

Kongsberg Maritime

# Insights

Powering sustainability



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**Featuring**

Meet the  
net-zero  
hero vessels

The strength  
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# Prime position

How Tow Assist tech supports precise delivery of major installations



Aurora Class vessels benefit from Kongsberg Maritime technology – and are setting a benchmark for sustainable deep-sea shipping. Read more on pages 28 and 29



KONGSBERG



Welcome

**Lisa Edvardsen Haugan,**  
**President – Kongsberg Maritime**

## Reshaping the future

Welcome to the latest issue of *Insights*, bringing you the latest updates and innovations from Kongsberg Maritime. As we navigate through an era of rapid technological advancements, I am pleased to share our most recent developments with a focus on electrification.

Electrification is not just a trend; it's a transformative movement that is reshaping the future of our industry. At Kongsberg Maritime, we are proud to be at the forefront of this change, driving innovation and transforming our customers' operations.

You can read about several groundbreaking projects, such as the battery-operated ferries on a busy commuter route in Norway. These ferries have successfully completed more than 20,000 automated operations using our advanced technology, enabling smart manoeuvring and efficient use of battery power.

We also visited the new hybrid *Meta 7* tug operating in South Korea, which can operate on batteries in the busy port of Busan. Additionally, we provide an in-depth look at how electrification is one of the key drivers in shaping our product development, in this case with advanced electric winches and pod propulsion.

The world is embracing and demanding greener energy, and we reveal our latest solutions to the floating offshore wind market. There will be large-scale arrays of floating turbines in the years to come, and we've developed smart and safe ways to transport, anchor and hook-up these towering structures, drawing on decades of expertise and our pioneering approach to offshore energy.

As your trusted energy transition partner, with in-depth understanding of maritime operations, we understand the complexities and challenges that come with navigating the shift towards greener technologies. Our mission is to support our customers through these difficult choices, offering solutions that not only meet regulatory requirements but also drive operational excellence and environmental stewardship.

On a personal note, I was particularly excited to recently visit the first two of Høegh Autoliners' new Aurora Class ships. These vessels benefit from our technology, and it is rewarding to see how our innovations are supporting this progressive owner's net-zero ambitions.

I hope you find this issue of *Insights* both informative and inspiring.

# 1,000

The *IWS Seawalker*, our milestone 1,000th ship design, has been delivered.

See page 7

# 2025

The new *Tow Assist* System is available for offshore wind.

See pages 20-23

# 58%

Reduction in emissions per car transported by the Aurora Class vessels.

See pages 28-29



Scan the QR code to find out more about Kongsberg Maritime.

### Contact

If you're interested in talking to us about our products and systems, please contact us:

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Cover image: *Tow Assist* tech innovates movement of floating structures

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# Kongsberg Maritime Updates

## Royal barge gets electric upgrade

The historic *Kongesjaluppen 1976*, a royal barge formerly used by the King of Norway, has been successfully converted to full electric propulsion by Kongsberg Maritime.

The project, in partnership with the KNM Narvik Foundation and the Naval Museum, involved students from Norway's Horten Upper Secondary School.

"This project has been a remarkable journey, combining our expertise in maritime technology with the rich history of this iconic vessel," said Bjørn Jalving, Kongsberg Maritime's Chief Technology Officer. "We are thrilled to have played a role in preserving the legacy of the *Kongesjaluppen 1976*, while also demonstrating the potential of electric propulsion for sustainable maritime operations."

The electrification project not only modernises the vessel but also serves as a sustainable and environmentally friendly symbol of maritime heritage.

The *Kongesjaluppen 1976* (pictured below) will now be operated by the Navy Veteran Ship Foundation, offering tours and charters to the public, supporting sustainable tourism and preserving maritime history.



The new vessels will ensure optimal safety and performance



## Major PSV contract for Capital

Kongsberg Maritime has been awarded a significant contract to supply a comprehensive range of equipment for a new fleet of 10 platform supply vessels (PSVs).

They are being constructed by Fujian Mawei Shipbuilding in China for a Greek shipowner, Capital Offshore. The contract, valued at approximately 800 million NOK (\$70.5m), includes all propulsion, automation and energy systems.

This investment marks a major expansion for Capital Offshore, which operates a fleet of more than 100 vessels.

The new PSVs are intended for the Brazilian market, aligning with the company's strategic goal to enhance its presence in offshore oil and gas operations.

Lisa Edvardsen Haugan, President of Kongsberg Maritime, expressed pride over

the company's support for Capital Offshore's ambitious expansion plans.

She said: "This significant investment in a series of 10 new PSVs signals Capital Offshore's intent to be a major player in future offshore operations.

"We look forward to building on our long and successful relationship with Fujian Mawei Shipbuilding in China on this exciting project."

The vessels will feature fully integrated electrical systems, propulsion and energy controls to ensure optimal performance and safety.

The Kongsberg Maritime electrical system includes an Energy Storage System (ESS) for peak shaving, spinning reserve and power boost, offering operational flexibility and reducing fuel consumption

and emissions. The 95-metre vessels, designed with MMC 897 CD specifications, will showcase Kongsberg Maritime's system integration capabilities.

"By selecting our integrated solutions, Capital Offshore will benefit from increased fuel efficiency and lower OPEX costs," added Haugan.

Gerry Ventouris, General Manager of Capital Offshore, emphasised the importance of this collaboration.

He said: "Partnering with Kongsberg Maritime is a critical step in achieving our goal of ensuring these vessels are of the highest quality."

The propulsion system for each vessel will include azimuth thrusters, tunnel thrusters and a hybrid electrical power plant, all integrated to optimise operability and efficiency.

## Integrated solution for Golar's latest FLNG conversion

Golar has chosen Kongsberg Maritime to provide an integrated package of electrical, control, safety and propulsion systems for the Golar Mk2 Floating Liquefied Natural Gas (FLNG) project.

Valued at more than \$25 million (283.5m NOK), the contract involves converting Golar's LNG tanker *Fuji LNG* into an FLNG vessel by lengthening

it by 100 metres. The conversion is being carried out at the CIMC Raffles shipyard in Yantai, China, with Black & Veatch supplying the topside LNG process plant.

Golar LNG Limited is a midstream liquefied natural gas company that designs, converts, owns and operates marine infrastructure for LNG liquefaction, storage, transport and regasification.

Kongsberg Maritime's extensive equipment package for the Golar Mk2 FLNG includes two UUC305 azimuth thrusters, electrical systems and an integrated control and safety system (ICSS). The ICSS integrates control of the process plant, energy management, power distribution, cargo handling, ballast control and auxiliary systems. It also includes safety systems

such as the Emergency Shutdown System (ESD), Fire and Gas Detection System (FGDS) and Process Shutdown System (PSD), ensuring robust protection and operational integrity.

The thrusters are equipped with a Heading Control system, leveraging Kongsberg Maritime's expertise in dynamic positioning (DP) without requiring full DP capabilities for the FLNG.

Vegard Skår, Kongsberg Maritime's Vice President – Sales, Offshore Production Units, said: "We have worked closely with Golar from the early design phase of this complex project, securing a large scope of supply for their Mk2 vessel. The systems to be delivered are all critical components in the safe and reliable operation of an FLNG vessel."



## Indian Navy to use RAS technology in five-ship programme

A contract with Hindustan Shipbuilding Limited has been secured by Kongsberg Maritime, to supply electric replenishment-at-sea (RAS) equipment for the Indian Navy's new Fleet Support Ships (FSS) programme.

The FSS initiative involves the construction of five large replenishment vessels – the largest warships ever built in India, with a full load displacement of 44,700 tons.



The advanced electric RAS system enhances naval logistics by offering faster, safer and more reliable resupply operations.

Unlike traditional hydraulic systems, the electric RAS equipment minimises maintenance needs and eliminates the risk of oil spills, ensuring environmental safety.

This technology is crucial for naval vessels during extended

missions, providing operational efficiency and safety.

Lisa Edvardsen Haugan, President of Kongsberg Maritime, said: "To have secured the contract to supply our electric RAS system to the Indian Navy's FSS programme is significant for us, and we are delighted to have been selected for this major shipbuilding programme.

"Our RAS technology supports critical operations for many of the world's navies and through the development of our electric system, we offer mission-critical capability enhancing operational readiness, extending range and providing a sustainable and responsive solution for the Indian Navy."

The RAS system will be used to transfer solid loads up to 2 tonnes and liquids such as fuel and drinking water, with diesel cubic transfer rates of up to 1,000 cubic metres per hour.

This capability ensures continuous support for naval fleets, reducing downtime and enhancing operational readiness.

The FSS will significantly increase the Indian Navy's operational range and endurance, enabling extended operations without returning to port.

# Kongsberg Maritime Updates

## Top tech leader award for Lisa

Kongsberg Maritime President Lisa Edvardsen Haugan has been named **Technology Leader 2024** by *Lloyd's List*.

The recognition is included in the shipping journal's annual rundown of the maritime industry's most influential figures, the *Top 100 People* report.

The 'Technology Leader'

accolade is among the most significant and prestigious of the 'Top 10' awards issued, underscoring the pivotal role of technological innovation in shaping the future of the maritime sector.

The honour recognises the range of ways in which Kongsberg Maritime is leading the way with green solutions, citing examples such as delivering hybrid offshore vessels, developing ever-quiet propulsion systems and energy-saving systems for cargo vessels. Innovative service solutions such as condition monitoring and thruster exchange are also mentioned.

Lisa has expressed her gratitude and highlighted the collective effort behind this achievement.

She said: "This award is a testament to the incredible team at Kongsberg Maritime. It is their dedication, innovation and hard work that have made this recognition possible.

"I am honoured to be named Technology Leader on behalf of everyone at Kongsberg Maritime, and I am proud of the great people behind the technologies that are shaping the maritime future."



Watch the video



Ceremony guests were able to review tug designs in more detail

## Milestone delivery to Damen

The delivery of the 1,500th azimuth thruster to Damen Shipyards Group by Kongsberg Maritime has been celebrated by both companies during a special ceremony.

The milestone was marked at an event in December in Rauma, Finland, which also highlighted their successful relationship of more than 40 years.

Kongsberg Maritime supplies azimuth thrusters for a range of tug designs operating for Damen's customers worldwide.

Thruster number 1,500 is one of a pair that will be installed on a Damen ASD Tug 2813, which is under construction at Damen Song Cam Shipyard in Vietnam.

At the ceremony, Ville Rimpilä, Kongsberg Maritime's Senior Vice President Thrusters, said: "Today marks a special milestone in our long, collaborative relationship with Damen, one of the world's leading and most innovative tug builders. Our azimuth thruster technology is a critical part of global shipping operations, offering high thrust and efficiency to tug owners.

"To have reached 1,500 thrusters is testament to the trust which Damen places in us, matched by the pride, dedication and focus on quality that goes into every thruster we supply. I express my sincere

gratitude to the team at Damen and look forward to continuing this long relationship as together we drive the efficient, safe and sustainable future of the global tug sector."

Martin de Bruijn, Managing Director of Damen Workboats, said: "We take a long-term view in all that we do. You can see this in the long-standing relationships we enjoy with our clients, and with partners such as Kongsberg Maritime.

