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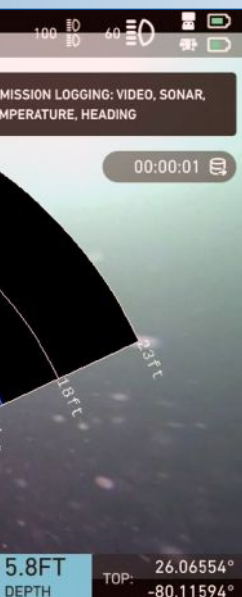
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)) Apply: DOE Hydrogen Reviewer. The U.S. Department of Energy's Hydrogen and Fuel Cell Technologies Office (HFTO) is looking for a diverse pool of subject matter experts to review federal funding applications for clean hydrogen programs and to review the merit of ongoing projects. Those eligible for consideration must have knowledge and expertise in—but not limited to—the following areas: hydrogen production, storage and delivery technologies; hydrogen fuel cell technologies, especially with polymer expertise (membrane, electrolytes, ion transport, etc.); hydrogen and energy infrastructure; integrated energy systems; manufacturing of fuel cells, electrolyzers and other clean-hydrogen systems; recycling and recovery of fuel cells, electrolyzers, and other clean-hydrogen systems; system integration; analysis (techno-economic, financial and market); hydrogen pilots and demonstrations; community engagement (e.g., workforce, labor and other community concerns); and safety, codes, and standards. To apply, email a copy of your most recent resume and a brief summary of your experience, along with a LinkedIn profile (if available), to: H2Reviewer@ee.doe.gov. You may express your interest at any time. HFTO will contact reviewers with relevant expertise based on the needs of specific programs and funding solicitations.

)) New Autonomous Class Notations. DNV has launched a new family of class notations: Autonomous and Remotely Operated Ships (AROS), providing a framework for how autoremotely vessels can achieve equivalent or higher safety compared to conventional vessels. Autonomous shipping, ranging from remote control operation to fully unmanned vessels, marks a major advancement in the maritime industry. These solutions can deliver a wide range of benefits, including improved safety, optimized logistics chains, improved cargo capacity due to reductions in crew, increased fuel efficiency, reduced emissions, and reduced operational and maintenance costs. While these advancements hold great promise, regulatory frameworks are still being developed. The International Maritime Organization (IMO) is developing a code for Maritime Autonomous Surface Ships (MASS), expected to be voluntary from 2025 and mandatory from 2032, driving the need for a developmental framework for related technologies. DNV's AROS notations provide the industry with the necessary structure for the future development of autonomous shipping technologies, in close cooperation with the flag and coastal states, which hold ultimate approval responsibility. The AROS family of class notations covers four specific functions for autonomous ships: navigation, engineering, operational and safety. It will also be distinguished by category (remote control, decision support, supervised autonomy, full autonomy) and location of ship control (on board, off-ship or hybrid). These definitions are in line with the current plans for IMO's upcoming MASS code.

)) Market Forces Drive the Energy Transition. The U.S. energy transition is moving faster than most realize, according to the Institute for Energy Economics and Financial Analysis. National generation data through the end of 2024 show this clearly. According to the Energy Information Administration's hourly grid monitor, total U.S. generation from utility-scale wind and solar has increased 298.8 million MWh since 2019, easily exceeding the growth in overall U.S. power demand, which rose 202.3 million MWh. This shows that renewable energy can grow fast enough to meet rising national power demand while also reducing fossil fuel use. The pace of the transition is perhaps best seen in a day-by-day matchup between coal-fired generation and renewable generation (utility-scale wind, solar and hydropower). In 2019, the power produced by renewables only exceeded coal generation on 38 days. By 2024, roles were almost completely reversed, with renewables out-generating coal on 294 days. With substantial new capacity additions in the works for solar and wind, and more coal-plant retirements coming, it is entirely possible that coal will not top renewable generation on any day by 2026. The transition in Texas, the U.S.'s largest and fastest growing electricity user, highlights the sheer scale of the ongoing transition from fossil fuels to renewable energy. Full-year data released by the Electric Reliability Council of Texas, which supplies 90 percent of power demand in the state, shows that wind and solar generated 34.6 percent of the region's electricity in 2024. Texas renewables have risen steadily over the past 10 years, almost tripling from 11.7 percent in 2015. Battery storage is a key technology helping to speed the transition away from fossil fuels. Installed battery storage capacity in the U.S. will likely top 30,000 MW at the end of 2024, with an additional 15,000 MW of storage capacity likely to be added by the end of 2025.

)) Maritime Company Joins Data Sharing, Sustainability Initiative. VesselBot, specializing in supply chain sustainability technology, has agreed to join the Development Data Partnership, a collaboration between international organizations and technology companies to advance sustainable development through data sharing. The Development Data Partnership, which includes major international organizations such as the World Bank and International Monetary Fund (IMF), facilitates the responsible use of private sector data for public good. VesselBot's selection alongside other innovative companies such as Microsoft, Meta, LinkedIn, Starlink and Esri reflects the growing importance of accurate emissions data in addressing global sustainability challenges. VesselBot's digital twin technology and real-time data collection across maritime, air, and land transportation will support international organizations in: measuring and analyzing global transportation emissions patterns; identifying opportunities for emissions reduction in supply chains; and supporting evidence-based policymaking for sustainable transportation. **ST**

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Maritime Security Ecosystem Balanced with Privacy

In a rapidly evolving world, the intersection of artificial intelligence (AI), border security and maritime safety is reshaping how we protect our seas. The I-SEAMORE project, funded by Horizon Europe, is at the forefront of this transformation. By developing an advanced ecosystem, I-SEAMORE equips European authorities with cutting-edge tools to enhance situational awareness and operational capabilities for maritime surveillance.

The project comprises four main pillars: employment and indirect tasking of multiple types of long-endurance unmanned assets; exploitation of heterogeneous data sources; provision of a common operational picture empowered by a novel and comprehensive suite of data fusion services based on AI and big data analysis for optimal decision making and successful mission execution; and interoperability within the ecosystem and its interface with key existing external systems.

I-SEAMORE also fosters cross-border cooperation, improves information-sharing mechanisms, and enhances engagement with stakeholders. By addressing challenges in maritime safety and developing trustworthy, reliable solutions, the project is setting new standards in maritime surveillance. It underscores the vital role of technology in securing Europe's waters, ensuring safer operations and protecting borders effectively.

The I-SEAMORE project drives technological advancements in maritime border management while prioritizing ethical and societal values by respecting fundamental rights and fostering public trust. Ethics is embedded at every stage of the design, development and deployment of I-SEAMORE solutions. This approach encompasses the adoption of privacy-by-design principles, informed consent procedures, and dedicated measures to identify and mitigate potential biases in AI systems. These efforts ensure that the technologies developed not only enhance operational efficiency but also align with broader societal values to safeguard individual freedoms.

A cornerstone of I-SEAMORE is the protection of data privacy in compliance with the General Data Protection Regulation. The project adheres to data protection principles by ensuring transparency in data collection, processing, and storage, thus managing personal information responsibly and securely. Regular assessments allow for the early identification and mitigation of potential risks to maintain a careful balance between robust maritime security and the preservation of individual rights.

Building public trust is another central objective of the project. I-SEAMORE actively engages citizens, stakeholders and end-users to ensure that diverse perspectives are incorporated into the solutions developed by the project. Through a participatory approach involving surveys and workshops, the project fosters open dialogue with citizens and stakeholders. This active engagement not only contributes to building trust in the systems that are part of I-SEAMORE but also facilitates the (co)design of solutions that address real-world concerns and meet the needs of local communities and actors.

To comply with the AI Act, I-SEAMORE adopts a structured approach that includes continuous self-assessment of AI systems against the act's requirements, regular stakeholder consultations, and alignment with emerging standards and best practices. The project integrates trustworthy AI principles, such as human oversight, technical robustness and fairness, into its development processes. Furthermore, independent ethics experts and external evaluations provide continuous oversight to ensure regulatory compliance throughout the project's life cycle. Learn more at: <https://iseamore-project.eu>. **ST**

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Annual Review & Forecast

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

***Undersea Defense Technology (UDT), March 25-27, Oslo, Norway*

MARCH

Electronic Charting/Vessel Management/
Ports & Harbors/Dredging/Homeland Security

***Ocean Business, April 8-10, Southampton, U.K.*

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

MAY

Communications, Telemetry, Data Processing

***OCEANS 2025 Brest, June 16-19, Brest, France*

***MAST AUKUS (USA), June 25-26, Waikiki, Hawaii*

JUNE

Seafloor Mapping/Sonar Systems/Vessels

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Deck Gear, Cable, Connectors, Power Systems & Salvage

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Ocean Resources Development & Coastal Zone Management

****MAST AUKUS (UK)**, September (dates TBD), Ayr, U.K.

****OCEANS 2025 Great Lakes**, September 29-October 2,
Navy Pier, Chicago, Illinois

SEPTEMBER

Geophysical Exploration/Seafloor Engineering

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

****CLEAN GULF**, November 18-20, New Orleans, Louisiana

****Offshore Energy**, November 25-26, Amsterdam, The Netherlands

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Port Security

How ROVs Enhance Customs and Border Protection

By Chad Gillen

Underwater threats have long posed challenges to customs and border protection (CBP) agencies worldwide. With advancements in submersible robots such as ROVs, agencies are now better equipped to address these issues.

Maritime Border Threats

Ports and waterways serve as critical gateways for trade and transportation, but they are also vulnerable

to illegal activities, including smuggling and sabotage. Traditionally, inspecting ships for contraband or security threats has been a labor-intensive process relying on divers. However, this method is limited by time, visibility and safety concerns.

Specific threats include the smuggling of narcotics, weapons and other contraband concealed in hard-to-reach areas of ships. These areas often include: propellers and propeller shafts, which are common hiding spots

ROV inspection of a ship propeller.





due to their size and accessibility; intake grates, which smugglers frequently target to secure packages out of direct sight; bow thrusters, with their intricate designs that make them challenging to inspect thoroughly using manual methods; and keels and hulls, where illicit goods can be concealed along these extensive and less visible surfaces.

Inspections often need to be completed within a 30-min. window to avoid operational delays. Divers face additional challenges in murky waters, which complicates their ability to thoroughly examine critical areas. Visibility often drops to near zero in busy ports, further increasing the risk of missed threats. By integrating underwater

ROVs into their protocols, agencies can overcome these limitations, conducting underwater surveys more effectively and safely.

ROVs equipped with ultrahigh-resolution 4K cameras, sonar systems, such as the Blueprint Subsea Oculus M3000, and advanced maneuverability provide precise and efficient inspection capabilities. Their ability to navigate tight spaces and maintain stable operation in strong currents ensures a thorough evaluation of high-risk areas without compromising the safety of personnel. Advanced lighting systems also allow these devices to operate effectively even in turbid conditions, ensuring no critical zone is overlooked.

