 'whole ship' approach

As part of a wider global technology company, Kongsberg Maritime Ship Design can draw on an impressive breadth of technology – mechanical, electrical and digital – that can be incorporated into its ships. "This adds a different dimension to what we can offer our customers," says Vegsund. "We can fully integrate our equipment within our design and consider a 'whole ship' approach, working with customers to offer modern solutions in an efficient way."

He adds, however, that while Kongsberg Maritime is perhaps most recognised for its in-house technology integration capabilities, in terms of ship design that is not the complete story.

EINAR VEGSUND. SOURCE: CECILIE HATLØY/KONGSBERG MARITIME

UT 5519 DE WIND FARM SERVICE VESSEL *IWS SKYWALKER*. SOURCE: KONGSBERG MARITIME

"Kongsberg Maritime produces a large range of products and systems, from highly efficient propulsion to deck machinery and advanced bridge systems, so naturally we look at how we can best combine our equipment in our ship designs," he says. "Sometimes that means we provide a ship with a lot of our equipment into an integrated solution, such as the oceanographic research ships or large anchor handler designs. Other times we work with customers to incorporate other technology in a way that can operate within our designs."

Vegsund says that the past five decades has seen major steps forward in terms of safety, technology and operational capability and predicts that the years to come will see an even faster rate of change. "Digital technologies play a big part in reducing emissions from ships and they also simplify and automate more aspects of ship operation going forward," he says. "This development will continue to influence how ships are designed, as will the need to accommodate alternative fuels in their various forms."

"Our designs continue to evolve to meet the challenges ahead and give owners the confidence to invest. It really is an exciting time to be a ship designer, and a unique opportunity to help shape the future of ship design and operation," he concludes. ■

INTEGRATING LOW-EMISSION SOLUTIONS FOR SEA TRANSPORTATION

As part of a wider global technology company, Kongsberg Maritime's ship design team can deliver a broad range of in-house energy-saving integrated solutions. They also work with customers to incorporate third-party technology in a way that can operate within their designs. A case in point is Kongsberg Maritime's award-winning hybrid, wind-assisted NVC 615CT tanker design for Danish tanker operator Terntank.

"We have good working relationships with suppliers of wind-assist technology, and while the company doesn't produce the sails, its strength is in integrating such technologies into the overall design to develop highly efficient ships," Per Egil Vedlog, chief designer at Kongsberg Maritime Ship Design, tells *TNA*.

The four MGO/biofuel and methanol-ready 15,000dwt ships, which are currently under construction at China Merchants Jinling Shipyard with first deliver expected next year, will also feature Terntank's own battery-powered Hybrid Solution. Kongsberg Maritime is supplying steering gear, rudders, controllable pitch propellers, tunnel thrusters and thruster control systems, integrated automation systems, propulsion control systems and deck machinery.

Vedlog says Kongsberg Maritime was excited to work on a project that incorporates so many energy-saving and clean technologies in one vessel. "These vessels are the next generation of ship and, through a progressive approach to introducing new technologies, we are delivering ships with an Energy Efficiency Design Index above 40% below the 2025 Phase 3 requirements," he adds.

The design's foldable Ventofoil suction sail solution has been developed in close cooperation with Dutch company Econowind. The technology is expected to reduce emissions by up to 19%.

The NVC 615CT's innovative, lower-emissions design achieved recognition last year, winning the highly competitive Nor-Shipping Next Generation Ship Award.

OPTIMARIN STRENGTHENS ITS POSITION IN THE BWTS MARKET WITH HYDE ACQUISITION

By **Richard Halfhide**

OPTIMARIN SAYS THE HYDE MARINE ACQUISITION WILL HELP PROVIDE SHIPOWNERS WITH CONFIDENCE THAT THE NORWEGIAN COMPANY WILL CONTINUE PROVIDING BWTS FOR MANY YEARS TO COME. SOURCE: OPTIMARIN

It seems barely any time at all since IMO's Ballast Water Management Convention entered into force but after the *sturm und drang*, not to mention prevarication, that accompanied it today's market for ballast water treatment systems (BWTS) has evolved into a mature and steady demand. According to class society DNV, as recently as 2019 there were around 60 different BWTS that had received IMO type approval, a number never likely to be maintained after the initial installation boom, and increasingly the more established system providers are looking to consolidate their positions through mergers and acquisitions.

In April, Norway-based BWTS provider Optimarin announced it had reached an agreement to acquire rival Hyde Marine UV from its Italian parent company Industrie De Nora S.p.A. Under the deal Optimarin has technologies, intellectual properties and provision of aftermarket services pertaining to the Hyde Marine and Hyde Guardian brands.

"The retrofit boom is over and the future will be the newbuildings and taking care of existing installations," says Tore Svanheld, who recently joined Optimarin as its new CEO. "We already have 1,700 systems sold and we want to show customers that we will be one of the main players for BWTS in the future. There are too many suppliers out there today for the newbuildings market."

Discussions about the acquisition began late last year shortly after De Nora announced plans to close down its marine business. Hyde Marine's UV-based system, which has been installed on around 600 vessels and has both US Coastguard (USCG) and IMO type approval, represents what Svanheld calls a "huge opportunity" for services and spare parts, as well as expanding Optimarin's reach in the Asian market. Additionally, Optimarin plans to open new production facilities in Asia in order to better penetrate the Chinese market.

Tore Andersen, Optimarin's EVP for marketing, adds that as the market adjusts shipowners ordering for newbuildings are looking for reassurance that their chosen system will prove to have some longevity. "With this acquisition we have shown the market that we will have ballast water treatment as a core product in the future."

Retrofits of retrofits

With a growing number of owners seeking to replace ageing or outdated BWTS, the retrofitting of retrofits is now becoming an important market, particularly with IMO's deadline for compliance with the more exacting D-2 standard pending in early September.

Andersen comments: "There are quite a few old systems, installed by Hyde but also by other manufacturers, that are too costly to upgrade because there were big changes for all of us in 2018 when IMO revised the G8 [Guidelines]. This will extend the retrofit wave for maybe a half year longer than we would have had on purely Optimarin.

"The retrofit orders we have received this year are for urgent delivery. A lot of owners have their backs to the wall and need to install urgently. Since we have kept our production facilities in Europe we are able to supply these within six weeks, which has given us a lot of sales this year."

However, Hyde's system has some notable differences with that of Optimarin and it's anticipated that the two technologies could be used in tandem as part of the same installation, therefore allowing Optimarin to offer a wider portfolio of solutions.

Andersen explains that while both systems are both UV and filter based their configurations differ somewhat. "The Hyde system's UV reactor is much smaller and has several lamps fitted into it, making it similar to our main competitor Alfa Laval's system. That means we have enough space for that UV part on smaller ships, such as the fishing fleet, as previously our lamps were too long to go in there."

Optimarin has also sought to expand its portfolio and future proof itself with new products, such as an oily water separator and sewage treatment plant. ■

INLAND & COASTAL VESSELS

INDIAN BUILDER RAISES ITS GAME

By **David Tinsley**, Correspondent

Since breaking into the export market nearly 20 years ago with a 12-ship coaster deal from northern Europe, the shipbuilding division of Indian mining and industrial group Chowgule has consistently raised its game in the production of short-sea dry cargo vessel tonnage.

The company's standing in the sector today is notable not only for the volume of work in hand to European account, but also for the extent to which the orderbook features vessels incorporating diesel-electric or hybrid propulsion systems.

Moreover, the recent acquisition of the former New Mangalore Shipyard has substantially increased Chowgule & Co's business reach beyond that afforded by its Loutolim and Rassaim facilities in Goa, which can construct vessels up to around 7,000dwt. The investment has been quickly endorsed by a contract from Germany for a series of 8,500dwt short-sea traders.

Over the past two decades, Chowgule's Goa output has included over 50 European-designed dry cargo vessels for interests in the Netherlands, Germany, Norway, Sweden and the UK, and the orderbook there stretches into 2027. The investment at Mangaluru (Mangalore) is intended to take Chowgule into a new league, by making the yard an internationally competitive supplier of vessels in the 7,000-25,000dwt range, including larger classes of coastal and intra-regional trader.

A new generation of green coasters

Starting with a long run of 4,500dwt multi-purpose cargo ships, and progressing through the production of various designs of 'maids-of-all-work' in the 4,200-5,650dwt range developed in conjunction with Conoship International, Chowgule signalled its shift towards the higher added-value segment of the short-sea category by securing contracts for a new class of 5,400dwt coasters featuring a hybrid power setup. The entire series of 12 vessels was ordered in three tranches, the initial six-ship commitment having been made by Finnish dry bulk specialist ESL Shipping through its Swedish subsidiary AtoB@C Shipping in September 2021.

Dubbed the Green Coaster generation, the design and model testing were undertaken in conjunction with the Dutch company SMB Naval Architects & Consultants. The versatile vessel type employs a fuel-flexible Yanmar diesel main engine, complemented by a Corvus battery pack of nearly 1MWh enabling fuel-saving, zero-emission port stays, manoeuvring and peak shaving.

CHOWGULE'S LOUTOLIM YARD IN GOA. SOURCE: CHOWGULE & CO

First-of-class *Electramar* was completed in December 2023. The 90m design is suited to the transportation of manifold bulk goods and breakbulk products, with trading flexibility enhanced by movable bulkheads in the single box-like hold, and by strengthening to Finnish/Swedish ice class 1A standard and for loading and discharge aground at tidal berths. The forward arrangement of bridge and accommodation has optimised the hull envelope for revenue-earning, and creates a long, unobstructed deck which allows for more weatherdeck-borne cargo and longer items of project freight.