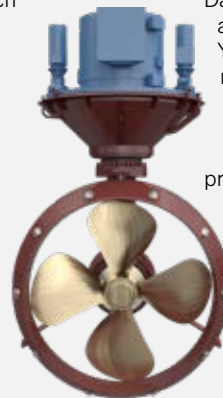
"The continual evolution of our products is dependent on such partnerships and their products. As such, we fully appreciate the quality and capability that Kongsberg Maritime helps bring to our tugs.

We are also grateful for their strong client focus and the way they support our operational excellence initiatives, resulting in shorter lead times and optimised processes. These

are crucial factors in the development of high-standard, cost-effective solutions relevant to our clients' needs.

"This collaborative approach has never been as important as it is today, as we fix our sights on optimising the safe and sustainable performance of our vessels.

"We look forward to our continued cooperation in the years ahead and the delivery of the next 1,500 thrusters."



# One thousand reasons to celebrate

The 1,000th ship design by Kongsberg Maritime, the *IWS Seawalker*, has been delivered to IWS Fleet.

Following a delivery voyage from China to Europe and a naming ceremony in Hanstholm, Denmark, the UT 5519 DE design CSOV has now taken up duties alongside sister ship *IWS Skywalker* (see last issue), serving the Dogger Bank offshore wind farm and operating from the port of Hartlepool, north-east England.

Lisa Edvardsen Haugan, President of Kongsberg Maritime, said: "We are especially proud to unveil our 1,000th ship, the *IWS Seawalker*. This milestone is a testament to our enduring commitment to innovation and is the latest example of how our ship design specialists have worked with many customers over five decades to deliver some of the most advanced, efficient and capable ships sailing today."

Speaking at the naming ceremony, Christopher Andersen Heidenreich, Managing Director, IWS Fleet, said: "Together, we celebrate the delivery of Kongsberg Maritime's 1,000th vessel design, and we're honoured to be part of such a significant milestone."

"Just like the very first UT vessels of the 1970s, this latest advanced CSOV design is a pioneer of its day, setting high standards for safe, efficient and innovative operations in the global offshore energy industry."



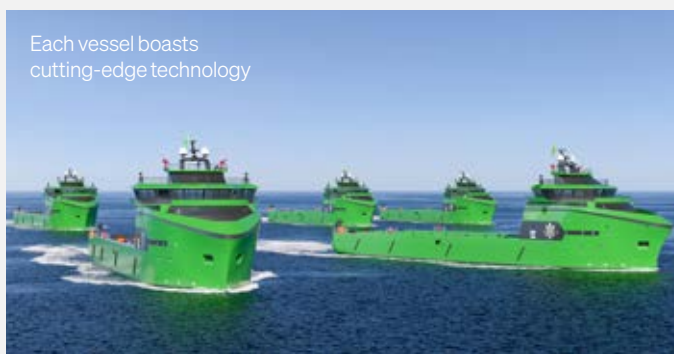
# Brazil partnership for six PSVs

Six state-of-the-art, hybrid, multipurpose 5,000 DWT Platform Supply Vessels (PSV) with oil spill recovery capacity will be developed as part of a partnership between Kongsberg Maritime and Compagnie Maritime Monégasque (CMM).

Brazilian group CMM was first in Petrobras's tender for the vessels.

The 92-metre UT 7420 is the latest generation of Kongsberg Maritime's successful UT design range. Each vessel boasts an advanced design, cutting-edge technology and hybrid propulsion systems that will contribute to a substantial improvement in fuel efficiency compared with conventional vessels.

The vessels are designed to be upgraded to ethanol fuel, enabling further reduction in carbon



Each vessel boasts cutting-edge technology

emissions by up to 70 per cent once the upgrade is executed.

Kongsberg Maritime has a strong Brazilian presence and has supported the country's offshore industry for decades, delivering designs for more than 50 offshore vessels built there.

Atle Gaasø, Kongsberg Maritime's Sales Director Offshore, said: "This project represents a significant step forward in sustainable offshore operations. Our innovative ship design, combined with advanced hybrid propulsion and

integrated solutions, ensures unparalleled fuel efficiency, safety and sustainability.

"Our long-standing presence in Brazil and our dedicated team of more than 200 engaged employees enables us to deliver tailored solutions that meet the specific needs of Petrobras and CMM."

Christophe Vancauwenbergh, CEO of CMM, added: "Kongsberg Maritime's innovative ship design is integral to achieving our vision for more efficient and sustainable offshore operations."

"Their expertise and Brazilian presence have been critical to the success of this bid and we are optimistic about final confirmation of the tender."

The all-electric revolution in maritime is charging up, thanks to Kongsberg Maritime's innovations providing a tantalising glimpse into the future of automation and electrification. Over the next seven pages, we showcase a responsive and efficient propulsion solution for the future of shipping and examples of how we can contribute to a more sustainable maritime industry.



Electrification

Pods

# The future of maritime propulsion

The Elegance electric pod propulsor is a shining example of Kongsberg Maritime's ability to create products that benefit both the customer and the environment.

**K**ongsberg Maritime continues to lead the way with innovative propulsion solutions that meet the demands of modern vessels.

With growing demand for electric propulsion, one such groundbreaking development is the Elegance electric pod propulsor, designed to offer unparalleled efficiency, manoeuvrability and environmental benefits.

The company has a long-standing reputation for excellence in thruster technology, particularly in the 1-7MW range. Recognising the growing trend towards electrification, the engineering teams drew on their extensive earlier experience with the larger Mermaid pods (with cruise, offshore and naval references) to create a product that fits perfectly within this power range.

"We saw a strong electrification trend coming and knew we had the expertise to develop a product that would meet future demands. While the larger Mermaid pod is no longer produced, we gained so much experience with this technology, which has helped us to create Elegance, a propulsor that's focused on future demands," says Per Nahnfeldt, Kongsberg Maritime's Product Manager for Pods.


Unlike traditional thrusters, the Elegance pod features a direct connection between the motor and propeller, eliminating the need for gears and therefore reducing drive train losses.

**"We saw a strong electrification trend coming and knew we had the expertise to develop a product that would meet future demands"**

Elegance is available in two main variants: the open pulling version, available in the full power range of 1.5MW to 7MW, and the pushing version with a nozzle, ranging from 2.6MW to 7.5MW. For ice-class applications, the Elegance pod can operate through ice up to one metre thick, pushing or pulling the vessel through ice. The open pulling type is designed for Polar Class 6, making it suitable for a wide range of vessels, including naval and research ships.

Three key factors define the performance of the Elegance pod: low noise, high efficiency and excellent manoeuvrability. The standard configuration typically involves two pods at the aft, providing superior manoeuvrability and eliminating the need for tunnel thrusters in the stern. This simplifies vessel design and enhances overall performance. The compact design of the Elegance pods allows for greater flexibility in vessel layout, freeing up valuable space for other critical systems and equipment.





The Elegance pod is both easy to install and service

## Advanced features and environmental benefits

The Elegance pod boasts several advanced features that set it apart from traditional propulsion systems. It has a very low oil content and environmentally friendly seals with an air space between the water and oil, which virtually eliminates the risk of oil spillage.

Exclusive in-house capabilities at the Kongsberg Hydrodynamic Research Centre (KHRC), in Kristinehamn, Sweden, include test tunnels and Computational Fluid Dynamics (CFD) capability, allowing for detailed product optimisation.

The pulling option of the pod features twin fins, which improve steering and cavitation performance.

“This means Elegance recovers losses from rotational flow more effectively than other solutions,” says Göran Grunditz, Director – Hydrodynamics. “During the development of the pod, several shapes for the tail were studied with both CFD and in the cavitation tunnel at KHRC.

“We found that the fins interact with each other and more efficiently recover rotational energy from the flow while also suppressing inception of cavitation.”

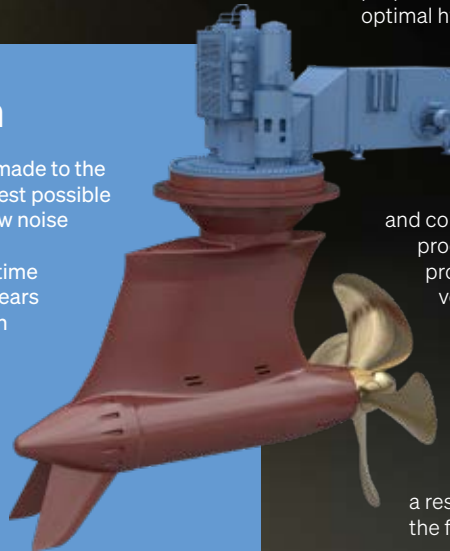
Another special feature of the pod is the slots on top of the cylindrical part to improve the motor cooling. The openings need to allow for sufficient water flow across the top part of the motor to supply sufficient cooling and, at the same time, minimise any additional drag.

The Elegance pods are designed for easy installation and servicing, with underwater replaceability and the ability to be delivered later in the build process, benefiting both shipyards and owners.

The pod uses a permanent magnet (PM) electric motor, known for its robustness, compactness and high efficiency. This motor, combined with a fixed-pitch propeller made of bronze or stainless steel, ensures optimal hydrodynamic performance.

## Hydrodynamic perfection

- The propeller design of the Elegance pod is tailor-made to the vessel's specification. The target is to achieve highest possible performance, independently if high efficiency or low noise levels are requested by the customer.
- The propeller design capability at Kongsberg Maritime is unique not only for its long experience from 80 years of hydrodynamic research, but also for the variation between vessel types and segments.
- The experience and knowledge gained from naval programmes are applied for commercial projects where similar requirements can be seen, for example in cruise vessels or mega yachts. The interaction between hull, pod and propeller is utilised to improve efficiency, comfort and underwater radiated noise (URN) levels.



## Comprehensive system integration

The Elegance pod can be fully integrated within Kongsberg Maritime's broad portfolio, including electrical, automation and control systems. “With our extensive range of products, which stretch from the bridge to the propeller, we can apply this technology to any vessel,” says Per.

“We are a leader in the integration of complex technologies onboard ships, and for the markets we operate in, which include yacht, naval, cruise and Ro-Pax, everyone is looking at electrification. So, as the maritime industry increasingly goes electric, the Elegance pod stands out as a responsive and efficient propulsion solution for the future of shipping.” ●

# A green solution for Busan Port

In a busy South Korean shipping hub known for its poor air quality, Kongsberg Maritime has supplied a hybrid-electric propulsion system for a new tug – another step in the right direction to protect the planet.

**B**usan Port, located on the southeastern coast of South Korea, is a major international shipping hub. The port handles a wide range of marine traffic, including container ships, bulk carriers, tankers and Ro-Ro vessels. In recent years, there has been a significant increase in the number of ultra-large container ships calling at the port, driven by the growth of global trade.

Kongsberg Maritime has supplied an innovative hybrid-electric propulsion system to a new tug, the *Meta 7*, which entered service in summer 2024.

The delivery is the first of three separate projects for battery-hybrid tugs in South Korean ports, all focused on emissions reduction. In addition to *Meta 7* in Busan, a tug from the Sunjin project has started commercial operation in Ulsan Port, and the World Marine project (in Gunsan Port) is being commissioned soon. All will feature Kongsberg Maritime hybrid systems and propulsion.