Traditional Inspection vs. ROVs

Traditional inspection methods rely heavily on divers, presenting several pain points. One is time constraints, since manual inspections often require significant preparation and must be completed within narrow operational windows. Another is safety risks: Divers face hazards such as low visibility, strong currents and underwater obstructions. In addition, there can be limited reach: Certain areas, such as propeller shafts or bow thrusters, are difficult to access manually.

Underwater ROVs address these limitations by offering rapid deployment. Operators can prepare

devices such as Deep Trekker's mini-ROV PHOTON for operation within minutes, minimizing delays. ROVs drastically reduce inspection times, completing tasks in minutes instead of hours. This efficiency allows CBP agencies to inspect more vessels daily, minimizing port delays. With user-friendly controls, even non-specialist personnel can conduct effective underwater inspections. These capabilities are particularly critical during high-traffic periods when delays can have cascading effects on port schedules.

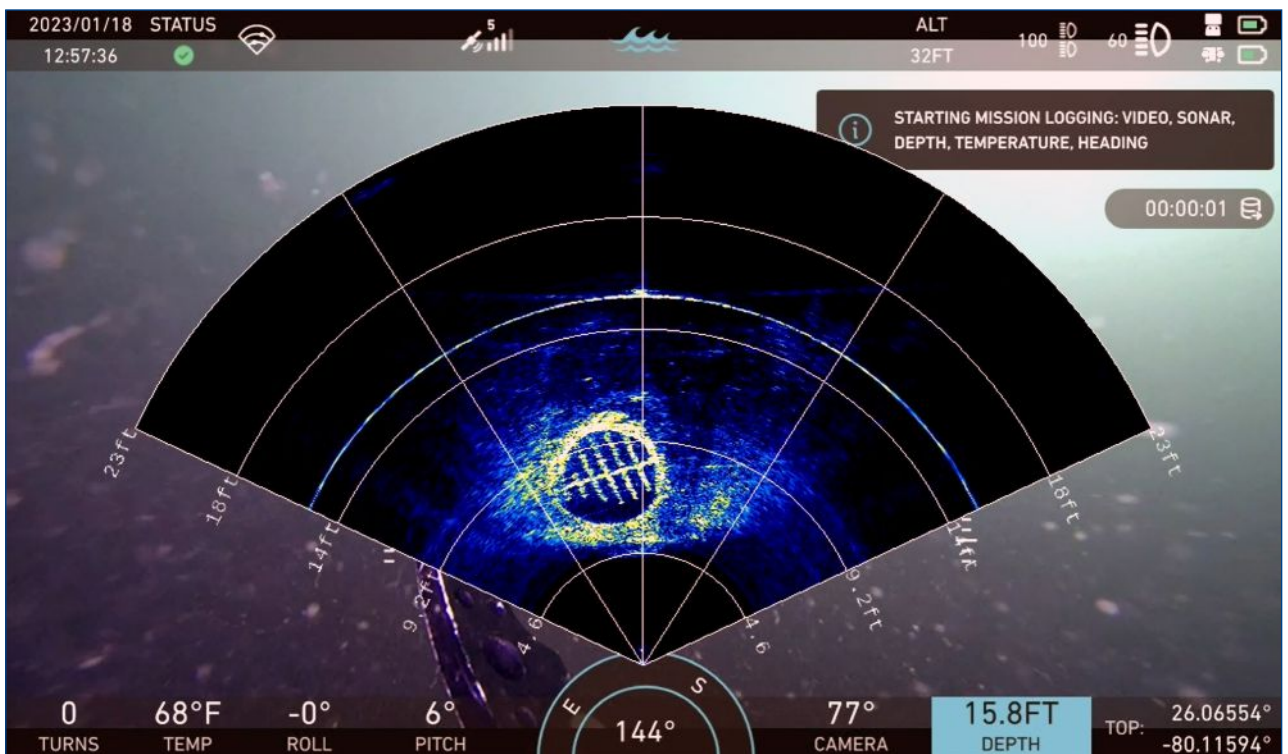
ROVs also offer enhanced visibility via integrated sonar systems, such as the M3000, which enable detection of concealed objects in turbid conditions. High-resolution imaging systems enable detailed inspections of hidden compartments and complex machinery. This precision minimizes missed threats, increasing interception success rates. Precision navigation is another advantage, as ROVs provide access to tight or intricate areas, ensuring thorough inspections without human risk. By reducing the need for diver teams and extended downtime, ROVs lower overall inspection costs, making maritime security operations more economical and sustainable.

ROV Border Protection in Action

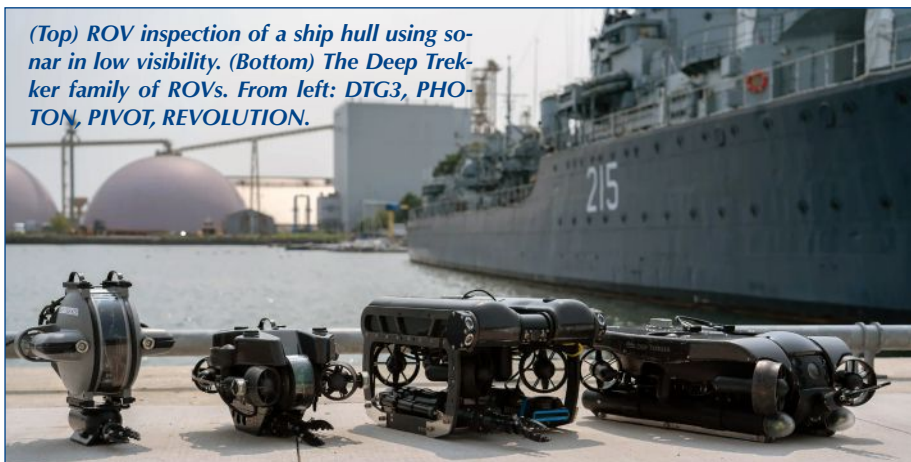
The Canadian Border Services Agency, the U.S. Embassy in Peru's International Narcotics and Law Enforcement Affairs Section, and U.S. Customs and Border Protection regularly utilize ROVs for inspecting vessels entering their ports. These inspections focus on submerged areas where tampering or concealment is likely, such as bow thrusters and propeller shafts.

ROVs monitor critical infrastructure, including intake grates and dock foundations, ensuring structural integrity and identifying potential threats. Regular inspections using ROVs mitigate risks associated with corrosion, biofouling and sabotage attempts. The ability to deploy ROVs frequently ensures ongoing monitoring without the logistical challenges of scheduling diver teams.

High-resolution cameras and sonar systems help locate contraband stashed in concealed compartments, such as false hulls or sealed intake grates. By providing



(Top) ROV inspection of a ship hull using sonar in low visibility. (Bottom) The Deep Trekker family of ROVs. From left: DTG3, PHOTON, PIVOT, REVOLUTION.



data. This technology enables CBP agencies to conduct thorough inspections of high-risk areas, such as propellers, intake grates, and hulls, enhancing their ability to detect illicit activities, such as smuggling, sabotage, and biofouling.

Advanced sensors, including high-resolution cameras, sonar systems, and GPS technology, ensure accurate navigation and detailed imaging even in low-visibility or confined environments. The addition of AI-powered analytics further

streamlines the inspection process by enabling immediate threat detection and anomaly identification. These capabilities not only improve operational efficiency but also reduce human error, supporting faster, safer and more reliable decision making in national security efforts.

streamlines the inspection process by enabling immediate threat detection and anomaly identification. These capabilities not only improve operational efficiency but also reduce human error, supporting faster, safer and more reliable decision making in national security efforts.

Conclusion

The utilization of underwater ROVs in customs and border protection operations represents a major advancement in maritime security. By overcoming the limitations of traditional inspection methods, such as the safety risks and time constraints that diver-led assessments typically involve, ROVs provide efficient, precise, and real-time

data. This technology enables CBP agencies to conduct thorough inspections of high-risk areas, such as propellers, intake grates, and hulls, enhancing their ability to detect illicit activities, such as smuggling, sabotage, and biofouling.

Advanced sensors, including high-resolution cameras, sonar systems, and GPS technology, ensure accurate navigation and detailed imaging even in low-visibility or confined environments. The addition of AI-powered analytics further streamlines the inspection process by enabling immediate threat detection and anomaly identification. These capabilities not only improve operational efficiency but also reduce human error, supporting faster, safer and more reliable decision making in national security efforts.

As ROV technology continues to evolve, its potential applications in defense, security and environmental monitoring will only grow. The collaboration between CBP agencies, Deep Trekker, and other industry partners highlights the importance of innovation in safeguarding maritime borders, ensuring that these tools remain at the forefront of global efforts to protect critical infrastructure and secure trade routes.

To learn more about Deep Trekker's cutting-edge underwater ROV solutions, see the article in *Sea Technology's* November 2024 issue and visit [deeptrekker.com](https://www.deeptrekker.com). **ST**

Chad Gillen is the content marketing strategist at Deep Trekker Inc.

Rethinking Navigation

Integrated Vessel Pilot Systems for Panama Canal and Beyond

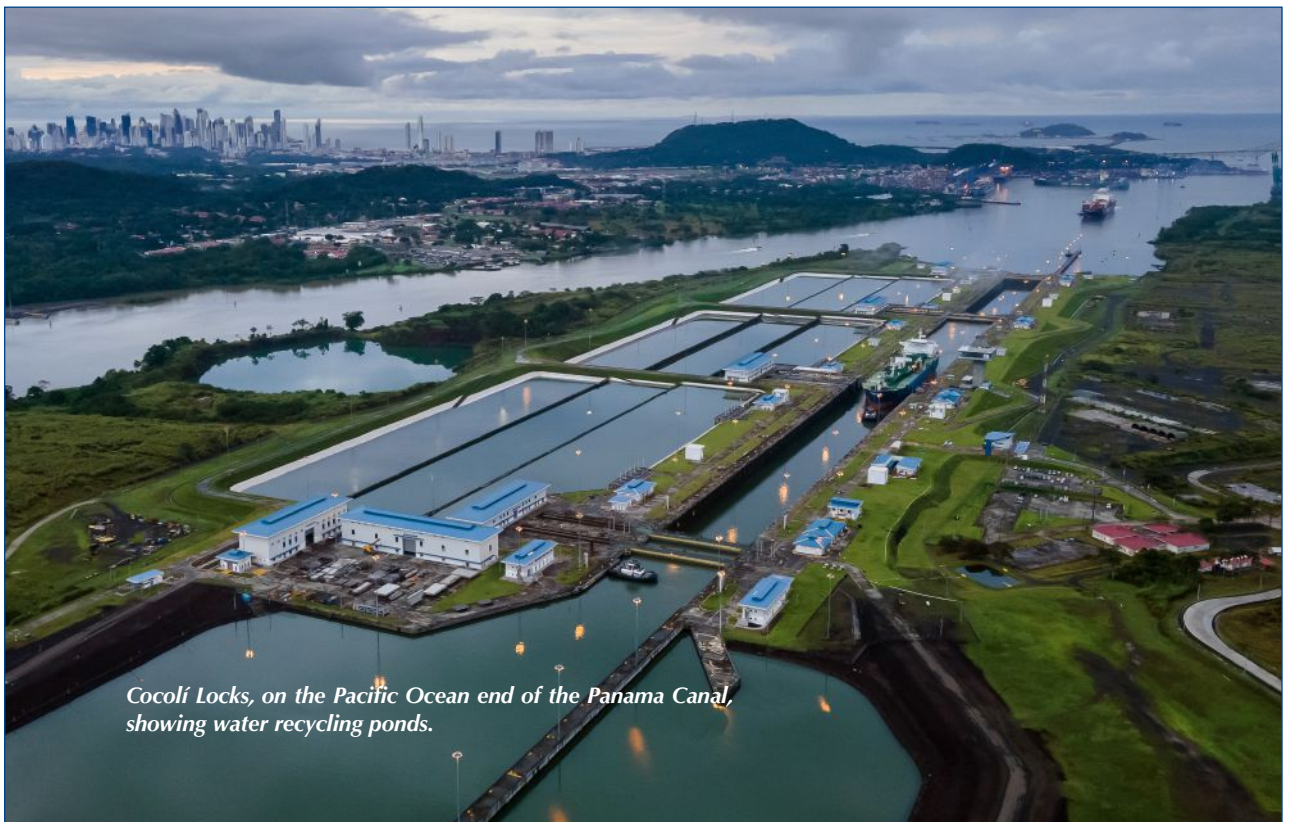
By Simon Lightbody

The navigation of ships through the Panama Canal, and in fact, through any narrow port, harbor or channel in the world, is one that requires precision and skill, particularly when it comes to ships the size of the *Panamax* and *Neopanamax* class.