The ship's configuration, the nature of the powering arrangements and compactness of the machinery spaces is claimed to yield up to 20% more cargo capacity and cut CO_2 emissions per cargo unit by as much as 50% relative to coasters of similar size.

The Yanmar medium-speed engine's nominal maximum output of 1,920kW meets the requirement for the modest laden speeds that typify the coastal and short-sea traffic. Besides mainstay low-sulphur fuel, the machinery is also able to burn various renewable fuels or diesel blends such as the 0.1 Co-processed low-emission marine fuel produced at Neste's Porvoo refinery in Finland.

The new vessels are currently exempt from the Carbon Intensity Indicator (CII) and EU emissions trading regulatory requirements due to the design's gross tonnage measurement (4,200t) lying below the 5,000gt threshold. Nonetheless, and for the benefit of customers as well as the company's own oversight and planning, the Swedish operator has established an internal reporting system to calculate emissions and CII rating for each Green Coaster. Deliveries of the final units in the programme are anticipated by 2026.

Parallel production of a series of diesel-electric coasters booked by Vertom Group of the Netherlands has been implemented at the Goa yards. The contract

encompasses 12 newbuilds of 5,600dwt, accounting for delivery slots as far ahead as 2029, using a custom-made design developed in conjunction with Groot Ship Design and conceived in line with a fleet renewal strategy intended to put Vertom on the path towards eventual decarbonisation.

The ships from India will share the same platform and makers' list as the 7,300dwt Labrax-type newbuilds in production for Vertom on home ground at the Kampen site of Thecla Bodewes (TB) Shipyards. While the 5,600dwt ships from India will be shorter at 99m, relative to the 118.6m of the Dutch-built 7,300-tonners, the beam will be the same, at 14.3m. Respective gross measurements are 3,840gt and 4,750gt.

The same distributed diesel-electric power and propulsion concept will be adopted in the Indian series. Each of the latter has been specified with four main generators, rated at 405kW apiece, feeding two 650kW propulsion motors and a 400kW bow thruster. It is anticipated that the 10knot design service speed, on a full-load draught and at a shaft power of 920kW, will be achieved using three generators, leaving the fourth as the standby unit or to meet particular sea conditions.

The power arrangements have been conceived in mind of future technological opportunities and the progression towards ever-lower environmental impact, by offering possibilities for adaptation to methanol-electric or hydrogen-electric propulsion.

The vessels will embody a single hold of 260,000ft³ (7,362m³) volume compared to the significantly larger capacity – 329,500ft³ (9,330m³) – encapsulated by the two-hold ships from Thecla Bodewes. In both cases, added hydrodynamic efficiency and improved seakeeping in heavy weather are imbued through the Groot Cross Bow configuration.

Adopting the same design platform and elements as the Dutch-built series, five of which are already in service, has provided Chowgule with reliable insights and information in advance, contributing to the efficiency of the build process. This approach also promises future fleet technical management benefits for Vertom, engendering greater uniformity in equipment and operation.

Dutch/German diesel-electric series

Through the contract sealed last November spanning four 8,500dwt diesel-electric cargo vessels, Boomsa Shipping of the Netherlands and Germany's Leonhardt & Blumberg have become the launch customers for Chowgule's recently acquired and renovated shipyard at Mangaluru (Mangalore). Deliveries to the Dutch/

THE HIGH CUBE 8500 DESIGN TO BE BUILT BY CHOWGULE AT MANGALORE. SOURCE: CONOSHIP

German partnership are scheduled to get under way in the autumn of 2025, and options attached to the order hold out the possibility of an eventual eight-ship series.

The low-emission design has been developed in cooperation with Groningen-headquartered Conoship, and the Dutch imprint on the project is all the greater for the brokerage role played by the JR Shipping Group. The Rotterdam company NewTide Chartering, an affiliate of Boomsa, will be responsible for the commercial management of all the vessels, which will form the High Cube 8500 flotilla.

Employing a forward bridge and accommodation arrangement, the new breed's High Cube designation reflects the 13,900m³ (approximately 491,000ft³) capacity in a single box-shaped hold, which will feature a portable, complete tweendeck. Open-top certification will give added cargo flexibility.

According to Conoship, the optimised diesel-electric system yields a reduction in the propulsion power requirement by 50-60% compared to existing tonnage, while the overall energy performance will be such as to cut CO_2 emissions by at least 50% and potentially up to 90%. Long-term asset and trading value considerations are implicit in design preparation for wind-assisted propulsion (notably the eConowind solution), carbon capture, and emission-free operation on batteries so as to lower emissions even further.

Given the rapid growth in Indian container ports and terminals, and the country's bid to stimulate greater use of coastal and river transportation, fostering a modal shift on efficiency and environmental grounds, Chowgule's portfolio includes a class of small feeder ship developed together with Groot Ship Design. Offering an all-up payload of 106TEU, the river/sea container carrier in its first iteration introduced a shuttle service between Mormugao and Mumbai.

On a length overall of 67m, the vessel is arranged with the superstructure located forward, maximising use of the hull envelope and affording protection to the underdeck spaces for open-top operation. The central section incorporates two small holds, which can be closed with hatch covers, fore and aft of which are slots for boxes carried directly on the main deck. Self-sufficiency in cargo handling is assured by a pedestal-mounted Liebherr 30t crane amidships.

Obviating the need for a main engine room, and in keeping with design and maintenance simplicity objectives, a deck-mounted propulsion system has been adopted. The solution is based on two 294kW Volvo Penta diesels powering ZF rudder propellers, giving a fully laden speed of about 8knots. A small machinery room is arranged in the foreship to accommodate two 168kW auxiliary gensets.

Boosting Chowgule production wherewithal this year at a time of evidently robust demand from the European market and potentially elsewhere, New Mangalore Shipyard was purchased following the bankruptcy of shipbuilder Bharati Defence & Infrastructure. The acquisition has been followed by a far-reaching upgrading programme at the 49acre facility. ■

DIVERSITY & INCLUSION

MARITIME'S DIVERSITY CHALLENGE IN THE TECHNICAL SECTOR

By **Richard Halfhide**

Across the entire maritime sector women account for 29% of the overall workforce, but as data published in the 2021 IMO-WISTA (Women's International Shipping & Trading Association) Women in Maritime Survey Report revealed there are enormous disparities not only between different countries but also different sub-sectors.

The survey of member states indicated that women now constitute a significant proportion of training staff (30%) among national maritime authorities, as well as diplomatic roles (33%). However, it's a markedly different picture with regard to women in specialist technical and operational roles (14%), while women seafarers account for a paltry 2% of the entire workforce.

It's the shortage of women in senior technical positions in particular – be they naval architects, inspectors, or surveyors for classification societies – that is a concern for Elpi Petraki, who was appointed president of WISTA International in 2022.

Petraki tells *The Naval Architect* that she believes that although there is a desire among shipping companies to redress the balance, outdated approaches to recruitment and what constitutes suitable experience for these positions is still proving an obstacle.

She explains: "The model in shipping that worked well for many years was based on experience on board the vessel. It was the captains, chief engineers, electricians who would then move on to manage the different departments within a company. With that in mind they look for others like them who have similar backgrounds. When shipping companies grow towards more of a corporate culture – searching outside that vessel idea – it becomes easier for women to get in."

Lack of support?

Commendably, in Petraki's native Greece a high percentage of naval architecture students are now women, a figure that would certainly be the envy of many northern European universities. Petraki herself has pushed for more maritime scholarships to be awarded to female students in her previous role as president of WISTA Hellas. Yet for a variety of reasons few of these progress to take on roles such as a shipping company's principal naval architect and don't always receive the support they need.

Petraki notes her own shock when her daughter, a mechanical engineering student, was questioned by teachers on why she wanted to study a traditionally 'male' subject. In her previous role as president of WISTA Hellas, she encouraged such initiatives as tours of Greek shipyards for female students so that they can see for themselves the potential opportunities. Increasingly the emphasis is upon ensuring these aren't empty promises but a genuine commitment to promoting diversity.

"We can't tell them you can study that and then not have a job for them or discriminate against them. Clearly, the more mixed the working environment, the healthier it is for everyone. By showcasing to people what can be achieved, highlighting role models that have done so, it helps them believe they can do it as well. Meanwhile a mixed environment demonstrates that companies are fully behind diversity in the workplace; whatever the gender, employees just need to be capable and talented," Petraki says.

IMO and WISTA are soon to conduct the second Women in Maritime Survey which will run from September to December 2024 – the results for which are due for publication in 2025. "We hope that the new statistics might show some improvement in the last three years in women working in technical roles," notes Petraki. "This is important, because with the huge decarbonisation challenge ahead, we need all the great minds working toward that."

A career in shipping

Being herself the daughter of maritime professionals, Petraki says she was drawn to the excitement of the shipping industry from an early age. After

ELPI PETRAKI, PRESIDENT, WISTA INTERNATIONAL

WOMEN OCCUPIED JUST 14% OF SPECIALIST TECHNICAL AND OPERATIONAL ROLES IN THE 2021 IMO-WISTA SURVEY. SOURCE: IMO

studying Maritime Business and Maritime Law in the UK at Plymouth, followed by a master's degree in International Transport and Trade from Guildhall University, she joined short-sea shipowner and operator ENEA Management. Her 26 years with the company have seen her take on a variety of roles before rising to her current position as the company's chartering and operations manager.

WISTA has been a part of her career from the very beginning. "I met this network of women who inspired me," she says. "In those days, often when you attended a conference the only other women you knew were your WISTA fellows - you had someone to relate to. It made me feel capable, secure and allowed me to develop a network of my own, nationally and internationally, that wouldn't otherwise have been possible. Gradually I started being more involved, first with WISTA Hellas and then WISTA International, and really saw the value of it."