The introduction of the new tug *Meta 7* is particularly significant for Busan, as it faces increasing pressure to reduce air pollution. The port is known for its poor air quality, which is largely due to emissions from ships and other sources.

The use of electric tugboats such as the *Meta 7* can help to mitigate this problem by reducing emissions of harmful pollutants.

Pollution is a major issue in Busan Port, which handles a wide variety of vessels

## Full electric operation and smoke reduction

When operating on electric power, the *Meta 7* produces zero emissions. This is a significant advantage over traditional diesel-powered tugboats, which emit large amounts of pollutants. By reducing its reliance on diesel fuel, the *Meta 7* can help improve air quality in Busan Port and contribute to a more sustainable maritime industry.

Hyeon Ho Hwang, Kongsberg Maritime's Team Manager LNG & Energy, says: "The *Meta 7* is designed to operate on full electric power for most of its tasks, including berthing and unberthing operations. This is made possible by the vessel's advanced battery system, which can store enough energy to power the electric motor for extended periods. Generally, the tug can operate for one hour for normal speed transit operations."

By operating on full electric, the *Meta 7* can dramatically reduce its emissions of smoke and other pollutants.

"This is particularly important for tugboats, which often operate in confined spaces near residential areas. The reduction in smoke emissions will help improve air quality and reduce the impact of port operations on local communities. As the demand for cleaner and more efficient vessels continues to grow, it's likely that we will see more electric tugboats and other electric marine vessels being introduced in the years to come. We currently have three projects for hybrid tugs in South Korea and look forward to monitoring future operations with our battery-hybrid system," adds Kyu Sung Jung, Kongsberg Maritime's Vice President Regional Sales – South Korea and Japan.



**“The reduction in smoke emissions will help improve air quality and reduce the impact of port operations on local communities”**

The *Meta 7* has delivered impressive emission reduction results

## Pioneering step towards a greener future

The *Meta 7* is a pioneering project that demonstrates the potential of electric propulsion in the maritime industry. By reducing emissions and improving air quality, the vessel can help create a more sustainable and environmentally friendly port environment.

Hong Jae Kim, Vice President of Meta Tug, says: "Since its deployment in Busan, the battery-hybrid tug *Meta 7* has shown promising results. By utilising battery power for up to one hour during transit operations, we have successfully reduced emissions and improved air quality, contributing to a more sustainable and environmentally friendly port.

"While the diesel engine remains in use and automatic hybrid mode conversion is not yet applied, the PTI [power take-in] mode has proven beneficial by lowering fuel consumption and easing maintenance due to reduced operating time of rotating machinery. As the demand for cleaner and more efficient vessels grows, we anticipate seeing more electric tugboats like *Meta 7* in the future." ●

## The electric propulsion system

The *Meta 7* was built at DongSung yard. It is equipped with a hybrid-electric propulsion system, which combines a diesel engine with batteries and twin fixed-pitch azimuth thrusters (model US 255 S P30 FP) with electric induction motors. The diesel engine is used to generate electricity, which is then stored in batteries. The electric motor can be used to propel the vessel independently or in conjunction with the diesel engine. Other Kongsberg Maritime technology in this integrated power and propulsion system, includes:

- K-Power DC electrical system with 646kWh Energy Storage System
- Transformer
- Automation and Control (K-Chief 700)
- Shore connection (for charging).



The thruster electric induction motor

# Ferry operations at the push of a button

Kongsberg Maritime's innovative all-electric propulsion systems are changing the ferry business for good and the company's technical skills are transforming the way vessels travel between ports.

All systems go for the future of ferries in Norway and beyond



**N**orwegian ferry operator Bastø Fosen is taking full advantage of all-electric propulsion by adopting Kongsberg Maritime's advanced manoeuvring capabilities and making maritime history in the process.

The company, which operates six ferries on the Horten to Moss route, has converted three of its vessels to all-electric propulsion. They are the world's largest all-electric ferries and ply the 30-minute route on a frequent schedule, on one of the country's busiest ferry connections. Bastø Fosen also operates two smaller ferries on the Svelvik to Verket route.

However, it's not just the all-electric propulsion that makes these ferries remarkable. Kongsberg Maritime has been working with Bastø Fosen

on a groundbreaking, five-year experiment in automated manoeuvring and control that promises to revolutionise ferry operations globally.

Moreover, vessel operators in many other segments could benefit, says Vegard Sæterlid, Kongsberg Maritime's Director of Positioning and Manoeuvring.

To meet the needs of vessel operators that could gain significant advantages with a dynamic positioning (DP) control system, but do not need the standards and certification involved with DP-class rating, Kongsberg Maritime now offers a suite of products and functions called Advanced Manoeuvring. This enables vessels to have functionalities normally associated with a DP rating.

"For Advanced Manoeuvring, though it is certainly possible with a combustion motor

**"We are pushing the boundaries of what we can do with the dynamic positioning system"**



Find out more about dynamic positioning (DP), Auto Crossing and Auto Docking

or diesel engine, you get more value from the system with an all-electric ferry," says Vegard. He notes that precise operations that require quick adjustments, such as in harbours or near the dock, benefit from all-electric power, which is more responsive to changes in power than a traditional engine. It is also easier to set up the control system for Advanced Manoeuvring on a fully electrified vessel.

There are two Advanced Manoeuvring functions that Kongsberg Maritime introduced to the Bastø Fosen all-electric ferries. One is Auto Docking, which uses a combination of sensors and thruster control linked to the algorithmic control found on a DP system, to automatically dock a ferry. The other is Auto Crossing, which uses data gathered from ferry transits to create and follow a route which optimises the use of a vessel's propellers and power during automated trip phases.

For the operator, the demands of a ferry journey are reduced to pushing buttons on the Manoeuvre Mode Switch. "It's just three pushes on the screen when sailing from Horten to Moss," says Svein Erik Waskass, the Captain on *Bastø Electric*, which has capacity for 200 cars and 600 passengers. "The system is built up over many months with the recording of navigators' actions."

The captain can simply push a button to activate or deactivate Auto Docking or Auto Crossing, depending on the vessel's position in its voyage. The captain can also take manual control at any moment. For the Bastø Fosen ferries, Kongsberg Maritime embedded these functions in the Collision Avoidance system, thereby using information from ECDIS and situational awareness data to maintain course and speed.

The system worked so well, and so easily, that it created a new problem for Kongsberg Maritime engineers.

The system required data from thousands of crossings by the Bastø Fosen ferries, including data from manual operation. According to Sæterlid, the



Electric power is easy to use and more responsive than traditional engines

crew liked using the Advanced Manoeuvring system so much that the company's engineers found they weren't getting enough data from manual operations during the initial phases of the project.

These operations and experiments provide a first, tantalising glimpse into the promise of automation and electrification for the maritime industry. The Auto Crossing and Auto Docking functions are building blocks for future remote and autonomous operations. In just a few years, Kongsberg Maritime has developed a leading position in this remarkable technology. In part, this is because of the company's experience over decades of DP systems development, which is the basis for the functions of Advanced Manoeuvring.

Kongsberg Maritime also used the technology behind Auto Crossing and Auto Docking to automate an 80-metre container vessel, *Yara Birkeland*, the world's first fully electric container vessel. Other vessels have also started using Advanced Manoeuvring solutions.

"We are pushing the boundaries of what we can do with the dynamic positioning system," says Vegard. "We are bringing in all our knowledge on how we can take a vessel to the next level of the vessel on DP."

Kongsberg Maritime has industry-leading expertise in hybrid and battery electric operation across segments including ferries, tugs and workboats, and offshore vessels. By pairing an electrical system with Advanced Manoeuvring, ferry operators and crew are seeing big benefits. It should be no surprise that the all-electric revolution in maritime operations is charging up. ●

# Dynamic innovation

A range of winches from Kongsberg Maritime use technology that offers speed, safety and efficiency in rough conditions, while meeting growing demand for greener solutions.

**K**ongsberg Maritime was an early adopter of permanent magnet (PM) technology, with the launch of a range of products for propulsion, anchor handling and fishery winches. The range of PM winches has been proven effective in heavy-duty bottom fishing operations, when the speed, torque and rapid response have proved invaluable.

The products have been developed by the company's in-house engineering team, located in Brattvåg, Norway, where a serial assembly and test line for motors is located.

The winches offer significant benefits in energy efficiency and are a key part of the shift towards electrification of ships.

The high-torque, low-gear ratio winches have always used the manufactured motors from Brattvåg. The main advantage with this motor design is it provides very high torque, which leads to an overall total low moment of inertia for the winch. This gives the winches a very good dynamic capability – an important feature when working with large loads. Another key element is the enabling of active heave compensation capability, with high electrical efficiency and the possibility to regenerate electrical power.

Runar Hjelle, Kongsberg Maritime's Sales Director Offshore Construction & Support, says: "There are a lot of adverse sea conditions that aren't easy to predict. Add to that the mass involved, movements such as slamming and drag, or perhaps equipment stuck on the seabed, and you have a very challenging environment that demands the best handling equipment to perform the operation safely and efficiently."

"The motor technology is, therefore, extremely well suited as a drive system for anchor handling, towing and escorting, as well as fishery."

Ten years on, Kongsberg Maritime has accrued significant references



Multiple PM winch motors



PM winches seen here on an AHTS provide very high torque

for its winches in the fishery market, with more than 50 motors installed on a variety of trawlers. The winches are easily scalable, in the same principle as low-pressure hydraulic winch systems, which the company has supplied to more than 10,000 vessels.

Fishing vessels require a pulling capacity from around 30 to 110 tonnes. Up to 55 tonnes is achieved with a single PM motor, without the need for a gearbox.

As pulling requirements increase, much larger winches can be configured, simply by adding additional motors, directly driven or with a gearbox.

Runar explains: "The PM winch is a flexible solution, with a broad power range from 30 to 700 tonnes, depending on the mission. At the lower power range, such as fishery, a single motor is fine. As you move up through the power demands, additional motors can power much larger winch systems for the heaviest of anchor handling and towing operations. With each motor rated at up to 1.1MW, there is a huge amount of power."

"The motors we have developed are purposely built for anchor handling applications, where it must be fast and dynamic. In some ways it's an electric version of what we already have with our world-renowned hydraulic winch portfolio. It's a high-end motor, designed for efficient and safer operation in the roughest of conditions."

Today, owners are exploring ways to maximise electric systems and components on board their new vessels.

Runar adds: "I would say, in the majority of the discussions we're having with customers in Europe, they are focused on electrification, and we see a trend for global interest in this technology." ●



Floating wind

# Winds of change

The world is embracing and demanding greener energy. A wide range of solutions from Kongsberg Maritime has been developed with the floating offshore wind market in mind. Over the next 10 pages, find out how the company's technology and pioneering designs are revolutionising the sector and aiding the world's transition towards a low-carbon future...



Floating wind

Ship design

# New vessels fit for a green future

The demand for offshore wind farms and cleaner energy is set to grow – as is the need for pioneering transportation, mooring and installation technologies, such as two innovative new FWIVs designed to prioritise safety, efficiency and the environment.