While positioning technology has helped improve the movement of these large vessels through confined spaces, the canal infrastructure still takes the brunt of even the slightest miss. In the Panama Canal, the lock chambers measure 427 m long, with a 55-m beam and

18.3-m draft. *Neopanamax* container ships, up to 366 m in length, with a 51.25-m beam and 15.2-m draft, are approved for transit through the new canal—leaving little room for error as the vessels move from lock to lock.

As Panama Canal navigation management has found, even small impacts or slight hits against the lock walls from these large vessels can cause significant damage. Those damages accumulate quickly when 35 to 40 ships, on average, transit the waterway every day, which can lead to costly repairs and delays.



Cocolí Locks, on the Pacific Ocean end of the Panama Canal, showing water recycling ponds.



A Trimble GNSS marine antenna mounted on a vessel in Lake Gatun, an artificial lake that forms a major part of the Panama Canal. (Next page) Trimble MPS566 pilot system components, which are approved for permanent installation on Neopanamax vessels transiting the Panama Canal.

To reduce the chance of vessel grounding and minimize damage to the canal, the Panama Canal Authority mandated that large vessels (ships 33.22 m or wider) must have an approved, permanently installed (non-portable) piloting unit with real-time kinematic (RTK) positioning capabilities for submeter accuracy. Effective October 2023, this mandate is a significant operational shift, as, for many years, the Panama Canal pilots have had to bring their own portable navigation system aboard each ship transiting the canal.

The non-portable, onboard pilot systems give canal pilots extremely accurate and reliable navigation data as the ships transit through the canal. These pre-configured add-ons also reduce risk for the canal pilots, who would otherwise have to calibrate these systems every time they step on board a ship; a mobilization/demobilization practice that increases the chance of inaccuracy and, thus, risk.

Onboard pilot systems enable the pilot to make decisions for safety of navigation in confined spaces, faster turnarounds, and use of fewer personnel for guidance. But what makes these systems truly groundbreaking is the potential they have to reshape global ship navigation well beyond the Panama Canal.

A Pilot of Purpose

Permanently installed pilot systems are made up of several critical technologies. They incorporate a GNSS receiver and an inertial measurement unit (IMU) for precise centimeter positioning data, as well as heading and rate of turn information with wireless data streaming.

The systems are also fully integrated with an automatic identification system (AIS). An AIS, the automated

tracking system that displays other vessels in the vicinity, incorporates one VHF transmitter, two VHF time-division multiple access (TDMA) receivers, one VHF digital selective calling (DSC) receiver, and a standard marine electronic communications link to shipboard display and sensor systems. The broadcast transponder system operates in the VHF mobile maritime band.

The onboard pilot system must be able to receive signals and corrections from the Panama Canal's RTK base stations, which includes Trimble Alloy GNSS reference receivers that broadcast corrections over Trimble 450-MHz radios or via cellular. These base stations provide reliable 24/7/365 GNSS signals.

To date, the Panama Canal Authority has approved eight non-portable pilot systems for use in the canal, each with some unique characteristics.

For instance, Trimble's MPS566 pilot system includes an MPS566 receiver with an easy-to-read status screen and an AIS receiver. The MPS566 receiver supplies vessel positioning data and rate of turn to enable the pilot to make decisions for safety of navigation in confined spaces. It also allows for faster turnarounds while requiring fewer personnel for guidance. It incorporates dual Trimble GA830 GNSS antennas, which are designed for harsh marine conditions, combined with an IMU to monitor the vessel in 3D. The integrated AIS receiver sends data to the MPS566 so that a Wi-Fi stream is delivered to a pilot's tablet or iPad.

The system was initially tested in New Zealand in 2023 on a roll-on/roll-off ferry along the Wellington to Picton inter-island route between the North and South Islands of New Zealand. The pilot app was loaded with LINZ S-63 charts. Over the course of two months, the



pilot app components, including AIS, were tested for accuracy and reliability on that route.

The system also includes 8 hr. of backup battery, which exceeds the Panama Canal Authority's requirements (5 hr.), in case of possible power outages. Backup support is available through an optional remote access log-in with a SIM card. Pilots can also remotely log on to the MPS566 receiver if it is connected to the ship's internet for additional support.

It's a complete onboard package designed to improve communication between the ship's captain, the Panama Canal pilot, tugs and other canal personnel. Notably, onboard pilot systems are also helping captains improve situational awareness during canal transit and port approach.

Global Opportunities

The value of permanent onboard pilot systems is relevant beyond the Panama Canal. As more ports and canals recognize the safety, efficiency and cost-saving benefits of these precise positioning systems, the global adoption of these systems on large ships (and likely even smaller ships) is expected to grow.

Other major canals, such as the Suez Canal in Egypt or Kiel Canal in Germany, may also adopt similar onboard pilot system requirements for precise navigation systems. Fast ferry docking is another opportunity for non-portable pilot systems to improve safe, efficient vessel docking in locations where vessels are not required to have a specialized pilot to board.

A non-portable onboard pilot system is an excellent sensor for real-time under-keel clearance. As the behavior of the ship is affected by vessel loading and dynamics,

it is now possible to know its exact draft so the pilot system can help pilots make better decisions, such as adjusting speed for safe under-keel clearance.

In the future, these non-portable pilot units could remove the need for portable pilot units that come with a number of challenges, including extra weight for the pilot, setup time, calibration and the potential for possible errors during measure-up.

With advanced GNSS receivers and positioning systems integrated on board ships, marine pilots can leverage the existing GNSS infrastructure assets installed in ports and canals around the world for precise navigation. Marine pilotage in general and particularly in complex environments, such as canals, rivers, harbors, and ports, can be made safer and more efficient if the GNSS is already on board and calibrated.

It's a significant technology advancement that will allow vessels of all sizes, from large commercial ships to smaller vessels, to benefit from precise guidance, berthing, docking and pilotage capabilities. In the near future, these non-portable pilot systems could be used by marine pilots on any size ship, enabling them to board and navigate with precision, using just a tablet or iPad.

Eventually, it is possible that a marine pilot will remotely access the permanently installed pilot system and the ship's other navigation systems so they will not need to board the vessel, which will enhance safety. **ST**

Simon Lightbody has been a product manager at Trimble for marine and GNSS products for more than 25 years. He uses his background in marine hydrographic surveying and geophysical exploration to develop products for the marine construction industry.



Ports Lead the Way to Net Zero

Methanol Infrastructure Supports Hydrogen-on-Demand

By Bryan Reid



To achieve global climate objectives, the International Maritime Organization (IMO) has established a comprehensive strategy to reduce GHG emissions from international shipping, aiming for net-zero emissions by or around 2050. Targets include achieving at least a 20 percent reduction in total annual GHG emissions by 2030 (striving for 30 percent, compared to 2008 levels) and attaining at least a 70 percent reduction by 2040 (aiming for 80 percent relative to 2008 levels).

Ports are uniquely positioned to serve as hubs for clean energy innovation. By leveraging methanol-to-hydrogen systems coupled with fuel cells, ports can access clean, on-demand power that reduces emissions, enhances operational efficiency and strengthens relationships with maritime partners. These systems offer a practical pathway to clean energy and electrical power, addressing global emissions targets and the immediate power needs of modern port operations.

As the global maritime sector considers transformative ways to reduce emissions, leading ports (and shipping operators) are looking at hydrogen and its immense promise as a clean energy source. Hydrogen's potential, however, is tempered by practical challenges. Hydrogen storage and handling is complex and costly, creating an infrastructure puzzle with unique hurdles and opportu-

nities for both shipbuilders and port operators. A breakthrough lies in hydrogen on-demand, on-site systems that streamline hydrogen generation and deployment and offer ports a leading role in reducing emissions.

Why are port facilities poised to play such an outsized role in clean energy initiatives? From a readiness perspective, major ports are fitted with the methanol infrastructure that is the foundation of clean energy systems based on hydrogen-on-demand. Methanol—and by extension, methanol-to-hydrogen (M2H2) solutions—is readily accessible across most global shipping ports. In terms of flexibility and strategic operations, ports also feature flexible and expansive space, diverse end-use applications, and a growing drive to define themselves as tactical partners in the global journey toward a greener shipping industry. These factors, paired with the urgent



RIX's M2H2 Series offers hydrogen-on-demand, integrating technology licensed from Element 1 (e1). Combined with PEM fuel cells, M2H2 systems produce power with no NOx, SOx or particulate matter. These systems deliver high efficiency, minimal vibration/noise and low emissions for power-critical applications.

Simplifying Hydrogen by Starting with Methanol

M2H2 systems use methanol as a feedstock fuel and hydrogen carrier for generating hydrogen-on-demand. It's a low flash point fuel with management requirements that are deeply familiar to maritime professionals, given it is approved for storage, handling and bunkering in marine environments. It is already widely utilized as a feedstock globally, handled much like conventional fuels. With its liquid state at normal temperatures, biodegradability, water miscibility, and widespread availability in seaports, methanol offers a practical and economical choice as a hydrogen carrier.

Methanol itself is being scrutinized for ways to add further value to global emissions goals. Current M2H2 systems recognize this evolution and remain versatile, capable of utilizing both conventional and renewable methanol. As green methanol becomes more accessible, ports can seamlessly switch to this cleaner alternative, ensuring their sustainability investments remain future-proof for evolving greenhouse gas (GHG) emission standards.

The Power of M2H2 Technology

M2H2 systems convert methanol into hydrogen within a compact, self-contained unit, providing a steady supply of pure hydrogen, much like drawing it from a large storage tank. Commercially available M2H2 systems can be integrated into cabinet or container configurations, offering scalable, modular designs that deliver over 80 percent energy efficiency; when combined with fuel cells, these systems can accommodate power requirements ranging from 50 kW to multimewatt-scale applications.