Petraki stresses she was always treated with respect by her colleagues but that it's also important to show that you deserve it. Although not an advocate of so-called positive discrimination (whereby underrepresented groups are given preferential treatment when applying for positions), within her own company she has worked hard to create openings for capable women to advance in their professional careers and break through the glass ceiling.

She says: "To give one example, the HSEQ manager at our Piraeus office is a woman. She was an assistant in the technical department, although she didn't originally study in a technical profession. Now she visits the vessels and interacts with the personnel on board, giving instructions on what they could do better.

"When recruiting for our technical department we do try to give opportunities to women but candidates are not always so easily found. There's clearly a need to make women aware of the opportunities available in technical roles in shipping-related companies. I firmly believe that we need more women onboard vessels and in engine rooms, even if just for a few years of service."

New opportunities

Naturally, during Petraki's career she has witnessed huge changes in areas such as ship-shore communications, from the days of the humble telex and GPS tracking to today's constant exchange of information that has seen many of the operational decision-making taken away from the masters and into the office.

"I think digitalisation has made life easier for all of us. Connectivity is available everywhere and women need that freedom sometimes," says Petraki, adding: "Technology, whether on board the vessel or at a shipyard, no longer requires the same physical strength because you have machines doing it for you. There are also far more facilities that can accommodate women; in the past if you were at a port or shipyard you wouldn't always find an easily accessible toilet. How can you apply for a job where you can't even go to the bathroom?"

The challenges posed by decarbonisation and digitalisation of the industry, not to mention the regulatory compliance designed to help realise those goals safely and effectively, is levelling up the field with regard to the traditional gender divide. A prime example being the challenge of developing vessels capable of running on alternative fuels and energy sources. It's something where smaller operators don't usually have the luxury of making bad investments and need the input of the brightest new talent.

Petraki says: "Every day we're seeing new ship designs emerging. What will be the alternative fuel on board a vessel that will make sense in terms of availability? In the Mediterranean we find that LNG is hardly available at all, so how would you fuel that vessel?

"These new challenges make the shipping industry exciting, whilst ensuring opportunities for new talent, whatever the gender. On behalf of WISTA International, I'm involved with the UN and European taskforces for training the next generation, and hope to help that we don't make the same mistakes as in the past – and ensure that roles are available for everybody." ■

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RNLI PROMOTES DIVERSITY IN MARINE ENGINEERING AS ORGANISATION CELEBRATES 200TH BIRTHDAY

By **Tom Barlow-Brown**

The topics of marine engineering and safety are intrinsically linked. No clearer is this connection than in the Royal National Lifeboat Institution (RNLI), which celebrates its 200th anniversary this year. Throughout its storied history women in the organisation have been crucial to this both on land and at sea and are still driving change to ensure a safer maritime future.

Heather Nice, a seasoned CAD PDM and configuration manager at the RNLI, is a testament to this progressive movement.

Nice initially embarked on a path in psychology. However, after graduating university her career trajectory turned to the nuclear sector, where she discovered her penchant for configuration management. Keen to find a role that aligned with her personal values, Nice transitioned to the RNLI, captivated by its steadfast moral compass and dedication to saving lives at sea.

Reflecting on her transition, Nice remarks: "I had transferable skills from my previous job, so I was trying to decide if I wanted to stay in nuclear engineering or whether I wanted to work for an organisation that had really strong morals and apply them that way. The RNLI is a company that I have always admired, and they've got great values. So, I thought, this is great. I need to apply for that role."

Positive role models

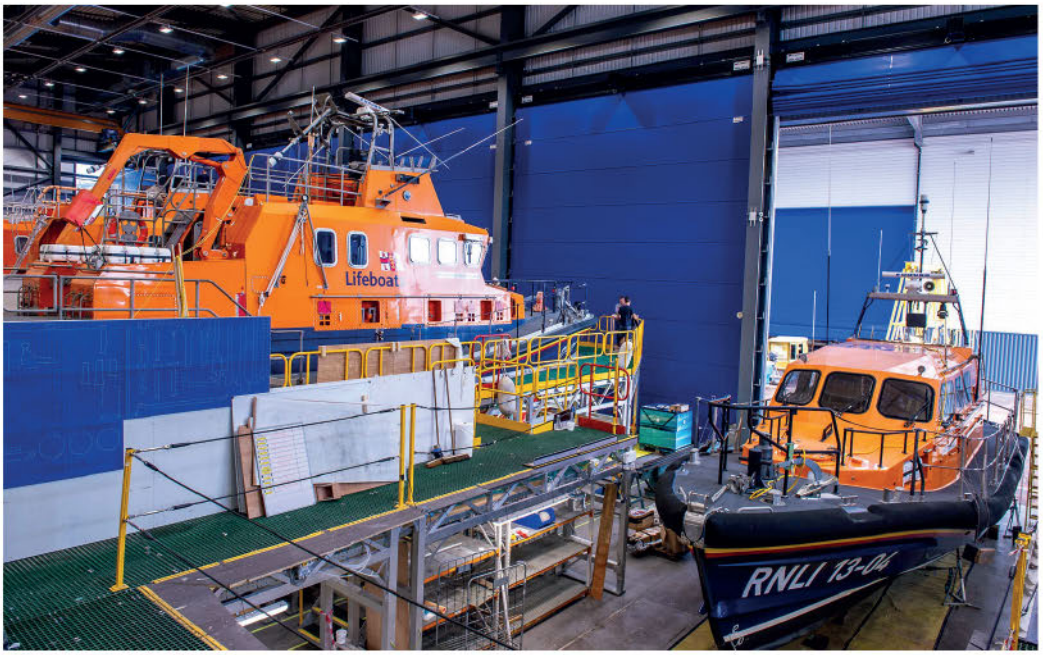
At the heart of Nice's work ethic lies a fervent belief in fostering inclusivity and diversity within the RNLI. Championing initiatives tailored to support women in engineering roles, she accentuates the pivotal part positive role models play in sculpting the industry's fabric. "I think a diverse group is a good group. You get a lot of different opinions and perspectives," Nice emphasises.

"In a workplace you have to take all of that on board and when managing a team, you've got to decide who is the best fit is and how they'll work together. But personally, I fully think that a diverse team is a better one," she adds.

Based at the RNLI Support Centre in Poole, Dorset, Nice is responsible for managing the field project data management (PDM) and computer aided design (CAD) teams within the organisation. Her passion for technology and data management resonates through her work. One key project her team is responsible for is an upcoming meticulous review of the RNLI's inshore lifeboats and the exploration of sustainable propulsion methods.

Embracing her role as an advocate for aspiring engineers, particularly women, Nice extols the satisfaction derived from contributing to the RNLI's lifesaving mission. "I genuinely love data, information, documentation, making sure that everything is fit for purpose, organised and accessible," she explains.

HEATHER NICE, RNLI. SOURCE: TOM BARLOW-BROWN



THE RNLI HAS BEEN SAVING LIVES AT SEA SINCE 1824. SOURCE: TOM BARLOW-BROWN

Nice's career journey is another example in the history of the RNLI, an institution which has many famous women in its ranks. From Grace Darling, the heroine in the rescue of survivors from the shipwrecked *Forfarshire* in 1838, to Elizabeth Hostvedt, the first official female crew member in 1969, women have played a transformative role in the RNLI's narrative of courage and resilience. Nice's role illustrates this legacy in a new era of inclusivity.

"The RNLI is a charity that I always knew about and admired growing up, it's one that my parents always supported," says Nice.

In tandem with Nice's work, the RNLI's commitment to gender equality is backed up with tangible statistics. With 34% of its employees being female, the RNLI demonstrates a progressive stance towards inclusivity and diversity. Moreover, initiatives such as the Women of the RNLI exhibition, which opened recently at the Royal Maritime Museum Greenwich, illustrate the organisation's commitment to amplifying female voices in the maritime sphere.

Statistics paint a stark picture

Despite historically being underrepresented in the maritime sector, women like Heather Nice are increasingly recognised for their significant contributions. However, the broader statistics paint a stark picture of gender disparity within the industry. According to the International Maritime Organization, women represent only 1.2% of the global seafarer workforce as per the BIMCO/ICS 2021 Seafarer Workforce Report. Statistics for the EU show that of 292,000 people aged 15-64 years working in the marine sector in 2022 almost eight out of 10 were men. In the United States, women comprise around 18% of the maritime industry's workforce, with the majority employed in administrative and shoreside roles rather than seafaring positions, while in the United Kingdom, women account for roughly 4% of the maritime workforce, with an increasing presence in traditionally male-dominated roles such as engineering and navigation.

Globally, women hold only a small percentage of leadership positions in the maritime industry, with estimates ranging from 1% to 5% of top executive roles. While there has been progress in recent years, women still face barriers to accessing education and training in maritime-related fields. In some regions, cultural norms and gender stereotypes may discourage girls from pursuing careers in maritime engineering or navigation. Women's representation in seafaring positions, such as captains, engineers, and deck officers, remains particularly low, with estimates suggesting that less than 1% of seafarers worldwide are women.

These statistics underscore the ongoing challenges and disparities faced by women in the maritime sector, highlighting the importance of initiatives aimed at promoting gender equality, increasing access to education and training, and creating inclusive work environments. The efforts of organisations like the RNLI to support and empower women in maritime engineering roles are crucial steps toward addressing these disparities and building a more diverse and equitable maritime industry. Through the dedication and advocacy of individuals like Nice, the maritime sector can continue to progress towards a future where women are fully represented and recognised for their contributions to maritime engineering and beyond.