UT7900 FWIV AHT

UT7600 FWIV SUBSEA

The two vessels can serve new and traditional energies



**F**or 50 years, Kongsberg Maritime has been a pioneer of ship design. Now, this innovative spirit is being expanded even further amid efforts to obtain future growth in floating offshore wind farms and subsea construction.

Offshore wind is set to grow rapidly in many parts of the world and the potential growth in larger, floating wind turbines will mean large-scale wind farms that require efficient transportation, mooring and installation – for hundreds, and perhaps thousands, of turbines.

Two new vessel types have been designed for large-scale mooring and installation operations and are equally suited to floating wind turbines, other offshore and subsea structures, and structures for oil and gas.

Described in the portfolio as ‘Floating Wind Installation Vessels’, or FWIVs, one of the two designs is an anchor handling vessel designed to handle large dragging anchors with very high forces, as well as implement a novel rope handling logistics set-up that allows large rope storage and simultaneous deck operations.

The other design is a large subsea construction vessel with mooring system installation capabilities. This version is equipped with systems required to handle, store and deploy chain, various mooring system elements and rope in a safe and efficient manner, similar to an anchor handler.

Both designs bridge a gap between traditional anchor handler and subsea construction vessels, as well as extend the vessel design range in vessel size and capacity.

**“The new designs will play a key role in enabling the industrialisation of installing floating wind turbines”**

## Future-focused portfolio

Kongsberg Maritime unveiled the first part of its new portfolio in 2023, with a range of platform supply (PSV) and anchor handling tug supply designs. All featured a range of technologies for the use of alternative fuels, hybrid operation and lower emissions. In the case of the anchor handler (AH), an innovative cross-tensioning system for deep sea anchor installation has been incorporated in the new designs, along with other new features, to meet the requirements for seabed anchoring of floating structures.

The anchor handling version (the UT 7900 FWIV AHT) features the Kongsberg Maritime triple cross-tensioning system, which is able to tension up three mooring system lines in one operation. The system can pull up to 900 tonnes in a single fall configuration with the use of the winch systems and not the propellers.

The key difference is that the triple cross-tensioning capability is for up to three lines rather than the two on the 2023 AHT’s design longitudinal cross-tension system.

Martijn De Jongh, Kongsberg Maritime’s Chief Designer, says: “The new designs will play a key role in enabling the industrialisation of installing floating wind turbines. The volume is going to be very high. That’s why we describe this as the industrialisation of mooring installations.

“Whether it’s using suction anchors, ropes or chains, this work will be very repetitive. It’s the same month after month. That is so different from usual offshore oil and gas operations, which are typically about the mooring of a single large unit, then the vessel moves off to another project. We’ve optimised the designs to do this operation efficiently for the long term.”

Safety for crew members working on deck is a key feature of both vessels. For the FWIV AHT version, the set-up of winch and chain storage is very different from classic anchor handlers.

“This vessel offers a new approach and, because of the high volume and repetitive nature of the operations, we’ve built in additional rope and chain storage,” Martijn says. “The whole point behind this system is that you deploy the rope while preparing the next one and you do it in a safe environment, which you can’t do on a normal anchor handler because you have rope winches on deck and a danger zone where you can’t have people. We call it Sim-ops – simultaneous operations. It’s all about preparing for the next task.”

To enable Sim-ops, the UT 7900 FWIV AHT has a series of reels for the storage of mooring ropes and chains in the bow, forward of the bridge.

“This configuration means the whole main deck is a safe area for handling the rope and respooling it, which is

The mooring tensioning system is used to connect floating turbines



Vessel tensioner

done under low-tension,” Martijn says. “The only ‘danger zone’ is around the stern rollers where you have high-tension ropes deploying anchors. You have a clearly defined safe working area and a non-safe working area – this is very different for a vessel of this type and offers something new to this emerging growth market.”

The UT 7900 FWIV AHT is a significant step up in size and the capacities are much higher. Martijn adds: “It compares with the Kongsberg Maritime-designed AHTS *Island Victory*, one of the most successful vessels we’ve ever delivered. It’s the same length but wider at 28 metres. It’s an installation machine.”

The high-thrust propulsion for this large vessel is through a triple azimuth thruster at the stern, which offers enhanced station keeping, high bollard pull of around 300 tonnes and plenty of redundancy for DP operation.

### Subsea solution

The second new vessel design evolved from the requirements of owners experienced in subsea construction who wanted the capability for high-volume floating wind installation.

The UT 7600 FWIV SUBSEA is a large subsea vessel with mooring system handling capabilities.

The longitudinal cross tensioning is planned on the subsea vessel, with one line going forward and one line going astern. The forward line is fixed and winches pull in the stern line to tension both forward and stern lines.

Martijn describes the ways that owners see the future opportunity with a flexible vessel, saying: “They are telling us they want a subsea construction vessel but also with anchor and mooring handling capabilities built in.

“This is a combination of two vessel types and is a result of a major research project we’ve run looking at the long-term requirements of the floating wind market.

“This is the type of vessel that would likely need to be built on speculation but, with such a drive for clean energy worldwide, I’m convinced that the market will be there – and very soon.

“This is a vessel that would be heavily utilised throughout the 2030s and if you want a vessel to be operating then, now is the time to be signing contracts.” ●

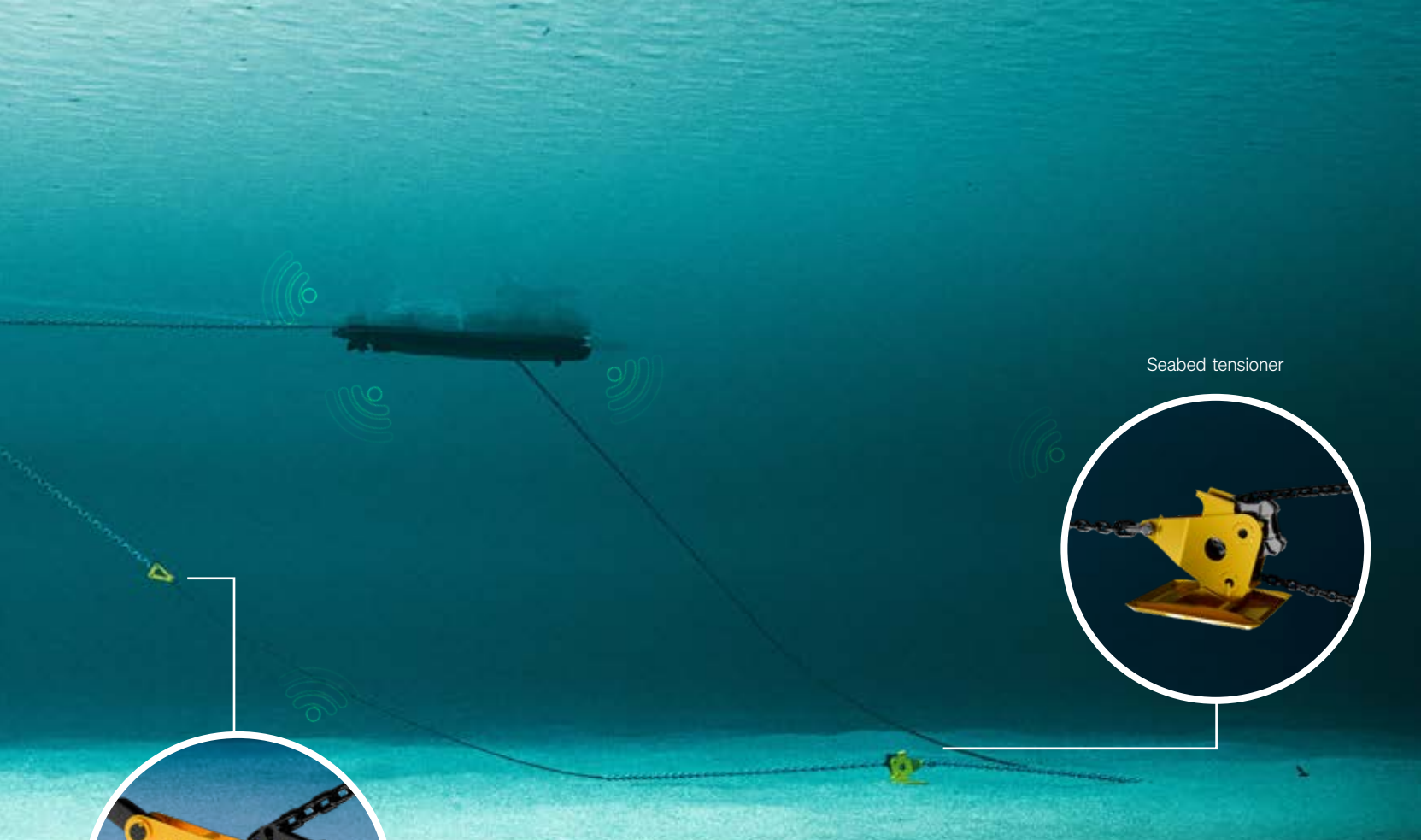


Floating wind

Mooring tensioning

# Seamless solutions for floating turbines

A cutting-edge ‘integrated tensioner’ concept from Kongsberg Maritime increases the efficiency, precision and safety of the wind generator installation process, enabling streamlined and large-scale deployment of these vital offshore structures.



Inline tensioner



Seabed tensioner

**T**he “integrated tensioner” is one of several cutting-edge solutions developed by Kongsberg Maritime to streamline the installation of floating wind turbines. In certain markets, trends point towards avoiding permanent winches on

the floaters. However, new demands are placed upon the anchor handling vessel performing the hook-up, tensioning and decommissioning with the use of mooring tensioners.

Lars Petter Tennfjord, Kongsberg Maritime’s Product Manager – Emerging Markets (pictured), explains: “The process begins with the pre-laying of anchors on the seabed, which can involve a spread of three to six lines, depending on the project requirements. This task is typically handled by a specialised mooring installation vessel.

“Once the anchors are in place, the mooring lines are laid out on the seabed, ready for the arrival of the floating turbine. When the floater arrives at the site, towing vessels assist in optimising the headings and positioning of the floater. The towing spread is carefully laid out and a high-end anchor handling vessel, known

as the hook-up vessel, takes over. This vessel is responsible for picking up the mooring lines and connecting them to the floating turbine.

“The traditional method of hooking up mooring lines involves a vessel picking up the line from the floater and transferring it, often struggling with weather limitations. Our new integrated tensioning concept increases the efficiency

of this process. The system monitors the motion of the floater, allowing the vessel winch to compensate, removing peak loads and hazardous situations. This results in a much smoother hook-up process and significantly increases the operational weather window.

“The control system utilises a variety of sensor systems, both on board the floater and on the vessel, to compensate for relative movement. This ensures precise and efficient tensioning of the mooring lines, which can handle loads ranging from 150 to 300 tonnes – and higher, if required.

“Designed for the largest floaters, this system is a key component in the industrialisation of floating turbine installations. It integrates seamlessly with Tow Assist and new vessel designs, providing a comprehensive solution that enables large-scale deployment of floating wind turbines.” ●





Floating wind

Tow Assist System

# Positive energy

A surge in demand for offshore floating wind turbines has brought major business opportunities for Kongsberg Maritime. Its technologies will help power reliable and sustainable major infrastructure projects.