For example, an M2H2 hydrogen generator combined with fuel cell can efficiently power refrigerated containers (reefers) waiting at ports, generating up to 300 kW from a 20-ft. unit, scalable with additional units. Configurations are flexible and, depending on the number and scope of a port's reefer population, the M2H2 would offer a bank of plugs for easy power connection. This aligns well with port activities and creates a stable micro-grid approach to electrical power delivery.

Another example features shore-to-ship power. This is the preferred method of power for ships to support hotel loads or refrigeration at port docks to reduce emissions, rather than continued operation of the vessel's diesel systems. Reliable power generation via M2H2 systems combined with fuel cells ensure port operations during outages; ship facilities are maintained and cargo requirements are met, with steady power supporting operations such as cold ironing, reefer and auxiliary power.

Containerized M2H2 and fuel cell power systems can be easily relocated to provide power for various port operations and deployed where needed for both gener-

need for clean energy and electrical power, make ports likely to adopt hydrogen-on-demand systems more readily and cost-effectively than shipbuilders.

The Goal of Modernizing Ports

With the International Maritime Organization (IMO) setting ambitious net-zero targets, it is logical and strategic for ports to prioritize seamless emissions reductions. It's a goal that is well-reflected in the influx of government support for hydrogen infrastructure development. The U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) is overseeing the Regional Clean Hydrogen Hubs (H2Hubs) program, designed to establish interconnected networks of hydrogen producers, users and supporting infrastructure. The program includes up to \$7 billion to establish six to 10 regional clean hydrogen hubs across America. Overall, the initiative seeks to advance the adoption of hydrogen as a clean energy carrier capable of storing and delivering vast amounts of energy efficiently.

OCED is working with the Alliance for Renewable Clean Hydrogen Energy Systems to build the California Hydrogen Hub, a network of clean hydrogen infrastructure sites that incorporates multiple facilities, including California's Ports of Los Angeles, Long Beach and Oakland. The goal is decarbonizing public transportation, heavy-duty trucking and port operations by 2 million metric tons per year—roughly equivalent to the annual emissions of 445,000 gasoline-powered cars.

The U.S. Department of Energy is working with the Alliance for Renewable Clean Hydrogen Energy Systems to build the California Hydrogen Hub, a network of clean hydrogen infrastructure sites/facilities, including California's Ports of Los Angeles, Long Beach and Oakland (pictured here).



al port facilities and in support of docked ships. What sets them apart is their exceptional cleanliness and quiet operation, eliminating the noise and pollution typically associated with diesel systems. Combined with PEM fuel cells, M2H2 systems produce clean power with no particulate matter, NOx or SOx.

RIX Industries' hydrogen generator systems, for example, enable the integration of advanced fuel reforming and hydrogen purification technologies directly on board marine vessels and heavy-duty logistic vehicles. The M2H2 Series is specifically designed to displace stored compressed hydrogen to support primary propulsion, auxiliary power systems, cold ironing and bunkering by providing high-purity (99.97 percent) hydrogen-on-demand. RIX's scalable M2H2 Series applies to PEM fuel cell power systems from 100 kW to megawatts.

Tailoring Strategies for Port Profiles

Ports with extensive methanol infrastructure and bunkering as part of routine operations are well-positioned to adopt M2H2 technology and fuel cell-based power systems immediately. Others, such as container-focused ports (for example, Oakland), typically do not stockpile the large quantities of methanol necessary to fully utilize M2H2 technology. Despite this, container ports also face the dual demands of meeting power requirements and advancing environmental goals. To benefit from M2H2 systems, these ports would need an alternative approach, such as partnering with nearby fuel depots for methanol supply.

This added logistical step has minimal impact on infrastructure, as methanol is a stable, easily transportable substance. It can be delivered in intermediate bulk containers, which are modular, stackable and highly efficient.

Partners in a Cleaner Future

Much like small cities, many ports are shifting to electrified equipment, including cranes and drayage trucks.

Hydrogen-on-demand systems support this shift by enabling the use of both fuel cell and battery-electric vehicles. Additionally, ports can enhance their appeal to the refrigerated container business by offering reliable, off-grid power solutions that surpass the limitations of traditional power grids. By addressing air quality, noise, and pollution proactively, ports can also build stronger relationships with nearby communities, gaining the support of residents and businesses while advancing their sustainability goals.

Ultimately, M2H2 technology combined with fuel cells allows ports to implement clean energy solutions tailored to their unique operational needs. It's a level of adaptability and flexibility not previously associated with hydrogen power, giving hydrogen-on-demand the real potential to bring innovative options to the surface.

In embracing M2H2 technology, ports take a critical step toward becoming the "port of the future," leading the charge in the maritime industry's journey toward reduced emissions and sustainability. Where possible, a shipping operator may choose one port over another to better align with its emissions reduction targets and avoid penalties for non-compliance. Port operators play a crucial role in this transition, as their dedication to providing accessible and efficient hydrogen infrastructure can either support or hinder fleet owners' shift to greener operations. Furthermore, some shippers are eager to highlight their commitment to sustainability, emphasizing clean shipping practices throughout the supply chain.

As the maritime sector evolves, ports that prioritize clean energy solutions will not only drive progress but also position themselves as indispensable partners in the global fight against climate change. **ST**

Bryan Reid is the chief sales officer of RIX Industries: breid@rixindustries.com.

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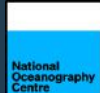
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Using the Past to Chart the Future

Digital Heritage Improves Vessel Performance and Compliance

By Stephen MacFarlane



The global maritime landscape has never been more complex. Globalization, geopolitics and decarbonization have created an intricate web of interconnected systems where every decision, event, or disruption has ripple effects across industries, market segments, and businesses.

A push for decarbonization in the EU, with regulations like EU ETS and FuelEU Maritime, is just the start. Soon, other regulators will move to implement their own emissions reductions measures, which will increase regulatory complexity and cost, and raise long-term questions around fleet efficiency investments, strategies for trading carbon credits, charter party agreements, and more.

Meanwhile, the ongoing Red Sea challenges are also driving increased complexity and volatility in the industry. The extra routing requirements associated with avoiding the Red Sea passage mean that the equivalent of 6

to 7 percent of shipping capacity has been taken off the market.

Brewing below the surface is a myriad of overlapping developments, from conflict in Eastern Europe affecting thousands of seafarers to the return of Donald Trump to the White House, all coalescing to form one of shipping's most transformative periods.

For ship managers and operators, this means our job becomes more about expertise and global scale. Nimble navigating the interconnected web of industry challenges is a delicate balancing act.

Of course, these challenges also bring opportunities. The key to thriving in a volatile landscape lies in strategic adaptability, and in this context, ship managers can act as critical partners by guiding businesses through unpredictable waters, leveraging their expertise and experience to keep operations on track.

“At the heart of digital heritage lies the data flywheel effect ... the process by which data compounds over time; the more data a company collects, the better its ability becomes to analyze and extract actionable insights from that data.”

While headline grabbers such as geopolitics and environmental regulations have been significant disruptors, one of the most transformative forces reshaping the shipping industry has been digitalization. It has already revolutionized how businesses operate, offering technologies that enhance safety, optimize energy usage, improve decision making and unlock new levels of commercial efficiency.

Digitalization has delivered groundbreaking results, from real-time tracking and predictive analytics to advanced fuel management systems and AI-driven maintenance. These tools offer opportunities to streamline operations, reduce costs and meet tightening regulatory requirements.

However, like all innovations, the path to digitalization has not been smooth. The explosion of new technologies and software providers over the past decade has created a crowded and competitive marketplace. Start-ups and established players alike have rushed to offer solutions, each claiming to be the next game-changer.

For shipowners, this presents a significant dilemma. How do you identify which solutions are genuinely effective? Making the wrong choice can create more problems than it solves. Poorly implemented software can lead to information silos, duplication of efforts, communication breakdowns, and missed opportunities to leverage data for strategic insights. In large organizations, this risk is magnified when different departments or regional offices adopt different technologies that do not integrate seamlessly. Instead of solving problems, these fragmented solutions can amplify them.

In such a saturated digital marketplace, shipowners need more than flashy promises. Proven experience, a strong track record and digital heritage have become the most significant differentiators.

The Benefits of Data Heritage

One of the most valuable benefits of digital heritage is access to historical data. Solutions with a proven track record may have amassed years, even decades, of data that provide unparalleled insights into operations, fuel consumption, maintenance patterns and environmental performance.

Take the industry's decarbonization challenge, for example. Companies with access to rich historical data can use this information to develop more precise strategies for meeting compliance targets. By analyzing trends in energy use, emissions, and vessel performance, shipowners can identify inefficiencies, optimize routes, and implement solutions that reduce fuel consumption while meeting regulatory standards. This proactive approach is only possible with the foundations of robust, reliable data.

Digital platforms, such as V.Group's ShipSure, provide the industry with extensive data and insights to manage vessels and navigate evolving challenges with confidence. With a rich data heritage built up over many years, it is a critical part of the toolkit to make informed, strategic and data-driven decisions.

The power of data lies not just in its existence but in its breadth. Companies with access to vast data sets can gain clearer, more authoritative insights; the kind that smaller providers cannot offer. In a market where every commercial decision can have significant financial and operational consequences, the ability to trust in data is critical. The larger the data set, the clearer the patterns and trends become, which means shipowners can make informed, confident decisions based on trusted insights rather than guesswork or incomplete information.

At the heart of digital heritage lies the data flywheel effect. In simple terms, this is the process by which data compounds over time; the more data a company collects, the better its ability becomes to analyze and extract actionable insights from that data. These insights drive improvements in operations, which in turn generate more data to be collected and analyzed. This creates a continuous cycle of data collection, analysis, and action that fuels ongoing innovation and improvement.

For example, a digital platform that collects data on fuel consumption, maintenance schedules, and weather conditions can identify inefficiencies and suggest optimizations. Over time, these improvements become increasingly precise and impactful as the system learns from more data. The result is a perpetual cycle of enhanced performance, reduced costs and greater resilience.

Another example of the benefits of deep historical data would be in the world of maintenance. It is well known that predictive maintenance powered by data analytics can significantly reduce downtime and repair costs. By analyzing historical maintenance data alongside real-time performance indicators, shipowners can anticipate when equipment is likely to fail and schedule maintenance proactively. This not only saves costs but also minimizes operational disruptions.

Ultimately, the full potential of data is unlocked when it can be coupled with human expertise. While data and digital platforms provide all the right insights, it's human decision making that ensures these insights are applied effectively in real-world scenarios, that their implications are understood, and that the customer's trust is maintained.

This dynamic was recently demonstrated when a major cruise line engaged V.Group to support its energy performance management. Combining the expertise of three naval architects, alongside robust vessel efficiency data that were drawn from automated processes on board, V.

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***“Companies with access
to rich historical data can use
this information to develop
more precise strategies
for meeting compliance targets.”***

provided consultancy on ways the cruise line could identify potential savings and take corrective action.