Nice's journey within the RNLI symbolises the ongoing transformation of women's roles in maritime engineering. Her story highlights the importance of inclusivity and advocacy in shaping a more equitable industry. However, broader statistics reveal persistent gender disparities, emphasising the need for continued efforts to promote gender equality and access to education. Nice's journey inspires hope for a more inclusive future in maritime engineering, where women like her can thrive and make significant contributions. ■

RETROFITS

EXISTING FIREFIGHTING METHODS AND SAFETY RULES NOT READY FOR GROWING INTEREST IN METHANOL RETROFIT PROJECTS, WARNS NEW STUDY

By **Daniel Johnson**

SURVITEC TESTS FOUND THAT WHILE WATER MIST SYSTEMS ARE HIGHLY EFFECTIVE IN ABSORBING HEAT AND DISPLACING OXYGEN ON DIESEL FIRES, THEY DO NOT PRODUCE THE SAME RESULTS ON METHANOL FIRES. SOURCE: SURVITEC

Methanol as a low-carbon fuel is an attractive choice for vessel owners and operators as they look to transition to net zero. Orders for methanol-fuelled newbuilds have increased 9% in the last 12 months, 2% more than those for LNG-fuelled ships. There has also been a surge of interest in converting existing ships to use the fuel, with Maersk, Seaspan and COSCO, amongst others, all recently announcing significant methanol dual-fuel retrofit projects.

Without doubt, shipping will need to draw on these retrofits if it is to have any hope of reaching IMO's interim emissions targets – it is a powerful measure that can be implemented relatively quickly. However, as the number of owners and operators looking to convert their vessels to methanol dual-fuel operation continues to grow, so does the risk of future catastrophe.

That is the stark warning from global survival technology solutions provider Survitec, which is calling on the industry for immediate action to prevent dangerous gaps in fire safety. The alert follows the conclusion of a new safety study carried out by the company that reveals existing firefighting methods used to extinguish machinery space spray and pool fires on conventionally fuelled vessels are inadequate when dealing with methanol-based fires.

For the study, extensive comparative fire tests were carried out on dual-fuel marine engines using diesel oil (DO) and methanol.

Another approach needed

"Our findings indicate that if existing vessels are retrofitted to run on methanol, they will also need a complete overhaul and redesign of their fixed firefighting arrangements. The challenge now is to communicate that to shipowners, operators and class societies," Michal Sadzynski, product manager for Water Mist Systems at Survitec, tells *The Naval Architect*.

Sadzynski explains that Survitec's tests confirm that traditional water mist fire suppression mechanisms do not perform as expected on methanol pool fires and methanol spray fires. "Another approach is needed," he says.

Methanol is a methyl alcohol (CH_3OH) that burns in a completely different way than hydrocarbon fuels and has a much lower flashpoint of 12°C. However, while there are established fire safety regulations and testing standards for diesel fuels, clear test protocols for alcohol-based fuels such as methanol and ethanol have yet to be developed.

"We believe this is a high-risk situation that needs immediate action," says Sadzynski. "Methanol fires are far more aggressive than fires involving traditional hydrocarbon fuels. Methanol fires have different physicochemical properties and so they cannot be extinguished as easily or with the same approach."

The Survitec tests found that while local application firefighting (LAFF) water mist systems are highly effective in absorbing heat and displacing oxygen on diesel fires, they do not produce the same results on methanol fires.

"For a diesel fire, water mist has two mechanisms at play," notes Sadzynski. "First, very small droplets of water falling on the flame take energy out of it, and secondly the barrier created around the flame by the water mist makes it hard for oxygen to get to the flame, causing suffocation of the fire. For a diesel fire, it's the perfect system – that's why it's so popular.

"Methanol is a totally different story. Because methanol is an alcohol it can mix with water so having small droplets of water falling on the fire is ineffective. The second mechanism, suffocation, is also redundant as methanol has its own oxygen, so is still able burn."

Survitec's solution was to completely rethink nozzle placement, spacing and other factors to make water mist suppression effective on methanol.

"We can now assure that this system will work when used for methanol fires, which is critical when considering local application firefighting systems," says Sadzynski.

He points out that the LAFF system is the only firefighting system on the vessel that releases automatically if a fire starts and so is key to the prevention of serious injury to crew or significant damage to equipment. "What's important for you as the operator or owner of the vessel is to extinguish the fire as soon as possible. If not, it will spread. If it spreads, it will prove very costly," Sadzynski says.

He adds: "After the local application system, there is the total flooding system. For methanol, we believe the best solution would be a gas-based system. But it's not automatic and relies on human reaction. With a gas-based system, questions around whether or not all of the fire dampeners and doors are closed and if all the crew are evacuated from the space can delay the release. Also, the decision to deploy a system that costs a lot of money has to be made. It takes time, and in that time the fire is still on the engine and it's still burning equipment that you will need to repair or replace."

MICHAL SADZYNSKI. SOURCE: SURVITEC

Tackling pool fires

For bilge areas, statutory rules formulated in IMO's interim guidelines for ships using methyl or ethyl alcohol as fuel, MSC.1/Circ.1621, establish a requirement for an approved alcohol-resistant foam system for ships running on methanol. For the first time, a fixed, low expansion foam system is mandatory under the rules when it comes to protecting machinery space bilges.

Maciej Niescioruk, product manager, Foam Systems, Survitec, says: "Our tests demonstrate that standard discharge devices do not properly extinguish methanol pool fires in the confined bilge space. It is crucial to deliver properly expanded foam on the methanol pool fire and this is not an easy task within such a narrow space where throw length is limited."

According to Niescioruk, MSC.1/Circ.1621 provides the industry with a starting guideline but it is very general and therefore open to interpretation. "For example," he says, "for the total flooding system it says that it needs to be checked and verified that it works but if there is a lack of information on how to design a particular system, please refer back to existing rules, et cetera. This can lead class societies to approve a system not by actually fire testing them, but through pure legislative action.

"Moreover, methanol compliance for local application firefighting systems is not yet covered."

Some newbuilds may require retrofits

Niescioruk tells *TNA* that it is difficult to say how many of the methanol-ready ships already in operation and newbuilds ordered have firefighting systems on board that are capable of firefighting a methanol fire, but that it is very likely that a number will need some modification to render them safe if the current arrangement of equipment is based on the rules that exist for diesel engines.

On the back of the new safety study, Survitec is encouraging all stakeholders to come together to address methanol's unique fire risks and create clear standards, new testing protocols and updated safety rules for methanol.

"What is important for Survitec now is to raise awareness of the issue," says Sadzynski. "For example, we recently had one customer approach us for a retrofit project who didn't appreciate the difference between methanol and diesel fires until we presented our results."

"We hope that the findings in this study and continued research will give a better understanding of methanol as an alternative ship fuel and safer conversions to methanol in the future," concludes Niescioruk. ■

ACCOMMODATION & INTERIORS

CREW ACCOMMODATION 'JUST A PART OF THE MACHINE' AMID MOVE TO PRIORITISE COMFORT

By **Tom Barlow-Brown**

In the Michael Palin documentary Around the World in 80 Days, which premiered in 1989, a central mode of transport was the cargo vessel, on which the presenter travelled at many points in his adventure. During one leg of his trip the captain of the *Neptune Diamond* sailing from Singapore remarks, "In a few years a trained monkey could do this job... We are here to make money. That is all a ship is built for, to make cash." This sentiment feels increasingly prescient in a world where efficiency is top priority, and the needs of the crew are placed second.

In the maritime industry, the design of accommodation for seafarers is a topic that has garnered increasing attention in recent years. As the Seafarers Happiness Index (SHI) reveals, the quality of living spaces aboard ships significantly affects the well-being and job satisfaction of the crew. Steve Jones, a representative from SHI, argues that while the design of crew accommodation has evolved seafarers still face ongoing challenges.

Jones emphasises that modern ship accommodations have become more sterile and functional, often prioritising compliance with regulatory requirements over comfort and aesthetic appeal. "It's just a part of the machine that people happen to live in," he notes, lamenting the lack of investment in making these spaces more welcoming and enjoyable for the crew. A further shift towards utilitarian design reflects a broader industry trend where technical aspects and cost-saving measures overshadow considerations for crew well-being.

The evolution of ship accommodation design has led to a noticeable decline in the quality of social and

THE NEEDS OF THE SHIP'S CREW USUALLY COME SECOND IN A WORLD WHERE EFFICIENCY IS THE TOP PRIORITY. SOURCE: MARLOW NAVIGATION CREW & SHIP MANAGEMENT/CREATIVE COMMONS

THE LACK OF COMFORTABLE AND INVITING AREAS FOR RELAXATION AND SOCIAL INTERACTION CAN DETRIMENTALLY AFFECT THE MENTAL HEALTH AND OVERALL MORALE OF THE CREW

recreational spaces on board. According to Jones, ships today are equipped with minimal and often inadequate amenities. "That certainly comes across now in the SHI where people say there's just nowhere to really go when they've finished their shift," he explains.

"We've got gyms that are tiny and rubbish, there's a saloon, but that is usually only dining chairs, which are okay for 20 minutes while you're scoffing your food, but you wouldn't want to sit in to relax for a long time," he adds, highlighting the lack of comfortable and inviting areas for relaxation and social interaction. The absence of such spaces can detrimentally affect the mental health and overall morale of the crew, making their time at sea feel more like an ordeal than a fulfilling experience.

A lack of discourse

Furthermore, Jones points out the disconnect between the emphasis on the technical elements of shipbuilding and the neglect of accommodation quality. He argues that this imbalance results in a diminished seafaring experience, contributing to dissatisfaction and potentially deterring future generations from pursuing careers at sea. "There's so much talk about propulsion and technical details, but you very rarely, if ever, hear a discussion about accommodation and how we can maximise the experience for seafarers," Jones observes.