**T**he global demand for clean energy is driving the development of large-scale offshore floating wind turbines. With many countries proposing significant investment in this technology, Kongsberg Maritime is ramping up its offering for this fast-moving market. With perhaps 50 or more turbines in future wind farms, establishing such infrastructure many miles from shore presents big challenges and opportunities for equipment and technology suppliers.

Getting the giant turbines out to the fields will be a mammoth task, and, as volume shoots up, the need for a fast and effective way to transport them from shore will become a prerequisite.

With decades of experience in supplying the world's offshore companies with advanced dynamic positioning (DP) systems, Kongsberg Maritime has developed a new technology application to enhance its popular K-Pos DP system. This enables unpowered floating structures to become DP-enabled during complex towing and positioning operations.

The new Tow Assist System was successfully trialed in the North Sea in summer 2024 and is set to be commercially available in 2025.

This innovative approach to transportation could transform complex towing operations on an industrial scale.

## DP at the heart of the solution

"Many countries, including Norway, the UK, China and France are proposing major investment in floating offshore wind," says Martinus Løken, Kongsberg Maritime's Aftermarket Sales Manager.

"This will see major upscaling of manufacturing for the turbines and the floating, underwater part of the structures. These are huge, and getting them out into the field, in much higher volumes than we've seen so far, is going to pose a major challenge. Add to this the fact that you must do this kind of operation all year round, and we're looking at a whole new way of working."

Continued on page 22

Kongsberg Maritime  
has the technology  
to power the offshore  
energy industry.  
Image: Guttorm Udjus



## Tow Assist System

The complete turbines, including blades, generators, the tower and the underwater floating part, will be transported in one piece, often several hundred miles out to sea.

Martinus continues: “We have looked at the opportunities and solutions we could offer and also listened to several wind farm operators, and the towing of the completed turbines comes up regularly as a key challenge, especially as volumes will increase to levels we’ve not seen before.”

As a leader in the supply of DP systems, Kongsberg Maritime’s technology was the natural choice for deployment in this new market. DP automatically engages thrusters to hold a vessel’s position, or heading, during critical operations. The principle for the new Tow Assist System is to provide a floating structure – which is unpowered – with its own DP capability, in combination with towing vessels in one coordinated operation.

Martinus explains: “In the case of floating wind turbines, these are large, unpowered objects, but being able to manage and understand their positioning is crucial. To do this we install temporary positioning equipment onboard, which links wirelessly to the connected towing vessels, which are equipped with DP systems.

**“Real-time data on position and heading, along with thruster and winch status, is transferred wirelessly to the Tow Assist master computer”**

“We’re essentially providing a decentralised DP operation to a floating object. We can measure the position of the floater and the position of the connected vessels, and then we can establish a model for the precise positioning of the unit, either for station keeping or moving along a trajectory in a controlled manner.

“Real-time data on position and heading, along with thruster and winch status, is transferred wirelessly to the Tow Assist master computer, located on the lead vessel. Then the connected vessels, ideally three in total, act as thrusters for the floating structure – they become one, and move as one, all controlled by proven DP technology.”

To date, such manoeuvres have been carried out using radio and audio instructions from the Tow Master (on the lead vessel) to the other connected vessels. The Tow Assist System offers real-time situational awareness of all three vessels and the floating object, with crews on each vessel able to monitor each other’s position.

Martinus continues: “This approach is particularly useful when getting the floating structure into the exact position for attaching anchors, or ‘hook-up’. However, we believe it should be used for the entire journey from shore to field, as it offers optimal performance of the vessels. We’re going to see more and more of these structures being transported in different parts of the world, where there will be different levels of seaborne traffic and other obstacles to navigate, so all parts of the towing journey can be enhanced.

“Vessel capability and crew competency for complex towing also vary globally, so this will provide a standard approach.”

Look out for new animations on the Tow Assist System and other floating wind solutions in early 2025.



### Towing on test

In summer 2024, Kongsberg Maritime demonstrated the Tow Assist System’s capabilities during a successful trial at the Hywind Scotland offshore wind farm off the coast of Aberdeen.

Hywind Scotland started operating in 2017 and is a pilot project with five floating turbines, together producing 30 MW of power.

A ship’s crew will have all the information they need, delivered in real time.  
Image: Guttorm Udjus





The technology allows the wind turbines to be installed safely and efficiently

### Key benefits from using the Tow Assist System:

- Optimised vessel usage, globally
- Optimised operational efficiency
- Increases the turbine 'hook-up' weather window
- Improved situational awareness
- Reduced fuel consumption
- Improved safety.

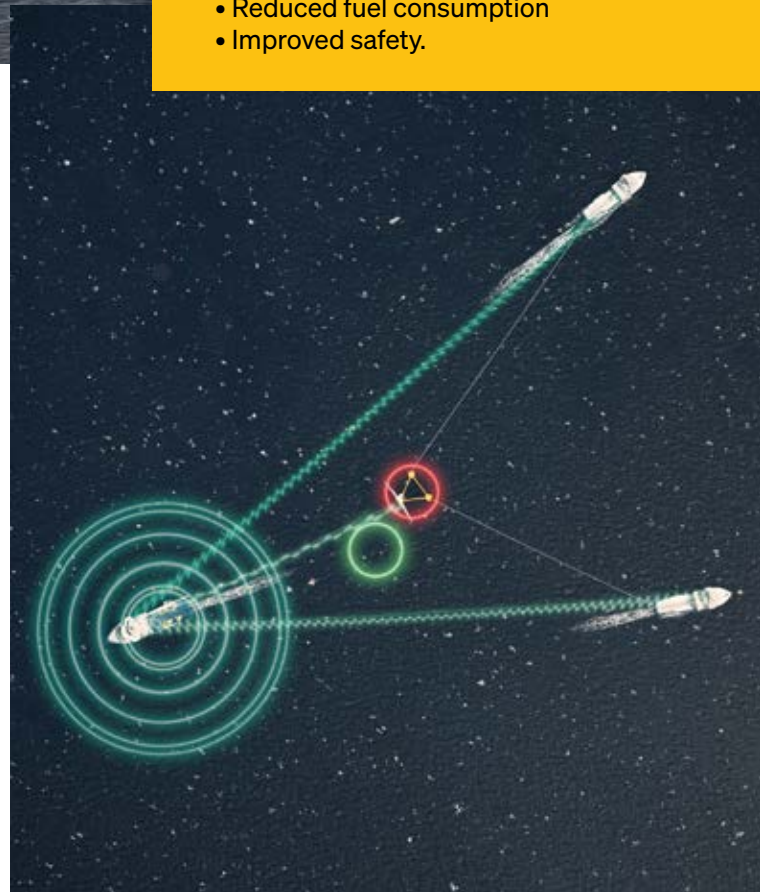
An operation was undertaken to tow each of the turbines to the port of Sløvåg in Norway for heavy maintenance, and back again.

"For the move of the fifth turbine, we installed the sensor equipment, and upgraded the K-Pos DP system on two of the three vessels," says Martinus. "For the trial, we didn't need all three vessels to have it installed, but for commercialised operation, three equipped vessels will fully optimise operations."

The vessels were the *Skandi Vega* (lead tow vessel with K-Pos, Tow Assist master unit and the Tow Master aboard), *Normand Ferking* (K-Pos/Tow Assist installed) and the *Normand Sigma* (without K-Pos and controlled manually).

"We had positioning sensors installed on the floater that measured angle, heading and position, giving real-time positioning signals. Once the location of the field was reached, we enabled the system and the Tow Master was able to control the heading of the *Skandi Vega* and the *Normand Ferking* through the Tow Assist system, which automatically controlled the vessels' propulsion to assist with the positioning of the unit. From a technical level it worked flawlessly." ●

**"We had positioning sensors installed on the floater that measured angle, heading and position, giving real-time positioning signals"**





# Power of integration

A new, patented Kongsberg Maritime method for dynamic cable pull-in operations enhances safety and efficiency by reducing the need for heavy equipment and personnel on the floaters.

**K**ongsberg Maritime has developed an innovative method for cable pull-in operations that promises to improve the way the inter-array cables are pulled in on floating wind turbines. This new approach from the Advanced Marine Operations (AMO) department in Kongsberg Maritime not only enhances safety and efficiency but also extends the operational window to all year-round.

At present, in what is a relatively new industry, cable pull-in operations require mobilising equipment such as winches, power packs, fuel tanks and sheaves on the floater (the floating wind turbine).

Personnel must be on board the floater after it has been hooked up to perform the cable pull-in. However, the new, patented Kongsberg Maritime method reduces the need for personnel and eliminates the need for heavy equipment on the floater. Instead, all necessary equipment is placed on the vessel, significantly reducing the complexity and risk associated with the operation.

Gunnar Thorsen, Kongsberg Maritime's Senior Vice President of Business

Concepts, explains: "What we have developed is a method where all active machinery is on the vessel, providing it has DP2 capability. This is a totally different way of doing things."

The operation involves a hand-carried, mobile instrument package being installed on board the floater that communicates with the vessel. A pre-thread line runs through the guide tube on the floater and a winch on the vessel equipped with a processing unit manages the data from the floater about its real-time motions and position. The system compensates for relative movements between the floater, the cable and the vessel.

Gunnar elaborates: "We have developed a highly accurate system that automatically instructs the winch on the vessel to take out relative movement between the floater and the cable, and between the vessel and the floater. With that method, we can do the pull-in operation in bad weather, extending the operational window."

The step-by-step method shown below offers several advantages, including enhanced safety by reducing the need for personnel on the floater during the pull-in operation, and speeds up the overall rate of installation of the wind farm array.

Ottar Antonsen, Kongsberg Maritime's Vice

**"All active machinery is on the vessel, providing it has DP2 capability. This is a totally different way of doing things"**

All stages executed from the installation vessel set in **Dynamic Positioning** and under **Remote Monitoring**



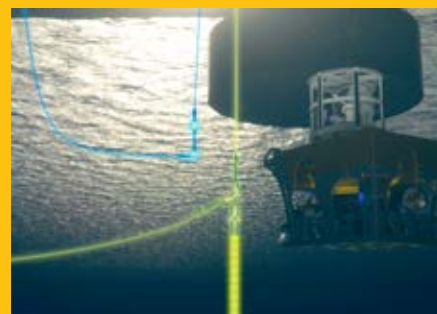
### Cable pick-up

First, the vessel moves towards the floater with the end of the pre-installed cable. The method may also be used in a direct installation.