The team looked at a range of areas that contribute to fuel savings, from hull and propeller cleaning to voyage optimization, evaluating the estimated fuel losses per leg due to higher average speeds and extra fuel consumption at ports. Using the data, technical expertise, and a collaborative approach between crew, customer, and data experts, the cruise line was able to build a strategy that would see it save 25 tonnes of fuel per month per vessel across its 20-strong fleet.

In other words, captured vessel data combined with human expertise unlocked measurable upsides for the cruise operator. This is only possible when both forces can work in tandem with each other—and when the vast reams of ship data being gathered on board can be harnessed, understood, and interpreted by digital applications.

Conclusion

The journey toward digitalization is not about adopting the latest technology for the sake of it; it is about choosing the right partner, one with the expertise, experience and digital heritage to deliver meaningful, long-term results to future-proof operations. The right partner will have a proven track record of success, a comprehensive understanding of the industry's unique challenges, and the ability to integrate solutions seamlessly across an organization's operations.

The shipping industry's challenges are not going away. Geopolitical instability, environmental pressures and technological disruption will continue to shape the future. The companies that thrive will be those that embrace adaptability, leverage the power of data, and choose partners with global scale and expertise.

Shipowners must understand their past to chart a confident course for the future. By blending historical data with advanced technologies and actionable insights, businesses can proactively manage risks, optimize operations, and drive sustainable growth. **ST**

Stephen MacFarlane is the chief information officer of V.Group.



The Role of OEMs in Compliance

OEM Tech Can Address Shipping's Sustainability Challenges

By Cathy Stephenson

The maritime industry is under intense scrutiny to address its environmental impact. Shipowners now face a complex regulatory environment as industry regulators clamp down on greenhouse gas (GHG) emissions.

The International Maritime Organization's International Convention for the Prevention of Pollution from Ships (MARPOL) now encompasses a host of environmental issues, from plastics to pollution. Understandably, much of the focus in recent years has been on the impact of airborne emissions on how our industry does its business.

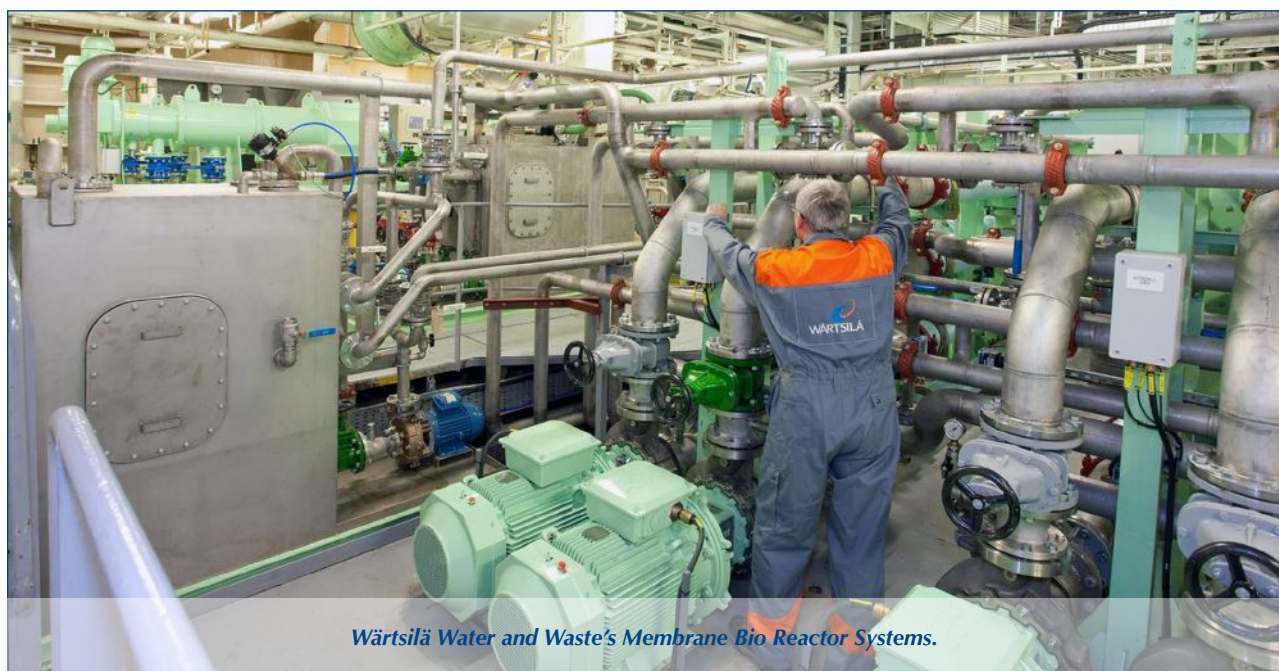
Less discussed—but still as pertinent—is the host of rules that shipowners and operators must comply with to tackle waste from on board. To fully address this, we must take a holistic approach that covers all of a vessel's waste products because our oceans are a precious environment

that we must protect to the full extent of our ability.

Original equipment manufacturers (OEMs) are key partners in helping shipowners address these challenges. By offering advanced technological solutions and expert guidance, OEMs play a critical role in ensuring vessels comply with regulations, avoid penalties, and operate sustainably. At the core of this partnership is trust—shipowners and operators must be confident in the reliability of the technology and the OEMs behind it.

Preserving Resources, Reducing Environmental Impact

Good technology preserves vital resources, not just on vessels but in the broader environment. Wärtsilä Water and Waste, for instance, has developed water management systems that enable efficient freshwater usage on



Wärtsilä Water and Waste's Membrane Bio Reactor Systems.



Wärtsilä Water and Waste's Aquarius ballast water management system on board MS Viking Glory.

board. By reducing reliance on shore-based resources, these solutions help shipowners minimize their ecological footprint while maintaining operational efficiency.

Similarly, advanced technologies contribute to environmental stewardship by ensuring compliance with rigorous regulations. With environmental protection being a priority for shipowners, Wärtsilä's systems make a significant contribution to actively preserving marine ecosystems and reducing pollution in sensitive maritime areas.

Trust in OEM technology extends to promoting circular economy practices within the shipping sector. Solutions that enable the recycling and reuse of onboard waste can help shipowners adopt more sustainable long-term waste management strategies. However, the success of these practices relies heavily on the durability and reliability of the technology itself, ensuring it performs consistently across the vessel's life cycle.

This approach aligns with Wärtsilä's broader mission to reduce emissions from waste treatment processes and optimize water consumption. By focusing on these critical areas, Wärtsilä contributes to the maritime sector's climate mitigation efforts and reinforces the industry's transition toward a low-carbon future.

Supporting Long-Term Performance And Regulatory Confidence

Building a new vessel or retrofitting an existing one requires significant investment and carries inherent risks. Shipowners must partner with suppliers who understand the nuances of vessel operations and offer reliable, scalable solutions. The longevity of these systems is also vital, as they must withstand extreme maritime conditions over decades of operation.

OEMs must work closely with shipowners' engineering teams to create retrofit options that align with evol-

ving standards and facilitate the approval process with classification societies. This will ensure that shipowners are always a step ahead in compliance.

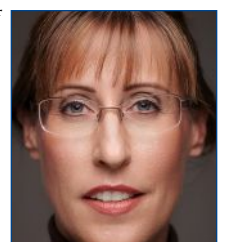
Building Confidence for a Sustainable Future

Beyond compliance, OEM solutions are essential to the maritime industry's efforts to combat climate change. New technologies are necessary to help shipowners minimize GHG emissions, meet sustainability targets, and adopt practices that support the industry's broader transition toward a low-carbon future.

As the regulatory landscape becomes more complex, shipowners face mounting challenges. However, by working with trusted OEMs, such as Wärtsilä Water and Waste, with a dedicated and highly knowledgeable team to help navigate compliance challenges, they can adopt innovative solutions supporting compliance, enhancing operational efficiency, and promoting sustainability. In turn, shipowners must ask the right questions and demand reliability, sustainability, and longevity from their technology partners.

Failing to do so risks stranded assets, additional costs and delays in the industry's mission to reduce its environmental impact. With trusted partners and forward-thinking technologies, the shipping industry can continue to make meaningful strides toward a greener future. **ST**

Cathy Stephenson is the managing director of Wärtsilä Water and Waste.



international

Hexagon to Acquire GNSS Company

Hexagon has made an agreement to acquire Septentrio NV, an OEM provider of global navigation satellite system (GNSS) technologies, to drive innovation and expand the market reach of resilient assured positioning solutions.

Combining Septentrio's pioneering GNSS platform with Hexagon's extensive positioning portfolio, including sensor fusion, anti-jamming, correction services, and perception technologies, will enable cutting-edge solutions for diverse markets and applications. This will ensure greater accessibility to high-accuracy and high-performance positioning technology with low size, weight, and power characteristics. This will accelerate the adoption of autonomous systems in existing markets and address the needs of emerging high-growth segments, such as robotics, UAVs, autonomy, and other mission-critical applications.

EIVA Partners with Tuco

A new partnership between EIVA and Tuco Marine will provide integrated autonomous systems for inspecting subsea assets, such as cables transporting renewable energy.

Examples of EIVA survey technology include the sensor platform ScanFish for UXO surveys and the ViperFish for USV systems. Tuco Marine offers its ProZero vessels for use in offshore wind farms, environmental surveys, defense and aquaculture.

The partnership is enhanced with positioning and imaging sensor technologies from sister companies within the international Covelya Group: sensor providers Sonardyne and Wavefront Systems, and Forcys (*Sea Technology*, January 2025), which provides defense expertise for mine countermeasures, rapid environment assessment, and more.

First Order for Dri-X USV

Exail has made the first sale of its DriX O-16, a trans-oceanic USV. Designed for long-range maritime operations, it has been acquired by an Indo-Pacific customer operating in the civil sector.

Equipped with advanced sensors, including a full-depth multibeam echosounder, the DriX O-16 enables operators to collect precise data for hydrographic, geophysical and environmental missions. Its ability to deploy AUVs and ROVs enhances operational versatility and productivity and broadens the scope of its missions.

With enhanced autonomy, the DriX O-16 enables extended port-to-port operations with less human exposure at sea and resources, aligning with the industry's push for efficient and sustainable solutions.

Omicron Connector for BBC Arctic Filming

Teledyne Impulse-PDM has supplied its Omicron optical fiber connectors to BBC Studios for use in an underwater natural history series set to air in 2026. Filming

required custom-built camera technology designed to capture extraordinary marine footage from the depths of the Arctic, facilitated by the Rev Ocean's Aurora ROV.

BBC Studios and Marine Imagine Technologies designed a deep ocean-rated camera system integrated with a telemetry bottle, the central hub for communications on the submersible. During the Arctic expedition, the crew encountered challenges connecting the camera system to the ROV's telemetry bottle due to a missing optical fiber connector, critical to establishing communications for the system. BBC Studios reached out from its expedition for support, and Teledyne Impulse-PDM rapidly supplied the Omicron 5030/5070 optical connectors, which deliver high-performance fiber connectivity in demanding environments. Despite a tight timeline, Teledyne Impulse-PDM was able to courier the connector to Svalbard, enabling the BBC Studios research crew to proceed with their mission.