This lack of discourse about the human side of ship design underscores the need for a change in thinking in the industry. "Unfortunately, it's also manifest because increasingly there are fewer people in shipping companies that have actually been to sea," Jones adds.

Captain James Foong, a seasoned mariner, echoes these sentiments and offers practical insights into the specific challenges faced by seafarers about their accommodation. He underscores the importance of soundproofing, noting that poor sound insulation can severely disrupt rest hours.

"The sound penetration between cabins is a problem. The ringing of a telephone in one cabin can disturb someone sleeping in the next cabin," Foong explains. This issue is compounded by the placement of cabins near noisy areas such as the engine room or laundry facilities, which can further worsen sleep disturbances and reduce the quality of rest for the crew.

Foong also highlights the impact of modern conveniences, such as Wi-Fi, on the usage of recreational spaces. He notes that the need for communal recreation rooms has decreased as crew members increasingly prefer to stay in their cabins and use their personal devices. This shift presents an added challenge for designers who must now consider how to create private yet comfortable living quarters that cater to the crew's evolving needs.

Some progress and ongoing challenges

Adding to this discussion, a study conducted by the Seafarers International Research Centre (SIRC) at Cardiff University in 2019 offers detailed insights into the mental health and well-being of seafarers. Directed by Professor Helen Sampson and researcher Neil Ellis, the study gathered feedback from over 1,500 seafarers, more than 40 shipping company HR managers, and representatives from employers, maritime charities, and P&I clubs. The research revealed a mixed picture of progress and ongoing challenges.

One positive finding was the increase in the number of seafarers satisfied with their cabins, with those rating their shipboard accommodation as good or very good rising from 51% to 74% over five years. The proportion of seafarers on tours longer than six months also decreased from 55% to 34%, and satisfaction with the quality of food onboard improved, though around one-third still described the food as unhealthy.

However, the study also highlighted significant issues: while onboard internet access had improved, many seafarers complained about time limitations or having to pay for access. The proportion of seafarers unable to get adequate rest all the time rose from 35% to 53%, and 60% reported being disturbed by noise, with 59% affected by vibrations in their cabins. Furthermore, reductions in recreational facilities and an increase in the number of seafarers never able to take shore leave from 7% to 11% were reported, illustrating the ongoing challenges in improving seafarer welfare.

Idwal, a company that provides owners and operators with a tool for assessing many aspects of vessel performance, also assesses aspects such as crew welfare. Thom Herbert, senior marine surveyor Asia and Idwal crew wellbeing advocate, elaborated on the firm's comprehensive efforts in assessing both the technical condition of vessels and the welfare of their crews. "If you're taking that risk and spending significant time away from your family and your loved

THOM HERBERT, IDWAL CREW WELLBEING ADVOCATE. SOURCE: IDWAL

ones for a job, the bare minimum you would expect is a nice living condition. Unfortunately, we just don't see that enough throughout the industry," Herbert explains.

The company has been inspecting vessels for nearly a decade but have only recently started to incorporate welfare data into its assessments. This innovative approach includes a Social Impact Score (SIS) derived from 50 distinct criteria seen during inspections, allowing for a nuanced evaluation of onboard living conditions. A significant concern highlighted is again connectivity, specifically the availability and cost of Wi-Fi. "Connectivity is the one that absolutely we see that can and should improve massively," says Herbert. Although a sizeable percentage of vessels are equipped with Wi-Fi, many crew members either must pay for it or face data limits, which significantly affects their quality of life.

The most recent quarterly survey by the SHI further underscores the difficulties faced by seafarers. Many noted that the profession could be incredibly lonely due to the absence of a strong social support system and limited interactions with others. Concerns were raised about the lack of investment by companies in onboard recreation facilities, which are seen as vital in alleviating daily stresses. Additionally, there was criticism about excessive and unnecessary paperwork, highlighting a perceived gap between the human approach outlined in company policies and the actual practice on board. Frustrations over cramped accommodation areas and limited access to the internet, due to data limits or added fees, were also common. The shortage of rooms on board worsens these issues, making life at sea even more challenging for the crew.

Practical design improvements can make a big difference

The design and placement of essential facilities like elevators also play a crucial role in ensuring the crew's comfort and convenience. Foong suggests that older, poorly designed elevators with heavy access doors can create unnecessary noise and inconvenience, further disrupting the crew's daily life. "If we can install modern elevators on vessels similar to the ones in shopping malls, or offices it would reduce sound disturbance because some people slam the door of the elevator, disturbing those sleeping nearby," he proposes. Such practical design improvements can significantly enhance the overall living experience for seafarers.

Both Jones and Foong advocate for a more thoughtful and human-centric approach to ship accommodation design. They stress the importance of involving naval architects who prioritise crew welfare and are willing to invest in quality materials and innovative designs. Jones recommends engaging in conversations about the quality of materials and the overall design philosophy to foster a greater emphasis on comfort and liveability. He also suggests collaborating with experts like the team at Idwal, who have conducted research on the social impact of accommodation in the maritime industry.

Thom Herbert can draw from his own firsthand experiences as a seafarer in industry when looking at what improvements to make. During his own time spent at sea he also had to deal with inadequate connectivity, poor water quality, and subpar food on vessels. "Unfortunately, vessels have had issues with the fresh water supply, and this has led to crew members becoming sick. This not only has a physical, but also a mental impact about trusting the water supply," he says. While there has been a growing interest in crew welfare, particularly post-Covid, more effort is needed to prioritise and enhance these conditions.

Continuous improvement is essential

Idwal's collected data is used to provide recommendations to shipowners and operators, though they lack the authority to enforce changes. Some issues, like noise on board a vessel, that may affect seafarer's sleep are also unfortunately difficult to assess. "It's often very difficult to fully assess noise whenever a vessel's alongside or when it's at anchor, it's not till you're out at sea, full steam ahead going that the rattles start coming from the roof or the door and, but this stops when the vessel isn't moving," Herbert says.

However, he stresses the importance of Idwal's SIS in highlighting issues and pushing for industry standards to be raised. He believes that although there are existing measures in place, continuous improvement is essential for achieving best living conditions for seafarers.

The current state of seafarer accommodation design reflects a broader industry trend towards functionality and cost-efficiency at the expense of crew well-being. Both Steve Jones and Captain James Foong underscore the need for a cultural shift within the maritime sector to prioritise the comfort and mental health of seafarers. By addressing the myriad of issues such as soundproofing, the quality of recreational spaces, connectivity, and overall sanitation the industry can enhance the living conditions on board ships, ultimately leading to greater job satisfaction and retention among seafarers.

As Jones aptly puts it: "No one wants to spend more money, but seafarers out there deserve better." This recognition is the first step towards creating a more humane and fairer world for seafarers. ■

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UK MARINE INTERIORS COMPANY SECURES £1 MILLION TRADE FINANCE PACKAGE

By **Tom Barlow-Brown**

Trimline, a leading marine interior outfitter based in Whiteley, Hampshire, has secured a substantial £1 million trade finance package from Lloyds Bank, supported by UK Export Finance (UKEF). This financing injection aims to help move Trimline's plans for expansion forwards, facilitating the continuation of the company's trajectory in the highly specialised field of bespoke cruise ship and ferry interiors.

The assistance from UKEF, the UK's export credit agency, comes as a boon to Trimline, enabling the company to embark on two sizable projects within the upcoming year. These projects are anticipated to engage approximately 400 individual contractors and involve collaboration with 40 to 50 other UK-based companies. Without this key funding, Trimline might have faced the unfortunate scenario of having to decline these contracts, potentially relinquishing them to overseas competitors.

Commenting on the significance of the deal, Nick Farrell, co-owner at Trimline, expresses gratitude for the support provided by UKEF remarking how it has helped the company bounce back from recent world events that have affected the industry.

"The pandemic was a huge challenge, with travel restrictions grinding everything to a halt and the cruise line customers we work for stopping all projects overnight," he says. "The work is now increasing again, and Trimline is almost back to its pre-pandemic levels."

"However, with our very strong growth, and the subsequent demand on cash, we needed support to enable us to take advantage of these new opportunities," adds Farrell who also emphasises the instrumental role UKEF played in enabling the company to seize new opportunities and sustain robust growth.

Innovative solutions

Established in 1965, Trimline has emerged as a leader in marine interior outfitting, renowned for its innovative solutions. Specialising in large-scale refurbishment and outfitting of cruise ships and ferries, Trimline boasts an impressive portfolio of clients including industry giants such as Royal Caribbean, Princess Cruises, Carnival Corporation, and Holland America Line. The company offers clients a comprehensive service and is capable of either producing bespoke designs or working to pre-set specifications through its team of over 500 contractors.

Cruise and ferry interior designers need to be conscious to blend functionality and aesthetics with a sense of luxury for passengers. Trimline's expertise stems from creating spaces that can meet the rigorous safety standards of marine travel but also provide passengers and crew with memorable experiences. These can be either elegant dining areas decked out with intricate lighting fixtures or spacious lounges. The company focuses on making sure its designs reflect the opulence and sophistication synonymous with modern cruise and ferry travel.

Some of Trimline's work has included designing the crew and officers' mess on board the Royal Caribbean vessel *Radiance of the Seas*; as well as projects for operator Seabourn, such as designing the restaurant on board the *Seabourn Encore*; and Marella Cruises, for which they provided a series of bar and restaurant

TRIMLINE'S NEWLY DESIGNED 'SOLIS' RESTAURANT CONCEPT FOR THE *SEABOURN ENCORE*. SOURCE: TRIMLINE

THE COMPANY'S SCOPE OF WORK FOR MARELLA CRUISES INCLUDED THE CREATION OF 'THE EXCHANGE' WHICH ENCOMPASSES AN ART DECO BAR EXPERIENCE INSPIRED BY A CLASSIC SPEAK-EASY. SOURCE: TRIMLINE

fittings. These collaborations underscore the company's reputation for versatility and innovation in marine interior outfitting.