### Vessel moves cable towards floater

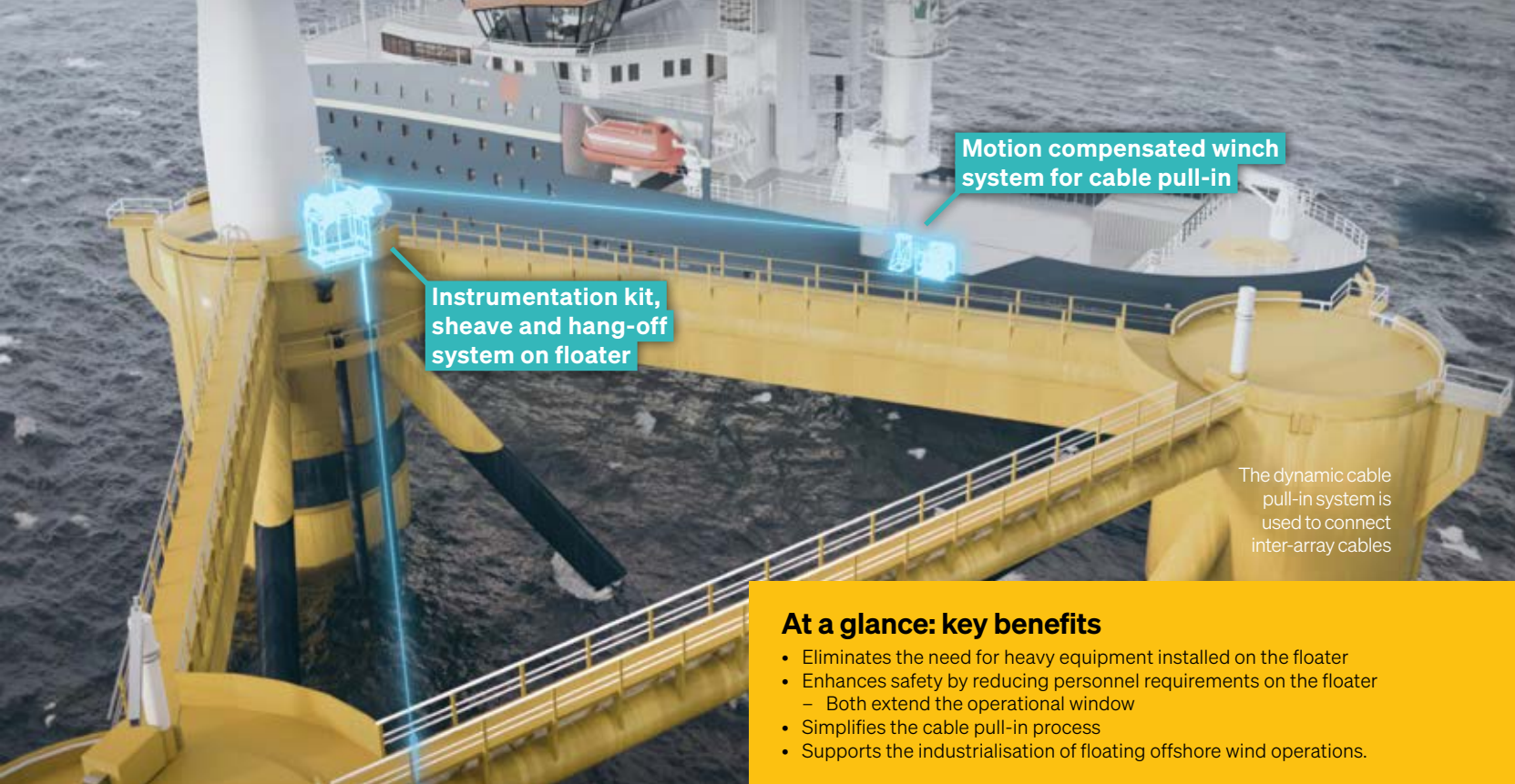
Positioning ready for connection.



### Winch line connection

The Remotely Operated Vehicle (ROV) picks up the winch line connected to the pre-thread line and attaches it to the cable's pull head.





**Instrumentation kit, sheave and hang-off system on floater**

**Motion compensated winch system for cable pull-in**

The dynamic cable pull-in system is used to connect inter-array cables

### At a glance: key benefits

- Eliminates the need for heavy equipment installed on the floater
- Enhances safety by reducing personnel requirements on the floater
  - Both extend the operational window
- Simplifies the cable pull-in process
- Supports the industrialisation of floating offshore wind operations.

President Business Concept and Advisory, highlights the broader implications: “We offer the full package of equipment and technology, from the point the floating turbines leave their construction site, up to the point at which the turbines are connected to the power grid and local substation, and everything in between.

“As the floating offshore wind market expands globally, with regions such as Taiwan, Japan, Korea, Europe and the Americas adopting this technology, the need for an industrialised process becomes evident.

“We see that the way we do it today, using several types of vessels, might be okay in the North Sea where we have a well-

functioning oil and gas spot market. However, with floating wind being adopted globally, areas without oil and gas activity will require a different approach, with vessels designed and built for this specific role.

“Our innovative cable pull-in method is the final part of a new holistic solution to the industrialisation of floating wind installation. Together with our new approach to tow-out, anchor tensioning, mooring and hook-up, we are offering a full solution that represents a big leap forward. This range of methods will enhance safety, efficiency and operational flexibility, and support the rapid growth of this vital renewable energy source.” ●



#### Load transfer

The load is transferred from the crane to the winch, and the instrument package on the floater is activated to communicate with the vessel.



#### Pull-in operation

The winch compensates for heave and other movements between the floater and the vessel, allowing the cable to be pulled in and hung off the hang-off system on the floater.



#### Disconnection of the pull-in line

Releases the load on the winch and disconnect line, which can be recovered and reused later.



# New era of offshore wind

Cadeler’s strategic investment in a fleet of cutting-edge wind turbine installation vessels underlines the company’s commitment to driving the global energy transition. As the offshore wind industry continues to expand, its latest addition to its growing fleet of jack-up vessels – *Wind Peak* – gives a taste of the future, where efficiency and size are everything.

**C**adeler is a leading player in the offshore wind industry and has made a significant investment in its fleet of wind turbine installation vessels (WTIVs). This strategic move positions the company as a key enabler of the global energy transition. With a focus on innovation and sustainability, Cadeler’s vessels are designed to handle the largest and most complex offshore wind projects, ensuring efficient and reliable installation operations.

With six newbuild WTIVs under construction and the newbuild *Wind Peak* already delivered earlier this year, Cadeler’s ambitions are on a par with the sheer scale of these mammoth vessels – big. Last year Kongsberg Maritime secured a significant contract from COSCO Shipping Heavy Industry to supply a comprehensive package of mission-critical technology for the company’s fifth installation vessel. This will be one of the largest in the offshore wind market when delivered, showcasing Kongsberg Maritime’s extensive range of equipment and integration prowess.

The new vessel, designed by GUSTO and designated a bespoke NG-20000X design, will be the third A-class vessel to join the Cadeler fleet. It boasts a deck space of 5,600 sq m and a payload capacity exceeding 17,000 tons, making it one of the largest installation vessels globally.

Kongsberg Maritime will be supplying a complete electrical, automation and propulsion system, including nine thrusters with fixed-pitch propellers. The package features four UUC355FP main propulsion thrusters, two ULE255FP retractable azimuth thrusters and three TT3300DPN FP tunnel thrusters.

The electrical system includes generators, medium voltage and low voltage switchboards, DC switchboards, an Energy Storage System (ESS) and propulsion drives, all integrated with the dynamic positioning (DP) system. Tailored energy control functions optimise the vessel’s energy efficiency, and

the battery-hybrid electrical system reduces the number of engines required for crane operations and manoeuvring.

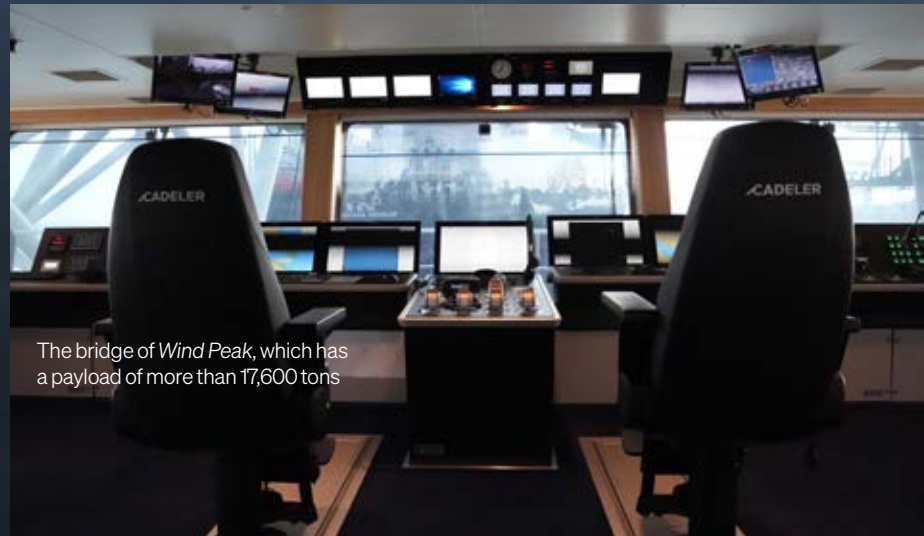
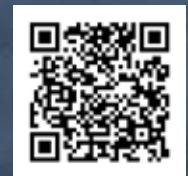
Cadeler’s fleet expansion includes two P-class, two M-class and three A-class vessels, with the latest expected to be delivered in 2027.

At the naming ceremony for the P-class vessel *Wind Peak* in August 2024, Mikkel Gleerup, CEO of Cadeler, emphasised the importance of advanced technology in meeting the increasing demands of the offshore wind industry: “With the growing need for efficient offshore wind farms to support global sustainability goals, there is a demand for larger turbines and more advanced vessels to install them. Kongsberg Maritime’s cutting-edge technology plays a crucial role in making this possible.

“It gives us a totally new opportunity, both as a company and as an industry. Kongsberg Maritime delivered the most comprehensive package to Cadeler, both in terms of the equipment we needed and the support we received.

“Every single component on this vessel has been well thought through. The propulsion package and the electrical package gives us the opportunity to run at maximum efficiency.”

Find out more about the *Wind Peak* project



The bridge of *Wind Peak*, which has a payload of more than 17,600 tons



The *Wind Peak*, left, is one of the largest installation vessels in the world. Below, the vessel naming ceremony at COSCO's yard in Qidong, China



Halvor Økland, Tender Engineering Director, Integrated Solutions at Kongsberg Maritime, expresses pride in the ongoing collaboration. "We are delighted to have once again secured a significant contract from COSCO Shipping Heavy Industry to supply an extensive range of technology for Cadeler's latest jack-up vessel. The company has exciting plans for the future of offshore wind installation, and their continued investment in a fleet of state-of-the-art installation vessels is setting the standard for offshore wind operations."

Brynjulv Standal, Kongsberg Maritime's Senior Vice President Sales and Marketing APAC, says: "These projects are very important for us, and it's been a pleasure to work with Cadeler and COSCO. Kongsberg Maritime is supplying a big range of equipment for these vessels, each with a very advanced hybrid electric system and energy management system. This partnership has enabled the creation of a vessel that sets new standards in the offshore wind industry."

The partnership between Kongsberg Maritime and COSCO Shipping Heavy Industry continues to drive innovation and efficiency in the offshore wind sector, with *Wind Peak* set to enhance Cadeler's capabilities in this rapidly growing market. With more to follow, it's an exciting time for offshore wind.