Thordon Chooses New Distributor

Thordon Bearings has appointed Axioma servisas as its sales, service and distribution lead for Lithuania.

Lithuania has been one of the fastest-growing economies in the EU over the past five years. The country continues to actively develop its maritime, manufacturing and renewable energy sectors, as part of government policy to strengthen the country's industrial competitiveness.

Vilnius-headquartered Axioma servisas, which has been servicing, maintaining, installing and commissioning technology solutions for companies across the Baltic's industrial sectors for more than two decades, is tasked with expanding Thordon's presence throughout Lithuania.

NextGeo Adds to Fleet

NextGeo, specializing in marine geosciences and offshore construction support services in the energy sector, has expanded its fleet with the purchase of the *NG Surveyor* vessel, which will be used for geophysical, geotechnical, environmental and unexploded ordnance (UXO) inspection activities.

The vessel was built in 2014. It is 64.8 m long, 15.8 m wide and has 500 m² of deck space. It is equipped with a dynamic positioning class two system and can accommodate up to 48 people. Following the takeover of the ship, NextGeo will carry out refitting work to install highly technical equipment.

Damen Dredger for Port of Baku

Baku Shipyard is constructing a Damen cutter suction dredger (CSD) 650. The design of the dredger and its materials package have been delivered by Damen Shipyards Group. The dredger, which will be ready later this year, will be operated by the Port of Baku, a thriving transport hub on the western shore of the Caspian Sea. Over the last five years, the water level of the Caspian Sea has significantly dropped. The dredger will be used for maintenance dredging to allow for increasing port traffic.

The CSD 650 is a stationary dredger designed to work at 3- to 18-m depth. It features 700-kW cutter power; 1,825-kW dredge pump power; and a 63-m swing width.

Stena RoRo Buys Ship

Stena RoRo has expanded its fleet with the purchase of the RoRo ship *Giuseppe Lucchesi*. The ship will be renamed the *Stena Shipper* and fly the Danish flag.

In connection with the transaction, Stena RoRo is taking over a contract with the Tunisian shipping company Cotunav for service on the Rades-Marseille route. The seller is CIN (Compagnia Italiana di Navigazione S.p.A), a company in the Moby Lines S.p.A group.

USMMA Students Receive Crowley Scholarships

Four students from the U.S. Merchant Marine Academy (USMMA) have been awarded Thomas B. Crowley Sr. Memorial Scholarships in recognition of their success and commitment to careers in the maritime industry: Draygan Colonese, Elizabeth Kay, Charles Lausten and Gianna Russo. They were selected based on their academic achievements and performance during the cadet training periods aboard Crowley-operated or -managed vessels.

Colonese, a senior from Colorado Springs, Colorado, is pursuing a degree in maritime logistics and security. He plans to sail commercially after graduation.

Kay is a senior studying maritime logistics and security and is from Charleston, West Virginia. She plans to sail as a licensed mariner and fulfill her commitment to the U.S. Navy Reserve upon graduation.

Lausten, a senior from Ashburn, Virginia, is pursuing a degree in marine engineering and shipyard management.

Upon graduation, Lausten plans to serve as a mariner.

Russo is a senior from Sparta, North Carolina, pursuing a degree in marine engineering.

Tech for Innerspace Initiative

Global Oceans has signed a letter of intent with Orpheus Ocean Inc. to develop strategies for integrating Orpheus's vehicle technologies in support of Global Oceans' Innerspace Initiative, which aims to host a deep-sea research, exploration, training and public outreach platform. Orpheus Ocean is a venture capital-funded startup with an exclusive license to develop and deploy an autonomous full-ocean-depth vehicle platform originally designed by Woods Hole Oceanographic Institution and NASA's Jet Propulsion Laboratory.

Accelerator Launches in Canada

COAST, Pacific Canada's hub for the sustainable blue economy, has launched Blue Action Canada, the country's first startup accelerator fully dedicated to the ocean economy, in partnership with the global venture firms Founders Factory of London and Blue Action of The Bahamas. This is the partners' first move into Canada.

BIRNS Chooses New Representative

BIRNS Inc. has made JOWO Systemtechnik AG an authorized dealer with exclusive representation of BIRNS subsea interconnect products and penetrator assemblies in Germany and South Korea. **ST**

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Find out more

Climate Funding for Alaska Native Tribes

NOAA has selected the Alaska Native Tribal Health Consortium (ANTHC) to receive \$2.7 million in funding through the Inflation Reduction Act. Through collaboration with NOAA's National Ocean Service and National Sea Grant Office, the funding will support efforts over the next four years to expand ANTHC's work addressing climate change impacts on Alaska native communities and enhance technical assistance for all 229 Alaska Native tribes.

In Alaska, where temperatures are rising faster than anywhere else in the U.S., communities are facing severe infrastructure damage from erosion, flooding and permafrost degradation. ANTHC, with its strong community ties and partnership with NOAA, is uniquely equipped to co-develop and implement climate adaptation solutions.

DOE Updates Hydrogen Plan

The U.S. Department of Energy (DOE) has updated its Hydrogen Program Plan, a foundational resource for advancing research, development, demonstration and deployment (RDD&D) of clean hydrogen technologies. The Hydrogen Program Plan specifically identifies and articulates strategic, high-impact areas of focus across DOE's Hydrogen Program, a cohesive and coordinated effort involving hydrogen-related offices.

Advancing a coordinated strategy for RDD&D is particularly important for clean hydrogen because it has the potential to be used across virtually all sectors of the economy, and it can be produced, stored, and delivered in many ways. A successful strategy will need to integrate efforts in renewable, nuclear, and fossil energy—and coordinate across end uses in multiple sectors of the economy.

In 2023, several federal agencies developed the U.S. National Clean Hydrogen Strategy and Roadmap, a comprehensive nationwide framework for accelerating the production, processing, delivery, storage, and use of clean hydrogen. DOE's updated Hydrogen Program Plan explains how DOE offices collaboratively work to efficiently implement the strategies outlined in that national framework. This new version also includes updated supporting data and analysis; a description of the Regional Clean Hydrogen Hubs; information about ambitious DOE-wide goals established through the Hydrogen Shot; and examples of DOE-wide efforts to establish a strong workforce, maximize technology efficiency and accelerate innovation in the transition to a hydrogen economy.

Green Light for SouthCoast Wind

The U.S. Bureau of Ocean Energy Management (BOEM) has approved the SouthCoast Wind Project after the release of the final environmental impact statement. The project will be located more than 20 mi. off the shores of Martha's Vineyard and Nantucket, Massachusetts, with the potential capacity of 2.4 GW. This project could power more than 800,000 homes in Massachusetts

and Rhode Island. A maximum of 141 turbine generators will be installed, along with up to five offshore substation platforms.

Interim Polar Icebreaker

The U.S. Coast Guard has accepted ownership of the motor vessel *Aiviq*, a 360-ft. icebreaker equivalent to *Polar*-class 3, from an Edison Chouest Offshore subsidiary. The vessel will enhance U.S. operational presence in the Arctic and support Coast Guard missions while awaiting delivery of the *Polar Security Cutter*-class vessels.

Upon commissioning, the ship will be renamed *Coast Guard Storis* (WAGB-21), marking the second cutter to bear that name. With minimal modifications, the future *Storis* will be capable of safeguarding U.S. sovereign interests in the Arctic and conducting select Coast Guard missions.

The Coast Guard requires a fleet of eight to nine polar icebreakers to meet operational needs in polar regions. The future *Storis* will provide near-term operational presence and support national security as a bridging strategy until the full complement of *Polar Security Cutters* is delivered.

Whale Vessel Strike Reduction Rule Unchanged

NOAA Fisheries has withdrawn the proposed amendment to the North Atlantic right whale vessel strike reduction rule. The proposed changes were intended to further reduce the likelihood of mortalities and serious injuries to endangered right whales from vessel collisions, which are a leading cause of the species' decline and a primary factor in an ongoing unusual mortality event.

The proposed rule would have: modified the spatial and temporal boundaries of current speed restriction areas, currently referred to as Seasonal Management Areas (SMAs); included most vessels greater than or equal to 35 ft. (10.7 m) and less than 65 ft. (19.8 m) in length in the vessel size class subject to speed restriction; created a Dynamic Speed Zone framework to implement mandatory speed restrictions when whales are known to be present outside active SMAs; and updated the speed rule's safety deviation provision.

Changes to the speed regulations were proposed to reduce vessel strike risk based on a coast-wide collision mortality risk assessment and updated information on right whale distribution, vessel traffic patterns, and vessel strike mortality and serious injury events.

Endangered North Atlantic right whales are at heightened risk for vessel strikes because they spend a lot of time at or close to the water surface.

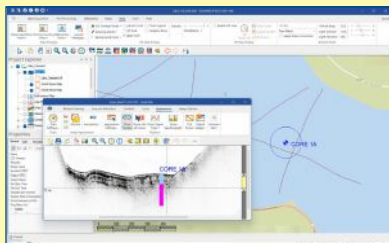
Right whales can be very difficult to spot from a boat due to their dark color and lack of a dorsal fin. Poor weather and sea state or low light conditions make it difficult to spot these whales.

NOAA Fisheries will continue to work closely with partners and stakeholders to further efforts to conserve and rebuild the North Atlantic right whale population, including by using existing management measures and technological innovation and partnerships to help reduce the risk of vessel strikes. **ST**

productdevelopment

For more information on any of these products, visit our website at www.sea-technology.com/products

Sonar Post-Processing



SonarWiz 8.2.0. includes the following additions: support for GeoTIFF raster data exports; support for Cloud Optimized GeoTIFF (COG); new color mapping option to improve line-to-line colors in mosaics; Cores as stand-alone objects, allowing for radial influence; keyboard controls and speed in knots to NMEAWiz; vertical scale to signal windows in waterfall displays; ability to change map scalar in the CSF to SEGy export; decimals to XY

coordinates in SEGP export; and improved CSF file renaming options. Chesapeake Technology Inc.

Magnetic Compass

Users of boats 16 to 35 ft. in length could benefit from using the SuperSport Venture SS-PR2 magnetic compass. It features easy-to-read heading numbers in 30° increments on the side and cardinal directives on top. It's pre-wired with blue 12- to 24-V LED lighting for use in reduced light. The polished dome has three orange lubber lines for direction reference. Ritchie Navigation.

Vessel Monitoring System

BareFLEET has been updated with a front-end dashboard to enhance usability for operators across the maritime sector. The dashboard introduces intuitive features that pro-

vide vessel operators with actionable insights into fuel consumption, operational efficiency, engine alerts and overall fleet performance. AST Reygar, part of AST Networks.

Meteorological Towers

PA-XS miniature Sodar is an acoustic wind profiler featuring 400-m average altitude range and 10-W power consumption at 44 lb./20 kg. The PA0 Sodar acoustic wind profiler features 700-m average altitude range and 10-W power consumption at 158 lb./72 kg. Remtech.