In addition to enhancing passenger comfort and satisfaction, Trimline's designs also prioritise efficiency and practicality. Every element, from furniture placement to material selection, is meticulously planned by their design team to optimise space utilisation and facilitate smooth traffic flow through vessels.

Upfront investments

The nature of marine refurbishment projects often demand significant upfront investments, necessitating outfitters like Trimline to procure materials and services in advance while awaiting payment upon project completion. Backed by UKEF, the financing package provided by Lloyds Bank serves as a crucial bridge.

Colin Walls, regional trade and working capital director at Lloyds Bank, highlights the bank's pleasure in facilitating the financing package, which has been tailored to suit Trimline's requirements. Walls emphasises the bank's dedication to supporting Trimline's growth objectives, foreseeing continued success for the company in 2024 and beyond. "We are delighted to provide this new financing package for Trimline enabled by our partnership with UKEF," says Walls. "The £1 million facility will help them continue on their growth trajectory, and we look forward to seeing the success that Nick and the team will have in 2024 and beyond."

The timing of this financing arrangement is timely for the company, as it gears up to meet seasonal spikes in demand, particularly during the winter season when numerous cruise ships undergo refurbishment. This deal also underscores the role played by UKEF in supporting specialist businesses and small to medium-sized enterprises (SMEs) across the UK, enabling them to maintain competitiveness on the global stage. Notably, 85% of the companies supported by UKEF in the previous fiscal year were SMEs like Trimline.

REFURBISHMENT OF THE CREW AND OFFICERS' MESS AREAS ON *RADIANCE OF THE SEAS* INCLUDED FLOORING, UPHOLSTERY, FURNITURE, WALL-COVERINGS AND TILING. SOURCE: TRIMLINETOP OF FORM

Richard Armstrong, UKEF export finance manager for Hampshire and the Isle of Wight, reiterates the agency's commitment to assisting businesses like Trimline in navigating challenges related to payment structures and seasonal fluctuations in demand. "The challenges posed by payment-upon-delivery and seasonal demand are a daily reality for many exporters – but they do not need to face these alone," he says.

"Working with lenders like Lloyds Bank, UKEF can help businesses such as Trimline to find the right financing and continue bringing their market-leading export to a large and growing global clientele," Armstrong adds.

In addition to Trimline's success story, this financing arrangement also underscores the vital role played by Lloyds Bank in supporting over one million UK businesses with a comprehensive suite of financial services, including import and export trade finance, structured finance, and asset finance. The bank's commitment to fostering long-term relationships with its clients, coupled with its extensive network of relationship teams, positions it as a trusted partner for businesses seeking to realise their growth ambitions.

UKEF's assistance extends beyond Trimline, having helped other businesses in the maritime sector reach new customers globally. In 2022, the agency supported Peterhead-based Denholm Seafoods with a £15 million funding package to enter new markets and allow the business to progress the sustainability of their operations, reducing their environmental impact as they drive the growth of their business forward.

Trimline's securing of the new financial trade package represents a significant milestone for the company and is a testament to the collaborative efforts of UKEF and Lloyds Bank in bolstering the growth and competitiveness of UK businesses on the global stage. ■

RO-ROS & FERRIES

PREVENTING CAPSIZING DURING TURNING OF SHIPS WITH LARGE PROFILE HEIGHT

By **Prof. Soonhung Han**, KAIST (Korea Advanced Institute of Science Technology) and **Prof. Robert Latorre** MRINA-Fellow, University of New Orleans

FIGURE 1. CAPSIZED RO-RO MV *HOEGH OSAKA*, SOUTHAMPTON, UK, 2015

As a contribution to preventing ro-ro capsizing during turning, we continue an earlier discussion of ro-ro capsize [1] and extend it to recommendations for preventing capsize in turning. First, let us examine three recent ro-ro vessel capsizes in calm sea from large heeling following ship turning. They occurred during the past decade: the MV *Golden Ray* capsize in 2019 [2]; the MV *Hoegh Osaka* capsize in 2015 [3]; and the MV *Sewol* ferry capsize in 2014 [4, 5].

On 8 September 2019, the pure car carrier (PCC) *Golden Ray* departed from the Colonels Island Terminal in Brunswick, Georgia, USA. The vessel speed was slightly increased to the normal transit speed: 13.3knots. The pilot ordered the helmsman to steer to starboard (the pilot used up to 20° of rudder angle). The ship then turned and began to lean sharply to port side. The pilot ordered the helmsman to move the rudder to port side to counteract the growing heeling, but in less than a minute it inclined about 60° to port side and capsized.

On 3 January 2015, the pure car and truck carrier (PCTC) *Hoegh Osaka* departed the port of Southampton, UK, for Bremerhaven, Germany. As it rounded the West Bramble buoy in the Solent River it developed a significant starboard list. This list caused some cargo to

	GOLDEN RAY	*HOEGH OSAKA*	*SEWOL*
Year of accident	2019	2015	2014
Built year	2017 Mipo, Korea	2000 Japan	1994 Japan, imported and modified 2013 in Korea
Profile height (above waterline)	Abt. 39.4m (3.7 times of design draught	Abt. 32.4m (3.2 times of design draught)	Abt. 21.6m (3.5 times of design draught)
Draught (design)	10.6m	10.15m	6.2m
Displacement	34,609 (at accident)	16,886 (DWT)	9,750
Gross tonnage	71,000	51,770	6,800
Cause of accident	Lack of stability while turning (13.3kt - 20° rudder angle)	Lack of stability while turning (12kt - 10° rudder angle)	Lack of stability while turning (18kt - 5° rudder angle)
GM	0.45m	0.7m	0.3m~0.5m

TABLE 1. SUMMARY OF VESSEL CAPSIZES

shift and flooding. At 40° list, the ship lost steering and propulsion, eventually drifting onto the Bramble Bank.

On 16 April 2014, the ferry *Sewol* sank while sailing from Incheon towards Jeju in South Korea. At 8:46am, the vessel was sailing at 18knots at a heading of 136°. The third mate ordered a course change from 135° to 140°. Around 8:48am, the vessel began to heel portside (left), turning quickly to the starboard (right). At around 10:30am, after 101 minutes, the *Sewol* ferry was submerged leaving only the bow section above water.

Table 1 summarises the important vessel-accident details.

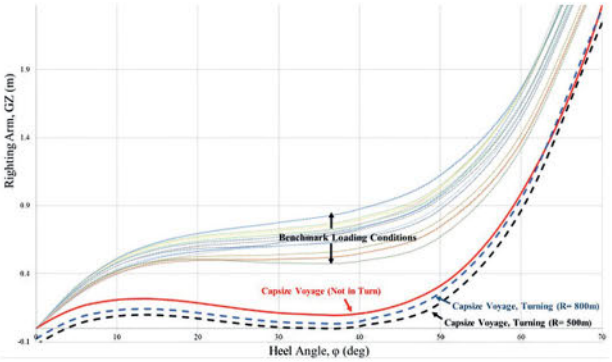

FIGURE 2. GZ VERSUS HEEL ANGLE FOR MV *GOLDEN RAY*

One important design feature of these ships is their large profile height above the waterline. In the case of PCCs and PCTCs, there are 12 or more vehicle decks for shipping 5,000-6,000 cars. The hull form of these ships has a small CB and is V-shaped near the waterline creating a large initial transverse GM. Consequently, when loading cars and trucks PCC/PCTC vessels are quite stable (less rocky) and have small angle of heel. These PCC and PCTC ships are subject to IMO requirements when engaged in international trade. There are no additional requirements for the stability or damage stability of PCCs compared to ro-ro ferries.

The transverse righting arm GZ-heel angle for the *Golden Ray* calculated in a post-accident analysis is shown in Figure 2. For small heel angles, the GZ is large. During loading, the heel angle is comparatively small, and the crew may mistakenly take this as indication of a safe ship. However, complying with safety regulations regarding total area under the GZ curve, the resulting GZ curve typically has a concave region shown in Figure 2. This concave region in Figure 2 is defined by two inflection points: Heel Angle = 10 deg and Heel Angle = 50 deg. During ship turning, this concave region creates a dangerous operating situation causing the vessel to list and settle at a large angle of heel (60° - *Golden Ray* and 40°- *Hoegh Osaka*). Consequently, recently built pure car carriers and pure car and truck carriers are likely to have similar capsizing accidents in the future.

When the vessel makes a sharp turn, a heeling moment caused by centrifugal turning force is generated. The centrifugal force increases with smaller turning radius R. This results in a reduction in the righting arm GZ as shown in Figure 2 for R = 800m and R = 500m. The heeled deck also generates tangential force and overturning moment acting on the lashed vehicles. These forces and moment can break the tiedown cables resulting in a shift in the cargo. Figure 3 shows a post-accident analysis of the *Sewol* heel angle versus time marking the onset of the cargo shift at 18° heel (t = 8.49.25). It should be noted that ro-ro ships like the *Sewol* usually carry a wide range of cars, trucks and buses. The trucks can be overloaded and unstable when the deck heels.