Mikkel Gleerup concludes: "Having a partner who understands us and who sees us as a partner ensures that we have maximum uptime on these vessels – this was important for us and that's why we selected Kongsberg Maritime. We have invested a lot of money in the company for the benefit of the industry, and for the benefit of the world." ●

## The facts – Cadeler's P-class vessels

*Wind Peak* and *Wind Pace* (to be delivered in Q2 2025) are designed to operate at some of the most difficult sites around the globe and with the most advanced equipment in the industry.

They will offer increased transit capacity, lowering the energy intensity of installation, reducing installation time and thereby lowering total cost of installing offshore wind farms.

- Deck space: **5,600m<sup>2</sup>**
- Payload: **more than 17,600 tons**
- Main crane capacity: **2,600 tons at 46 metres**
- Accommodation: **130 people**

The vessels will be able to transport and install seven complete 15MW turbine sets per load or five sets of 20+ MW turbines, cutting down the number of trips needed for each project, thus accelerating installation speed and minimising the carbon footprint.

Höegh Autoliners, a global leader in deep-sea RoRo transportation, is pioneering sustainable shipping with its new Aurora Class vessels. Partnering with Kongsberg Maritime, the company is making significant strides towards its goal of net-zero emissions goal by 2040.

# Net-zero heroes



The Höegh Aurora's advanced technology reduces emissions

**H**öegh Autoliners, a leading global provider of deep-sea RoRo transportation, is at the forefront of the maritime industry's transition to sustainable shipping. The company operates a network of pure car and truck carrier (PCTC) vessels, transporting approximately 1.6 million car equivalent units (CEUs) annually, alongside other cargo.

Kongsberg Maritime is playing a key role in enabling this ambitious ship owner to transform its green credentials through the supply of integrated systems to its newbuilds and upgrades to its existing fleet.

A key milestone in Höegh Autoliners' journey towards net-zero emissions by 2040 is the groundbreaking Aurora Class.

These state-of-the-art vessels, with ammonia-ready and methanol-ready notations, will be the first PCTCs capable of running on ammonia by 2027. By significantly reducing carbon emissions per car transported, the Aurora Class is setting a benchmark for sustainable deep-sea shipping.

Andreas Enger, CEO of Höegh Autoliners, proudly states: "With the Aurora Class we are pioneering efforts to combat pollution in a hard-to-abate segment. We are setting new standards for sustainable

deep-sea transportation, making a significant stride towards our 2040 net-zero emissions goal."

The Aurora Class vessels will be equipped with a range of advanced technologies to enhance efficiency and reduce emissions.

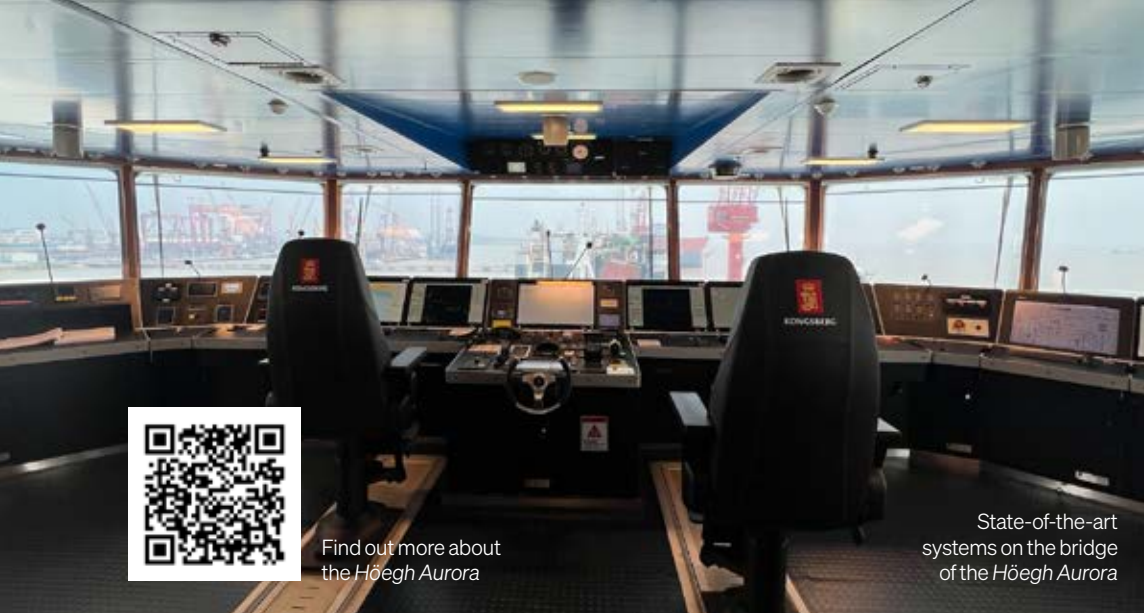
Key features include dual-fuel engines capable of operating on both LNG and marine diesel oil, an energy-efficient hull design and shore power connection for further emissions reduction in port.

The first Aurora Class vessel, the *Höegh Aurora*, started commercial operation in summer 2024, closely followed by the second, *Höegh Borealis*. With a capacity of up to 9,100 cars and enhanced capabilities to transport electric vehicles, the Aurora Class is not only outperforming existing tonnage but is also future-proofed to meet evolving cargo demands.

"We are committed to being a leader in sustainable shipping," says Andreas. "The investment in new vessels and the green upgrades to our existing fleet are major steps towards achieving our net-zero emissions goal."

Kongsberg Maritime President, Lisa Edvardsen Haugan, visited the *Höegh Aurora* at the yard in China to see first-hand how Kongsberg Maritime technology is transforming the future of Höegh Autoliners' global operations. She says: "Nothing beats the feeling of being on

**"We aim to make ships smarter and greener... and enable our customers to take a leading position in decarbonisation"**



Find out more about the Höegh Aurora

State-of-the-art systems on the bridge of the Höegh Aurora

board a new ship, and the Höegh Aurora is a very special ship. We aim to make ships smarter and greener, and our package of equipment on board is a clear demonstration of how we work with our customers to enable them to take a leading position in decarbonisation of their operations.

“For a large car carrier like this, it takes more than just a change of fuel type for greener and safer operations – it takes a wide range of advanced technology from many suppliers, including ourselves.

“We have an extensive, integrated equipment package on board the new Aurora fleet. This includes the navigation system, a system for emission monitoring and reporting, the engine control system and shaft torque metre solution.”

### K-Chief – the beating heart

“The K-Chief automation system is built on 50 years of operational experience and, for this ship, it is one of two very important arenas on board this vessel,” adds Andreas. “As everything on the ship becomes more digital and sophisticated, it’s becoming more and more important that you fully understand the operational patterns, routing, performance of the engines and other onboard systems, and we consider the bridge to be the brain.”

Höegh Autoliners is committed to reducing its environmental impact and is actively investing in green upgrades for its existing fleet.

These initiatives include retrofitting ships with energy-saving technologies such as upgraded propellers and hull coatings, derating turbo

chargers, exploring alternative fuels and installing Promas propulsion to improve efficiency and reduce fuel consumption.

In addition to the new Aurora Class ships, Kongsberg Maritime is supplying its Promas Lite propulsion system to Höegh Autoliners to upgrade the propulsion systems on 10 PCTC vessels.

This retrofit solution is designed to improve efficiency and reduce fuel consumption. Promas Lite integrates the propeller, hub cap, bulb and rudder into a single unit, optimising hydrodynamic performance. Detailed studies and full-scale measurements have confirmed fuel savings of at least 6.5 per cent for Höegh Autoliners’ DSME Class PCTCs.

Promas Lite offers significant energy savings and a quick return on investment and, with more than 100 upgrades carried out to date, it is a popular choice with many merchant ship owners. ●

**Read more about K-Chief on pages 30 and 31.**



Andreas Enger and Lisa Edvardsen Haugan at the shipyard in China

## Kongsberg Maritime’s technology solutions for the Aurora Class

- **K-Bridge navigation system:** A unified interface for critical navigation tasks, integrating various systems to improve decision-making and efficiency.
- **K-IMS emission monitoring and reporting:** A cloud-based information system that connects onboard data to optimise operations, reduce emissions and streamline reporting.
- **K-Chief automation system and power management system:** An automated system that controls and monitors the ship’s engine room, ensuring optimal performance and efficiency.
- **Promas propulsion system:** An integrated propeller and rudder system that reduces hydrodynamic resistance, leading to lower fuel consumption and improved manoeuvrability.

### The Aurora Class – key facts:

- Built at China Merchants Heavy Industries in Haimen.
- The first two ships were delivered in 2024.
- The total investment in the new fleet is approximately \$1 billion.
- DNV multifuel notations for ammonia and methanol.
- Reduced emissions: The first eight ships will initially run on LNG and are expected to reduce carbon emissions per car transported by up to 58 per cent, compared with industry standards.
- The last four ships in the series of 12 are planned to run on ammonia.
- Increased capacity: Each of the Aurora Class can carry up to 9,100 cars, making the vessels the largest PCTCs ever built.
- Enhanced cargo capabilities: The ships are equipped with strengthened decks and advanced ramp systems to accommodate electric vehicles (EVs) on all 14 decks.

# The strength of simplicity

The K-Chief marine automation system provides an efficient and integrated platform for controlling vessels and it is proving to be a popular choice with ship operators worldwide.

**F**rom its launch in June 2023, Kongsberg Maritime's new K-Chief marine automation system has now been commissioned in 40 vessels with a further 400 systems already ordered for the construction of new ships.

That number is growing as more shipowners and operators are appreciating the benefits of a vessel control platform that integrates all of Kongsberg Maritime's equipment to provide easier, more efficient and safer operations on board their vessels.

K-Chief is a popular and proven marine automation system, and this latest version builds on the success of the K-Chief 600 and K-Chief 700, plus the ACON control system, which is the culmination of more than 50 years of the company's pioneering work in making safe, reliable and user-friendly automation systems for the maritime sector.

As a result of this latest development, the new K-Chief integrates advanced functionalities into one system for better resource management and includes a new improved user interface and enhanced cybersecurity capabilities.

Espen Kværnstuen, Kongsberg Maritime's Technical Product Manager Vessel Automation, explains: "Our 600 and 700 versions of the K-Chief control system, together with our ACON control system, were developed for different maritime markets that had different operational needs.

"The K-Chief 600 was more suitable for the volume merchant market, which required less functionality but with a high focus on cost and ease of use, while the

700 was developed to meet more advanced installations where increased functionality and high flexibility were important, particularly in the advanced offshore operations and oil and gas sector. The ACON system was developed for fisheries and offshore support vessels.

"However, with the increasing adoption of different fuel sources on newer vessels, such as engines capable of running on both diesel and LNG, and different sources of power to manage, such as the introduction of batteries and fuel cell generators, we could see there was a need for a single automated vessel control platform that could handle these more advanced functions on board. We have brought the simplicity and user interface from the merchant market and combined it with the adaptability and flexibility from the offshore sector to provide one automated system that is suitable for all ship types."