Mini Fish Profiler



Acoustic Zooplankton Fish Profiler (AZFP)-nano is a compact, lightweight, single-frequency scientific echosounder well-suited for applications in challenging environments where size and weight are important considerations. This profiler was developed to measure a wide range of physical and biological parameters, including zooplankton, fish, algae, bubbles and suspended sediments within the water column. ASL Environmental Sciences Inc.

High-Precision GNSS

GEODNET GNSS correction services is being added to the Agnostic Corrections Partner Program. This program provides users with the flexibility to choose from a variety of high-accuracy correction services, ensuring compatibility with diverse application needs and geographical requirements. GEODNET's decentralized RTK network could extend high-accuracy positioning to even the most remote locations while keeping costs low to benefit robotics, GIS and UAVs. Septentrio N.V.

Integrated Communication System

For organizations seeking an all-in-one communications solution for



General Oceanics, Inc. introduces its new 2nd Generation model 8060 autonomous pCO₂ monitoring system.

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offshore platforms, the HELIDECK Rack is an integrated communication system including multiple NAUTEL technologies: a NAUTEL NDB transmitter; KENTA/NAUTEL VHF maritime transceiver; third-party VHF aero transceiver coupled with KENTA IP gateway; and KENTA/NAUTEL voice console and DSC console. This solution is fully integrated, plug and play, and benefits from a single source for support. NautelNav.

Machine Vision Camera



SmartSight MV100 leverages machine learning and AI to bring object recognition, navigation, inspection technology, and other autonomous solutions to the sub-sea market. The SmartSight MV100 camera includes a gigabit ethernet interface for easy integration with existing platforms and low power consumption, making it well suited for autonomous vehicles. It weighs only 0.44 kg (flat)/0.37 kg (dome) in water. DeepSea Power & Light.

Mold Elimination

Black mold is a toxic fungus that thrives in the damp, humid environments common to vessels, leading to respiratory issues, allergic reactions, long-term health complications and compromised operational safety. The Pyure Dynamic Protection system is an FDA-approved air purification technology that generates hydroxyls to actively neutralize mold spores, bacteria, viruses and other airborne contaminants. It eliminates up to 99.9999% of viruses, bacteria and mold in seconds to hours. VIKAND.

Real-Time Sensor Monitoring

IO-Link is a universal open-source communication protocol that enables real-time monitoring with remote accessibility to your sensor data. ICP Accelerometer + IO-Link

Model 674A91 provides more effective fault detection than comparable MEMS-based devices on the market. It offers wide frequency range vibration data for better insight into equipment health. PCB Piezotronics Inc.

AI to Improve Safety

Wise-AI uses large language models to analyze vast troves of historical data from past safety inspections. By identifying common issues and potential root causes, the development provides seafarers with tailored recommendations and insights, even if they're unfamiliar with the intricacies of the regulations. The platform provides fleet-wide benchmarking, enabling managers to compare their vessels' performance against industry standards. WiseStella Pte. Ltd.

Portable, Robust DVR Solution

The rugged DVR+ overlay laptop is designed to meet the demanding needs of offshore inspections. Powered by the Rayfin single-channel

inspection software, this compact system combines recording, comprehensive data logging, and real-time top-side media transfer to enhance efficiency for professionals in energy, marine science, and beyond. SubC Imaging.

Navigation Solution

Octans 9 is an attitude and heading reference system that offers several upgrades from previous generations in dynamic positioning, vessel navigation, and offshore platform stabilization. Leveraging fiber-optic gyroscope technology, Octans 9 has a heading accuracy of 0.1° secant latitude and heave measurement accuracy of 5%. The system is resilient to GNSS outages. Exail.

Marine Engines

JD14 has a higher duty cycle and more power in a smaller package size compared to John Deere 13.5L models. JD18 is designed for heavy-duty operations, ensuring maximum uptime and productivity. Deere & Co. **ST**

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AST, SAL Collaboration

AST Networks and SAL Navigation are working together to advance marine electronics and improve the safety of vessels worldwide. This collaboration aims to bring cutting-edge solutions to the maritime industry, with a focus on compliance, innovation and enhanced operational efficiency.

An instrumental part of the collaboration is the SAL SPU-100, a system designed to meet the stringent regulations of the Panama Canal Authority. The SPU-100 has been tailored to support vessels navigating the canal, ensuring full compliance with its unique requirements while improving safety, communication and efficiency during transits.

In addition to the SPU-100, AST Networks and SAL Navigation are exploring more opportunities to enhance ship-to-shore communications, improve compliance with global maritime regulations, and reduce operational costs for vessel owners and operators.

SIRE 2.0 Preparation

The AI-powered maritime operations platform company Kaiko Systems has partnered with LNG Shipping operator TMS Cardiff Gas to integrate the platform into TMS Cardiff Gas's entire fleet to enhance the readiness of its crew for the new, updated Ship Inspection Report Programme (SIRE) 2.0.

With the industry transitioning to a more rigorous and performance-driven inspection process, TMS Cardiff Gas was seeking a solution that could empower its teams to independently assess their preparedness, foster accountability, and ensure compliance with the new standards. Kaiko Systems' web-based application, combined with its user-friendly interface and comprehensive questionnaire, aligned with TMS Cardiff Gas's main goals of streamlining pre-inspection procedures and building crew confidence.

One of the major concerns for shipowners and managers is ensuring that every crew member, regardless of role or location, can participate effectively in pre-SIRE inspection preparations.

There is always a risk of uneven understanding or being unprepared across the team, which can compromise the overall inspection outcome.

Using Kaiko Systems' innovative technology on the company's fleet of 18 vessels provides TMS Cardiff Gas with an accessible platform where everyone can independently review and answer the multiple-choice questionnaires, fostering a culture of collective responsibility and preparedness.

Balancing AI Development

The U.K. government has announced plans to "unleash AI" across the country to boost economic growth.

This move raised questions about AI's high energy and water demands, and whether this can be balanced with the U.K.'s climate and environmental targets.

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Plymouth Marine Laboratory (PML, *Sea Technology*, January 2025), has been rapidly expanding AI capabilities in recent years as its scientists have been leveraging AI to accelerate understanding from huge amounts of environmental data, which continue to increase. This includes identifying features in satellite images, detecting species in drone footage or autonomous camera systems, and identifying complex relationships within large data sets.

With petabytes of data, an ever-increasing archive of field samples and surveys, and data sharing becoming easier, in-house AI and machine learning expertise are essential in order to effectively optimize the value of these data.

Alongside AI developments, PML is also investigating approaches to reduce the resource use of its AI systems, such as installing more solar panels, ensuring its data centers are as energy efficient as possible, and using best practices to train AI models.

PML is also looking into where the use of AI can reduce energy usage. For example, modeling the ocean requires solving a set of very complicated equations that must be done individually for different areas, times, and scenarios, such as different emissions pathways for climate change.

Using digital twins and emulators that can run much faster and use much less energy than current models are in the works for some biochemical models of the ocean at PML.

Allseas Chooses eLARS For New ROV Fleet

Allseas, a contractor in the offshore energy market, has commissioned MacArtney to enhance and future-proof its ROV operations by replacing three hydraulic launch and recovery systems with MacArtney's all-electric eLARS.

One system is planned to be mobilized on Allseas' *Pioneering Spirit*, the largest offshore construction vessel in the world.

The scope comprises three over-the-side 150-kN all-electric A-frames, including docking head and AHC winch, for a new fleet of electric ROVs to be used in survey and construction tasks in 4- to 6-km water depths.

Allseas chose MacArtney's eLARS for its advantages compared to traditional systems. Its intelligent control systems ensure longevity and versatility by adapting to future technological developments.

Real-time diagnostics enable continuous monitoring of performance, allowing for immediate detection and resolution of issues. Preventive maintenance can be based on the system's intelligent self-assessment capabilities, which reduce downtime and extend the life span of the equipment.

Automated launch and recovery enhances operational efficiency and safety. High redundancy ensures uninterrupted operations and minimizes downtime.

Environmental benefits include the elimination of pressurized oil contamination over water. The system is also operable from shore, which requires fewer crew members on board, resulting in cost savings. **ST**

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The logo for Nautelnav, featuring a stylized orange wave icon above the company name "nautelnav" in a white sans-serif font.

offshore oil & ocean engineering

AiP for Advanced FPSO

Hanwha Ocean Co. Ltd., one of the largest shipbuilders in the world, has been awarded an approval in principle (AiP) from Bureau Veritas Marine & Offshore (BV) for its standard floating production storage and offloading unit (FPSO) design, which includes the latest developments in advanced digital solutions to support more energy-efficient operations.

The standard FPSO design of Hanwha Ocean measures 340 m in length and 62 m in width, with a crude oil storage capacity of 2.38 million barrels and a production capacity of 190,000 barrels per day. The FPSO is designed to accommodate topsides of up to 55,000 tons and 17,600 sq. m, with a hull that can operate for up to 20 years without drydocking.

The FPSO will incorporate technologies such as zero-flaring, GHG monitoring and an energy management system to comply with environmental regulations. It will also feature advanced digital solutions, including cybersecurity, digital twin and predictive maintenance.

Structural Monitoring Services Partnership in Australia

FORCE Technology and Asia Offshore Solutions (AOS) have signed a strategic partnership agreement to improve access to structural monitoring, advanced subsea inspection and cathodic protection services to the Australian offshore industry.

AOS will offer FORCE Technology's pipeline integrity management services, including advanced non-destructive testing solutions. These services provide comprehensive, high-resolution insights into the integrity of critical subsea assets, enabling operators to identify and address structural vulnerabilities before they escalate into costly failures and environmental disasters.

Trelleborg Moves into Vessel Berthing

Trelleborg Marine & Infrastructure has signed an agreement to ac-

quire Mampaey Offshore Industries. The acquisition will significantly enhance Trelleborg's capabilities in the vessel berthing sector.

Mampaey, based in Dordrecht, Netherlands, has more than 120 years of experience delivering advanced solutions for the marine industry. The company is globally recognized for the design and manufacture of integrated berthing, mooring, ship-to-shore links, and towing systems for LNG, petrochemical, and commercial port applications.

Mampaey's manufacturing facility in Dordrecht will be integrated into Trelleborg's operations, establishing a central European hub to bolster the company's presence in the region. This move is expected to enhance production efficiency, ensure quality control and improve customer service for European markets. The combined installed base of Trelleborg and Mampaey projects will also support the expansion of site services, enabling Trelleborg to provide a higher level of global customer support.

ROV Pilot Training Partnership

Subsea resourcing specialist DRIFT Offshore, which provides support services for projects internationally, has entered a partnership with Norwegian ROV specialist Kystdesign that will focus on specialist pilot training for Kystdesign's advanced ROV systems, addressing critical skills and training needs in the subsea industry.

DRIFT Offshore's experienced personnel, recognized for their expertise in underwater robotics, have been certified as official ROV pilot training partners for Kystdesign's systems. This enables DRIFT Offshore to deliver comprehensive training on Kystdesign ROVs, as well as provide expert maintenance support and facilitate product sales globally. The partnership further extends DRIFT Offshore's subsea training capabilities and adds a new dimension to Kystdesign's service provision to customers.