The *Sewol*'s capsize is similar to earlier ro-ro accidents recorded during 1965-1982. During this 17-year period, the classification society Det Norske Veritas (DNV) identified 341 ro-ro casualties which included 217 "serious" and 36 "total loss" [7]. The most common causes for the 217 serious casualties were: collisions (24%); machinery damage (17%); grounding (17%); shift of cargo and operational (16%); and fire and explosion (14%). Examining the 36 total loss casualties, the most common cause was: shift of cargo and operational faults (43%); collision (25%); and fire and explosion (18%).

Figure 4 shows the ship heel angle in turning. After the rudder is turned, the ship experiences an initial inward heel caused by rudder force. This is then followed by a larger outward heel from the centrifugal turning force. As previously noted, for the ships in Table 1, their low stability margin (Figure 2) creates a dangerous situation whenever they experience a large heel angle θ max occurring at the beginning of a turn. The International Code on Intact Stability (ISC),

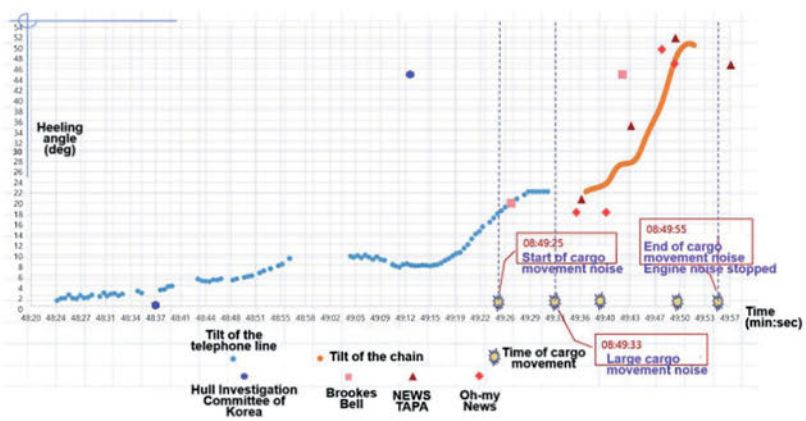

FIGURE 3. CHANGE OF HEELING ANGLE AND TIME STAMPS OF CARGO MOVEMENT NOISE DURING THE *SEWOL* FERRY ACCIDENT

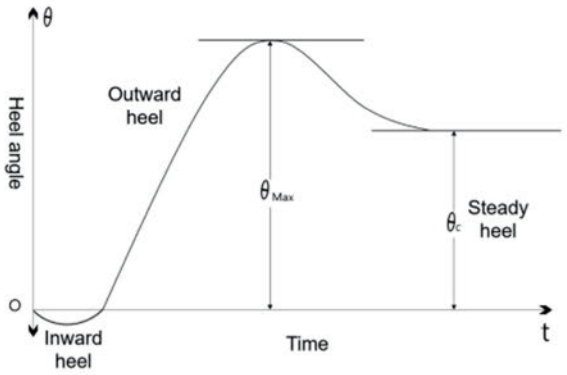

FIGURE 4. HEEL ANGLE VERSUS TIME DURING SHIP TURNING

adopted by the IMO in 2008, contains a rule that limits the heel angle to 10°. MARIN of the Netherlands has proposed to limit the maximum heeling angle while turning to 15° [8]. The Italian classification society RINA in 2012 proposed 15° for maximum outward heeling angle and 10° for steady state heel. The reason to limit the heeling angle by 15° is based on the fact that at a heeling angle of 18° (Figure 3) cargo loaded without safety devices begins to slide. It is recommended by the authors that the SOLAS limit for the steady heeling angle should be extended to limit the maximum heeling angle θ max (refer to Figure 4) during the transient period of the ship turn.

To provide a framework to improve the problems identified and avoid capsize in turning, we organised the design/operation parameters in the ro-ro capsize into a five-part sequence shown in Figure 5.

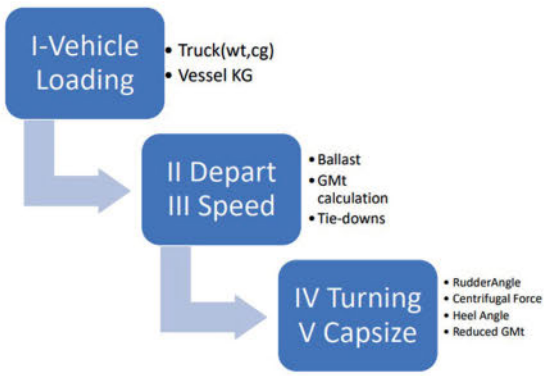

FIGURE 5. RO-RO CAPSIZE IN TURNING SEQUENCE

It is important that in the design, the naval architect adopts the goal of a safe ro-ro ship. This is preferable to having IMO and national marine safety organisations impose loading and operational restrictions on current and future ro-ro ships. Obviously, achieving an adequate stability margin allows the ro-ro ship to sail safely. To prevent the recurrence of ro-ro capsize in turn it is important to focus on three points:

- Precisely determine the loaded ship's centre of gravity KG;
- Adopt navigation systems that limit the centrifugal force when turning to limit the ship's angle of heel; and
- Calculation up to 100% filling level for liquid cargo.

A number of possible methods to improve ro-ro safety when turning are summarised in Table 2. ■

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No.	CAPSIZE PREVENTION ITEM	POSSIBLE METHOD
1	Precisely determine the loaded ship's centre of gravity KG	i) Use truck scale to measure vehicle weight during loading ii) Adopt software systems for tank levels iii) Monitor heel while retracting stern loading ramp/vehicle loading
2	Limit the centrifugal force when turning to limit the ship's angle of heel	i) Adopt heel angle limit < 15° ii) Limit the turning speed and rudder angle
3	Calculation up to 100% filling level for liquid cargo	i) Modify calculation software

TABLE 2. POSSIBLE METHODS TO IMPROVE RO-RO SAFETY WHEN TURNING

The Royal Institution of Naval Architects Presents:

Autonomous Ships 2024

20-21 November 2024, Copenhagen, Denmark

REGISTER NOW

In Partnership With:

IDA Maritim

Rapid technological development in the field of Maritime Autonomy is creating opportunities for the marine industry as well as challenges for the regulatory framework. Recent years have seen various ship projects involving coastal and ocean-going routes with different degrees of autonomy being tested. These will have significant implications for naval architects, shipbuilders, shipping companies, and maritime systems providers.

In December 2024, the International Maritime Organization (IMO) will host the 109th session of the Maritime Safety Committee (MSC) where the Maritime Autonomous Surface Ships (MASS) group will meet again. The Royal Institution of Naval Architects and the Danish Society of Engineers (IDA Maritime) are organising the 3rd Autonomous ship conference on 20-21 November 2024 ahead of the IMO meeting.

Scan the QR Code for more information

Conference Topics:

- IMO MASS Code Development
- Maritime remote-control technology
- Automated onboard systems
- Autonomous technology
- E-navigation
- Safety and Security
- Impact on maritime workforce
- Environmental impact
- Legal implications and maritime regulations
- Case studies and research projects

PRELIMINARY PROGRAMME NOW AVAILABLE TO VIEW

https://rina.org.uk/events/events-programme/autonomous-ships-2024/

The Royal Institution of Naval Architects Presents:

2025 Technical Conference:

Managing CII and Associated Challenges

21-22 January 2025, London, United Kingdom

REGISTER INTEREST

The Carbon Intensity Indicator (CII) is a mandatory rating measure for ships, developed by the International Maritime Organization (IMO), that came into effect on 1st January 2023.

In January 2024, the Royal Institution of Naval Architects (RINA) hosted the first Technical Conference on Managing CII and Associated Challenges at the IMO Headquarters in London. The conference resulted in bringing together 90+ industry stakeholders who exchanged feedback and insight on CII's first year.

The IMO must conduct a review of the CII before 1 January 2026, and following initial feedback, changes are expected to CII, though it is not yet clear on what the final outcome will be. The Royal Institution of Naval Architects is proposing a follow up conference in January 2025, and is inviting companies to share how they manage performance as a system, and to explain how continuous improvement in energy efficiency may be achieved.

Scan the QR Code for more information

https://rina.org.uk/events/events-programme/technical-conference-managing-cii-and-associated-challenges-2025/

EVENTS

MARITIME INDUSTRY SHINES AT RINA ANNUAL DINNER WITH INSPIRING SPEECHES AND HONOURS

By **Tom Barlow-Brown**

PRINCIPAL GUEST AND SPEAKER ARSENIO DOMINGUEZ

The Royal Institution of Naval Architects (RINA) held its highly anticipated Annual Dinner at the De Vere Grand Connaught Rooms in Holborn, London, for the second consecutive year, drawing an impressive crowd of 370 attendees. The event, marked by distinguished speeches, prestigious awards, and significant networking opportunities, celebrated the advancements and contributions within the maritime industry.

The evening was made possible by the generous support of several sponsors, including Gold Sponsor BAE Systems Submarines, Bronze Sponsor Shipglide, Inc., and Programme Sponsor Burner Fire Control.

The programme featured a keynote speech by Arsenio Dominguez, secretary general of the International Maritime Organization (IMO), followed by addresses from RINA president Catriona Savage and RINA IMO Committee chair Edwin Pang. The event was hosted by Craig Eason, technology editor at *TradeWinds News*, who ensured the evening ran smoothly and engagingly.

Contributions and critical themes

Principal guest and speaker Dominguez thanked RINA for its longstanding contributions to the IMO since 2002. His speech covered critical themes such as the global maritime outlook, decarbonisation and sustainability, safety and regulatory compliance, new technologies, cooperation with NGOs and professional bodies, inclusivity and diversity, and education and professional development.