**"K-Chief's success is the result of the dedication of our automation and system specialists"**



Espen Kværnstuen is proud of the spirit of collaboration on display in this project



The K-Chief system on the Höegh Aurora (see pages 28 and 29)



## All systems go

The K-Chief system's modular design enables flexibility in configuring the system so it can cover all the important functions on board a vessel, and is configurable for all ship types, including tankers (oil/LPG/LNG), bulk carriers, container ships, cruise ships and ferries, yachts, offshore vessels, drilling rigs and other special purpose vessels.

Typical systems that can be integrated include:

- Alarm and monitoring
- Gas management
- Auxiliary control
- Fuel gas control
- Safety management
- Ballast control
- Power management
- Cargo control
- Propulsion and thruster control.

Integrating multiple systems through the new K-Chief will help give shipowners and operators a greater overview of the operation of their ship systems and help to reduce costs, improve the efficiency of their onboard equipment and reduce the likelihood of human errors, improving safety.

The existing installations of K-Chief 500/600 and K-Chief 700, including ACON/UMAS legacy systems – which are currently used on 14,000 vessels worldwide – will continue to be supported. However, the new K-Chief comes with added benefits, particularly when it is integrated with Kongsberg Maritime's K-IMS information management system, which enables access to data on board and on shore.

Espen says: "We have worked very closely with our K-IMS team to integrate its system with K-Chief so that it not only gives value to the customer but also to Kongsberg Maritime in terms of providing remote support, malware protection and data export capabilities. It will also increase our overview of the installations so we can monitor where we can develop and enhance the system in the future."

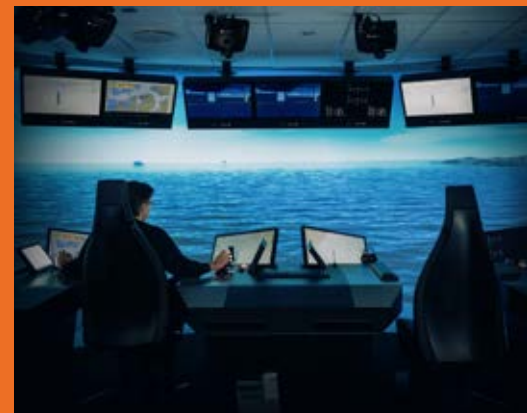
A major focus in the design of the new K-Chief system has been cybersecurity, particularly as the International Association of Classification Societies (IACS) published Unified Requirements (URs) for cybersecurity which are mandatory for classed ships and offshore installations, and which came into force on 1 July 2024.

Espen adds: "The system complies with the requirements of IMO [International Maritime Organization], local maritime authorities and IACS, and is the first commercial control system for vessels that has cybersecurity approval from nine major classification societies.

"K-Chief's success is the result of the dedication of our automation and system specialists from our many locations across the world, all working together to provide a single system for our customers. This collaboration will continue to further enhance K-Chief in the future so that we can provide ship owners and operators with a more complete overview of all the systems they are using, helping to simplify operations for their crew, making their jobs more efficient, easier and safer." ●



Find out more about K-Chief



Oddrun With

The *Oddrun With* uses Kongsberg Maritime technology to deliver sustainable results



# Precise position

Kongsberg Maritime prides itself on making customers' lives easier. Its dynamic positioning systems are excellent examples of this dedication as the company ensures that vessels are in the right place at the right time.





**K**ongsberg Maritime's dynamic positioning (DP) systems enable vessels to maintain a precise position and heading without the use of anchors, making them indispensable for a wide range of offshore operations.

While the systems are a common feature on numerous offshore energy applications, many other vessels use DP to enhance operations. In the fisheries sector positioning of fish feeding vessels, which deliver feed pellets to salmon farms, is a crucial element of safer operations. *Insights* magazine caught up with the crew of the *Oddrun With*, a state-of-the-art fish feeder owned by Norwegian company, Egil Ulvan Rederi AS.

### Sophisticated control

The DP system on the 86-metre *Oddrun With* ensures optimal station keeping and manoeuvrability, even in challenging sea states. By continuously monitoring the vessel's position and environmental conditions, DP systems calculate the necessary thruster adjustments to counteract external forces such as wind, waves and currents.

Built in 2022 by the Tersan Shipyard in Turkey, this vessel is designed for efficient and environmentally friendly operations. It primarily serves the Norwegian aquaculture industry, transporting feed to various salmon farms along the coast.

Key features of the *Oddrun With* include its impressive 120-ton crane, a significant upgrade in capability for the industry, and its ability to run on liquefied natural gas (LNG) to reduce emissions.

During the visit Captain Odin Hagan and Chief Officer Siv Oldeide explained how the Kongsberg Maritime DP system enables their vessel to play a crucial role in supporting Norway's sustainable aquaculture sector.

Siv Oldeide says: "Without the DP system we have from Kongsberg Maritime, we wouldn't have been able to unload as efficiently.

"When we approach the fish farming facilities, it's my responsibility to keep

the boat on DP and operate the crane we use to unload the fish feed.

"Being the only person on the bridge in bad weather, trying to keep the boat steady and unload the fish feed at the same time, I'm entirely dependent on the DP system.

**"It's just three to four button presses, and we are basically in action, so it's very convenient"**

"Personally, I think the Kongsberg Maritime DP system has a very simple user interface. For people who don't work with DP as much as they do offshore, the system is easy to understand. There are simple symbols that are logically placed so you know where to go to find settings and configurations."

Odin Hagan agrees: "For our part, we get into the position we need, and then we switch to DP. It's just three to four button presses, and we are basically in action, so it's very convenient.

"We don't have to moor the platform, and put equipment and people under pressure or risk as there are several thousand tonnes next to the platform. This avoids putting stress on the platform and the moorings, and more.

"Manually manoeuvring requires more focus. With Kongsberg Maritime's DP system you have much more time and capacity to get the bigger picture and keep track of what's happening around you. It makes the workday easier and we can focus more on safety." ●

Chief Officer Siv Oldeide on board the *Oddrun With*

See Kongsberg Maritime's DP system in action



The vessel is very easy to manoeuvre thanks to the DP systems

# Greetings from Las Palmas

The Kongsberg Maritime workshop in the Canary Islands is playing a key role in maintaining the world's oil and gas vessels, and is a great example of delivering service solutions to customers



Las Palmas, Canary Islands

**T**he Canary Islands might be well known as a popular holiday destination but the port of Las Palmas in Gran Canaria is also a busy place, providing a strategic stop for servicing oil and gas vessels as they ply their way between the world's major fields, from the Gulf of Mexico and Brazil to West Africa and the North Sea.

That is why Kongsberg Maritime set up a 2,100 square metre repair and overhaul workshop, in collaboration with Astican Shipyard, at the deepwater port in 2015. It is an investment that has paid dividends as the facility has expanded its services beyond swapping out, overhauling or storing the company's range of underwater mountable thrusters (UUC) to now having the capability to also service its propulsion products.

Javier Montesdeoca Pérez, Service Operations Manager, says: "The port of Las Palmas has always been a strategic place, as it is in the middle of the routes that connect Europe, Africa and America, so it's common for vessels to stop for repairs before heading to new contracts.

"As Kongsberg Maritime received requests to service UUCs on our customers' vessels when they were docked in Las Palmas, we set up a workshop at the port to provide a permanent facility to support our customers."

The sheltered deepwater port provides the ideal conditions for removing or installing UUC thrusters in situ, using divers and ROVs, as the equipment is specifically designed for easy underwater mounting and dismantling without requiring an expensive and lengthy time in dry dock.

The workshop has been specially designed to undertake overhauls of the thrusters with overhead cranes, torque and spin test rigs, special tools and its own calibration laboratory, which allows the team to deliver high quality and timely overhauls of the equipment.

In recent years the facility's capabilities have been expanded with investments in new tools, frames and skills to enable the team to work with all of Kongsberg Maritime's propulsion products, and to particularly help service

customers using the Astican drydock. Good logistical management with the Kongsberg Maritime spares centre at Helmond in the Netherlands means that the Las Palmas team always has the right parts at the right time, and other facilities – such as Rauma, Finland; Ulsteinvik, Norway; or Aalborg, Denmark – are always on hand to provide support as they all work to a common standard of customer care.

Javier says: "Repair and overhaul of our products is carried out to agreed processes and procedures that are common across all our workshops. We all use standard tools, systems and processes to ensure consistency of the end product. We're also in regular touch with our colleagues in other workshops to discuss best practice, safety and opportunities for improvements, so this results in our customers getting a standard offering at a consistent cost wherever the work is completed."

A good example of the work carried out by the team was for two Seadrill vessels in 2022 where – over seven weeks, working 24/7 – the workshop overhauled five spare thruster units stored at Las Palmas, swapped them

**“Repair and overhaul of our products is carried out to agreed processes and procedures that are common across all our workshops”**



The team in Las Palmas is committed to quality and the workshop has brought jobs to the local area

to one vessel, undertook a complete overhaul of the five removed thrusters and then installed them in another Seadrill vessel. Between 2023 and 2024, the team also undertook the overhaul and swapping of six thrusters on three Stena vessels, all the work completed on time and meeting quality expectations.

The opening of the workshop in 2015 had an inauspicious start as it coincided with a drop in the oil price, which reduced oil and gas activity. However, the Las Palmas port was ideal for cold stacking unused rigs and the local Kongsberg Maritime team was kept busy removing thrusters and storing them so they could be regularly maintained for when they were brought back in action when the oil price recovered.

Javier adds: "At one point we had more than 80 thrusters stored, with 16 drilling vessels at the port, but with the war in Ukraine and the increase in the oil price, customers reactivated those vessels, and so we have had two years of hectic activity!"

Since then, the Las Palmas port has expanded too, and the Kongsberg Maritime team has built up strategic relationships with local manufacturing companies to help support their work, as Javier explains: "Over the years, we have encouraged local companies to make investments in specialised



machinery, so now we are capable of refurbishing most of the components we need locally. For example, one of our main suppliers has invested in a laser cladding machine, which was not previously available on the island. That allows us to repair worn liners from steering tubes with special coatings. This is a benefit for the local economy and will significantly reduce the carbon footprint of our activity."

Another benefit of the Las Palmas workshop is employment. All the team is local and there are work experience opportunities for students from the local university and Marine School.

Javier says: "Getting students to work with us every year has been a win-win situation. For us, we have access to very skilled and motivated young candidates, and the local students have the opportunity to learn hands-on about our business. And for those we have hired after their internships they have the opportunity to develop their careers in a great international company." ●



#### Las Palmas Service workshop capabilities

- More than **2,100 sq m** of working space
- **Six working cells** allow six large thruster units to be overhauled at any one time
- **Significant crane capacity**, including:
  - Two 120t overhead cranes
  - Two 30t overhead cranes
  - Three 5t cantilever cranes
- **Specialist thruster exchange** and overhaul tooling/equipment
- **Specialised torque test equipment** for gear testing
- **Specialised deck machinery tools/equipment**
- **Automated component washing machine**
- **Spare part and unit storage**
- **Kongsberg Maritime service team** providing specialised product expertise.

#### Services offered

- Offshore thruster exchange
- Service azimuth thrusters and tunnel thrusters
- Service controllable pitch propellers, shafts and gears
- Service steering gear, winches and deck machinery
- Automation and controls component refurbishment facility.



KONGSBERG



# Tugs do a tough job.

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