Dominguez underscored the importance of RINA's expert advice in various IMO initiatives and emphasised the need for the IMO to remain technology and fuel agnostic. He congratulated Catriona Savage on her

RINA PRESIDENT CATRIONA SAVAGE

re-election as RINA president and highlighted the significance of women's contributions to the maritime industry, especially ahead of the International Day for Women in Maritime.

He stressed the necessity of transparency in the maritime sector, acknowledging that valid criticism should be taken on board to drive improvements. Dominguez pointed out current challenges such as the impact of Covid-19, mistreatment of seafarers, war, and corruption, but also highlighted the positive strides being made in innovation and the adoption of new technologies to reduce reliance on fossil fuels.

Savage, who was unanimously re-elected for a second term as RINA president at the annual general meeting held prior to the dinner, delivered a compelling speech. She welcomed members and distinguished guests, emphasising the diverse range of attendees from various countries and sectors within the maritime industry. She also expressed her honour at being re-elected and announced the confirmation of His Majesty King Charles III's patronage of RINA, a significant endorsement for the Institution, after a recent review of institutions and charities which have received Royal Patronage.

Strategic vision

The RINA president highlighted the Institution's strategic vision to be recognised globally as the maritime professional engineering institution of choice. She reiterated RINA's commitment to knowledge excellence, developing skills for modern naval architecture, inspiring the next generation, and expanding global membership. Savage also acknowledged the contributions of departing Board members and welcomed new appointees, stressing the importance of strong governance and fresh perspectives within the Institution.

Savage recognised the work over the past year of various RINA technical committees, including the IMO Committee, which has tackled the challenges of the IMO Carbon Intensity Indicator (CII), and the Maritime Safety Committee, which has engaged in safety discussions and legislative reviews. The Maritime Environment Committee's focus has been on nuclear propulsion, clean maritime technologies, and artificial intelligence, while the Maritime Innovation Committee has explored alternative fuels, offshore wind technology, and cyber security. The formation of the Developing Careers Committee (DCC) was also announced, which is aimed at creating modern career pathways and support for engineers.

Savage also extended her gratitude to the sponsors and attendees, expressing hope that everyone enjoyed the evening and took advantage of the chance to reconnect with old friends and forge new connections.

Investment in digital programmes and new systems was another key theme of Savage's speech, reflecting RINA's commitment to modernisation and future growth.

Collective effort

Edwin Pang, the RINA IMO Committee chair and RINA Board member, emphasised the critical role of all technical committees within RINA. He highlighted the

EDWIN PANG, RINA IMO COMMITTEE CHAIR AND RINA BOARD MEMBER

essential contributions these committees make to the advancement of maritime engineering and safety standards. Pang expanded on the significant work undertaken by the IMO Committee, showcasing its dedication to enhancing global maritime regulations and promoting sustainable practices within the industry. His speech underscored the collective effort required to drive innovation and maintain the highest standards in naval architecture.

The evening also featured the presentation of three prestigious awards recognising notable achievements in the maritime industry. The Lloyd's Register Maritime Safety Award was presented to ORCA AI for its SeaPod lookout unit which enhances maritime safety and operational efficiency. The Eily Keary Award, sponsored by BP, went to David Foote from Babcock UK for his efforts in promoting neurodiversity within the maritime sector. Lastly, the Peter Contraros Award was given to Dimitris G. Georgiadis for his innovative paper on modelling the inherent uncertainties in the geometric imperfections of ship plates.

The event concluded on a high note, leaving a lasting impression on the evening's attendees. Guests departed feeling inspired by the insightful speeches, which highlighted the remarkable progress and the promising future of the maritime industry. This sense of optimism was further reinforced by the tangible advancements showcased during the event, reflecting the RINA's commitment to maritime innovation and sustainability. ■

DAVID FOOTE (CENTRE) OF BABCOCK UK WITH THE EILY KEARY AWARD

CALENDAR

What's happening next?

SEPTEMBER 10-12, 2024
ICCAS 2024: INTERNATIONAL CONFERENCE ON COMPUTER APPLICATIONS IN SHIPBUILDING
RINA conference
Genoa, Italy

OCTOBER 8-9, 2024
HUMAN FACTORS 2024
RINA conference
Wageningen, the Netherlands

OCTOBER 22-23, 2024
WIND PROPULSION 2024
RINA conference
London, UK

NOVEMBER 13, 2024
PRESIDENT'S INVITATION LECTURE 2024
RINA event
London, UK

NOVEMBER 20-21, 2024
AUTONOMOUS SHIPS 2024
RINA conference
Copenhagen, Denmark

JANUARY 21-22, 2025
MANAGING CII AND ASSOCIATED CHALLENGES 2025
RINA conference
London, UK

For more information please visit:
www.rina.org.uk/RINA_Events

JUNE 26-27, 2024
5TH DECARBONISING SHIPPING FORUM
International forum
Rotterdam, the Netherlands
https://decarbonizingforum.com

JULY 8-12, 2024
IMO COUNCIL
IMO meeting
London, UK
www.imo.org

JULY 22-26, 2024
IMO SUB-COMMITTEE ON IMPLEMENTATION OF IMO INSTRUMENTS (III 10)
IMO meeting
London, UK
www.imo.org

AUGUST 26-29, 2024
OFFSHORE NORTHERN SEAS (ONS) 2024
International exhibition
Stavanger, Norway
www.ons.no

SEPTEMBER 3-6, 2024
SMM 2024
International exhibition
Hamburg, Germany
www.smm-hamburg.com

SEPTEMBER 16-20, 2024
IMO SUB-COMMITTEE ON CARRIAGE OF CARGOES AND CONTAINERS (CCC 10)
IMO meeting
London, UK
www.imo.org

SEPTEMBER 30 – OCTOBER 4, 2024
IMO MARINE ENVIRONMENT PROTECTION COMMITTEE (MEPC 82)
IMO meeting
London, UK
www.imo.org

OCTOBER 14-16, 2024
SNAME MARITIME CONVENTION
International convention
Norfolk, Virginia, USA
www.sname.org/smc-2024

NOVEMBER 4-7, 2024
EURONAVAL 2024
International exhibition
Paris-Nord Villepinte, France
www.euronaval.fr

NOVEMBER 6-7, 2024
ARCTIC SHIPPING SUMMIT 2024
International summit
Montreal, Canada
www.wplgroup.com/aci/event/arctic-shipping-summit

NOVEMBER 18-22, 2024
IMO COUNCIL
IMO meeting
London, UK
www.imo.org

NOVEMBER 19-21, 2024
METSTRADE 2024
International exhibition
Amsterdam, the Netherlands
www.metstrade.com

DECEMBER 2-6, 2024
IMO MARITIME SAFETY COMMITTEE (MSC 109)
IMO meeting
London, UK
www.imo.org

DECEMBER 3-6, 2024
EXPONAVAL 2024
International exposition
Port of Valparaíso, Chile
www.exponaval.cl/en

IF YOU HAVE A CONFERENCE OR EVENT YOU WOULD LIKE TO BE CONSIDERED FOR THIS PAGE PLEASE CONTACT: TNA@RINA.ORG.UK

The Royal Institution of Naval Architects Presents:

Human Factors 2024 Conference

8-9 October 2024, Wageningen, The Netherlands

REGISTER NOW

In Partnership With:

MARIN

Scan the QR Code
for more information

The conference will provide an opportunity for human factors experts, naval architects, bridge officers and others to get together and discuss recent developments. It will focus on lessons learned from interventions and applied research that were successful, or even more interesting, unexpected or bad results. For example, implementation of new automation on board that worked out differently or behavioral interventions that had unexpected effects. It is all about applied research that provides learned lessons for future Human Factor research, specifically for the Maritime domain.

As part of the conference, the delegates will have a unique opportunity to visit the new Seven Oceans Simulator centre of MARIN on 10th October 2024, where the attendees will have a chance to:

- Tour in the brand new Seven Oceans Simulator centre.
- Attend a workshop on how to design a bridge layout for special purpose vessels with physical mock-ups.
- Attend a workshop measuring human performance covering eve-tracking, emotion recognition, heart rate variability and galvanic skin response.

..... and more!

Keynote Speakers

Job Brüggen, LVNL

Job Brüggen holds a masters degree from Delft University of Technology in Aerospace Engineering. In 1986 he started working for the National Aerospace Laboratory where he later became the head of the Air Transport Division. His particular interest in safety led him to Air Traffic Control the Netherlands, to become their first safety manager in 2002. He is particularly known for his activities in Just Culture developments and was one of the first to demonstrate the detrimental effect of prosecution of air traffic controllers on incident reporting. In 2003 he re-created the CANSO Safety Standing Committee and chaired it for six years. He also advises in the health care industry on safety matters with a particular focus on safety leadership. From November 2014 he was co-chairman of the Eurocontrol Safety Team, until 2019. For the Air Traffic Controllers academy of LVNL, he is the chairman of the examinations committee.

Dr Rafet Emek Kurt, Reader, in Maritime Safety and Human Factors, Department of Naval Architecture Ocean and Marine Engineering, University of Strathclyde

Dr. Kurt also serves as the Director of the Maritime Human Factors Centre, further demonstrating his commitment to advancing research in this field. Additionally, he holds the position of Associate Editor in Ships and Offshore Structures, showcasing his dedication to the dissemination of knowledge within the maritime community. Dr. Kurt is also a member of the International Ship and Offshore Structures Congress (ISSC), where he collaborates with peers to develop ship design criteria informed by human factors, further highlighting his commitment to the advancement of maritime safety practices.

Over the years, Dr. Kurt has worked on many research projects aimed at integrating human factors, safety, and risk into maritime practices. His work has been published in respected journals and conferences, igniting essential discussions in the maritime community.

https://rina.org.uk/events/events-programme/human-factors-2024/

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