Geotechnical Ship Conversion

Geoquip Marine, a specialist in offshore geotechnical solutions and a Njord Partners portfolio company, has added a seventh vessel to its fleet. The *Geoquip Silvretta*, originally built as a platform supply vessel by Green Yard Kleven, is being converted in Norway into a state-of-the-art geotechnical services platform for the offshore energy sector.

The conversion, scheduled for completion in spring 2025, will include the installation of Geoquip's largest drilling rig, the GMTR150. The efficient and reliable cutting-edge rig will ensure a low carbon footprint and lower fuel consumption and will enable the vessel to conduct high-quality geotechnical site investigations in a range of sea states. Once the upgrade is complete, the *Geoquip Silvretta* will mobilize for a project in northern Europe, ready to tackle any challenging metocean conditions.

Green Yard will work with the vessel's original designer, Marin Teknikk AS, to customize the interior for Geoquip's global projects. These upgrades will include installing a moonpool, moving and adding cranes, extending the shelter deck, increasing office and meeting space, and building a new accommodation block.

Patrol Vessel for Nigeria

Damen Shipyards Cape Town has delivered an FCS 3307 patrol vessel to Homeland Integrated Offshore Services Ltd. (Homeland IOSL) in Nigeria. This vessel, on charter with an international energy company, will perform offshore patrol duties to enhance the security of personnel, assets and the environment in Nigerian maritime territories.

This delivery marks the 10th vessel to join the Homeland fleet, reflecting ongoing fleet expansion efforts.

The FCS 3307 Patrol is equipped with Damen's advanced Sea Axe hull technology, which enables it to cut through water at remarkably high speeds, ensuring safety, stability, and comfort for the crew, alongside enhanced maneuverability and fuel efficiency. **ST**

Zumwalt Modernization Work

HII's Ingalls Shipbuilding division has successfully undocked USS *Zumwalt* (DDG-1000), the lead ship of the U.S. Navy's *Zumwalt*-class of guided missile destroyers, taking the ship one step closer to testing and returning to the U.S. Navy fleet.

The undocking marked the completion of significant modernization work at Ingalls since the ship arrived at the Pascagoula shipyard in August 2023. Shortly after its arrival, the ship was put back on land in order to receive technology upgrades, including the integration of the Conventional Prompt Strike weapon system.

The Ingalls team also replaced the original twin 155-mm advanced gun systems on the destroyers with new missile tubes.

Sub Surveillance Collaboration

Researchers at Virginia Tech and the U.S. Naval Academy are teaming up to improve submarine surveillance technology. Funded by a grant from the U.S. Office of Naval Research, the collaboration focuses on finding smarter ways to track enemy submarines.

The project aims to ensure the Navy can make the best use of its resources in vast ocean areas while staying ahead of emerging threats.

For the three-year duration of the grant, the research team will focus on strategic and tactical allocation of resources. Strategic allocation uses surveillance tools to track movement and patterns over time, while tactical allocation focuses on deploying units, such as submarines, warships or aircraft, to neutralize a threat in the moment.

Naval Communications Partnership

Core Systems, a provider of rugged server solutions, has announced a partnership with Avaya, a specialist in unified communications, to bolster the communication capabilities of the U.S. Navy Fleet. This partnership builds on Core Systems' extensive track record of supporting the Navy's interior communications systems for more than 12 years with rugged and reliable server solutions.

The partnership will enhance support for major Navy

Fleet programs, including: IVN (Interior Voice Network), providing scalable, rugged voice communications for large-deck platforms; IVCS (Interior Voice Communications Systems), enabling secure and efficient voice communication systems across the fleet; and FFG (Fast Frigate), delivering next-generation communication infrastructure for modern frigates.

Hydrographic Drone for Shom

The Shom (French Naval Hydrographic and Oceanographic Service) has acquired a DriX H-8 surface hydrographic drone, developed by Exail. This acquisition marks a milestone in the modernization of Shom's capabilities, addressing the growing demand for reliable and certified marine data for both civilian and military purposes.

The drone's capabilities were validated during trials conducted by Shom aboard the hydro-oceanographic vessel *Beautemps-Beaupré* off the French coast of Brest in 2020 and in the Gulf of Lion in 2023.

The DriX H-8 will be deployed for diverse hydrographic tasks, including seabed topography, wreck detection and seabed composition analysis. It will also play a key role in preliminary studies for offshore wind farm development. The collected data will enhance understanding of the marine environment while expanding intervention capabilities over increasingly extensive areas, including deep-sea regions. The DriX H-8 is positioned as a strategic asset for faster, better-informed decision making.

Second OPV for Pakistan

Damen Shipyards Group has delivered the second in a series of two offshore patrol vessels (OPVs) 2600 to the Pakistan Navy. The vessel, named PNS *Yamama*, follows the delivery of the PNS *Hunain* in summer 2024.

Flexible Torpedo Launcher

SEA's Torpedo Launcher System (TLS) has been selected for a frigate program in Latin America. SEA's weapon-agnostic launcher capability is also in use by the U.K. Royal Navy and other navies in North America and Southeast Asia. SEA's TLS provides weapon flexibility in a close-range, rapid-reaction system that can fire NATO-compatible standard lightweight torpedoes. Configuration into containerized mission modules is possible. **ST**

Seaeye SR20

Empowering eco-responsibility

The Seaeye SR20 is a full-sized IMCA Class III B electric ROV system with performance exceeding that of a 200HP hydraulic vehicle.



SAAB



environmental monitoring

Drought Could Affect Climate

Increasing drought events in southern Africa could benefit Indian Ocean marine life and atmospheric carbon removal, according to a new study of the Madagascar Bloom, one of the world's largest recorded phytoplankton blooms.

The study, led by the University of Athens and co-authored by scientists at the U.K.'s National Oceanography Centre (NOC, *Sea Technology*, January 2025), linked the unprecedented marine algal bloom to an influx of nutrient-containing dust blown over the Indian Ocean from South Africa. This saw phytoplankton levels at three times the level normally expected at the time of year it occurred, spreading from southeast of Madagascar into the wider Indian Ocean for three weeks longer than normal.

These algae form the basis of the marine food chain and help to remove carbon dioxide from the atmosphere by using it to grow before being eaten or dying and falling as organic matter to the seafloor.

The study shows how African desert dust being blown over and deposited onto the ocean surface was key in triggering this unprecedented oceanic phytoplankton bloom in the southeast of Madagascar at a time of the year when blooms are uncommon.

This suggests that, as deserts release more dust into the air and that dust settles on the ocean's surface, it could help phytoplankton growth, potentially increasing the amount of CO₂ the ocean absorbs from the atmosphere.

The study used satellite data to study the causes of major phytoplankton blooms, focusing on the unprecedented Madagascar Bloom in late 2019 to early 2020, which was found to be the largest on record going back 24 years.

It's already known that dust from the Sahara Desert often crosses the Atlantic Ocean to the Americas and that when these particles settle on land or in the ocean, they deliver essential nutrients that may

boost plant and marine life growth. However, the relationship between desertification, dust emissions and ocean fertilization has been poorly understood. The new study, published in *PNAS Nexus*, marks a significant step in unraveling these connections. The scientists worked through the European Space Agency's Living Planet Fellowships Poseidon and Pyroplankton.

While this extensive phytoplankton bloom was highly unusual, trends in rising air temperatures, aridity and dust emissions in southern Africa indicate that such events may become more frequent in the future.

Alongside recent discoveries of ocean fertilization caused by drought-induced megafires in Australia, the findings suggest a potential connection between climate change, drought, aerosols and ocean blooms.

Port-Log Installed at Site of Special Scientific Interest

Langstone Harbour, a designated Site of Special Scientific Interest in the U.K., has completed the installation of a comprehensive marine environmental monitoring solution provided by OceanWise.

Langstone Harbour holds rich wildlife and is designated as a Special Protection Area. It is a hub for a range of activities, including commercial shipping, fishing and leisure boating. With its environmental significance, the harbor requires constant monitoring to ensure its health and sustainability.

Environmental monitoring is vital for understanding and responding to the dynamic changes in marine environments, including tidal fluctuations, weather patterns, water quality, and potential pollutants. With real-time data provided by the OceanWise Port-Log system, harbor operators can now track environmental variables in detail, enabling proactive management and informed decision making. This helps to prevent potential disruptions to marine ecosystems, support con-

servation efforts, and ensure compliance with environmental regulations.

Buoys for Beach Regeneration

The OceanDepth smart buoys developed by the Spanish technology company Satlink will be used in a beach regeneration project. The buoys will have an integrated echosounder and algorithms to precisely measure the different layers of marine sediment accumulated on the seabed in coastal areas. The thickness of these layers are a key indicator for beach regression and for monitoring the short- and long-term dynamic processes in real time.

USV to Monitor Water Quality

HydroSurv has sold an advanced REAV-28 package to Engitec Systems International (ESI), marking the company's first sale in the Eastern Mediterranean region. ESI, a Cyprus-based specialist in marine and offshore engineering solutions, will deploy the USV for environmental monitoring and research.

The zero-emission, battery-electric REAV-28 will initially support ESI's REDRESS project, focusing on ecosystem restoration and environmental monitoring in coastal and offshore waters. The platform will have an advanced sensor array to monitor critical water quality parameters, including temperature, salinity, dissolved oxygen and turbidity.

Data for Conservation, Climate Studies in Panama

OSIL has manufactured a pioneering oceanographic data buoy system, the first of its kind in the Central American Pacific coast. The buoy system, a floating laboratory platform, has been installed in the Parque Nacional Coiba in Panama for the Estación Científica Coiba to assist with the study and conservation of marine diversity and monitoring climate change.

Coiba Island regularly sees large congregations of different migratory marine species. The buoy will continuously monitor parameters that are crucial to critical migratory events. **ST**

meetings

APRIL

April 2-4—NOIA Annual Meeting, Washington, D.C. www.noia.org.

April 7-9—Sea-Air-Space, National Harbor, Maryland. seairspace.org.

April 8-10—Interspill, London, U.K. www.interspill.org.

April 8-10—Ocean Business, Southampton, U.K. www.oceanbusiness.com.

April 9-10—Geo Connect Asia, Singapore. www.geoconnectasia.com.

MAY

May 12-14—Intelligent Ships Symposium, Philadelphia, Pennsylvania. www.navalengineers.org/symposia/ISS-2025.

May 20-21—TugTechnology, Antwerp, Belgium. www.ast-reygar.com.

JUNE

June 2-5—Capitol Hill Ocean Week, Washington, D.C., and virtual. <https://marine-sanctuary.org/chow-2025>.

June 10-12—Seawork, Southampton, U.K. www.seawork.com.

June 11-12—European Wind Blade Recycling Summit, Berlin, Germany. www.wplgroup.com/aci/event/european-wind-blade-recycling-summit.

June 16-19—OCEANS 2025 Brest, Brest, France. <https://brest25.oceansconference.org>.

June 19-20—East Med Maritime Conference, Athens, Greece. <https://emmc.me>.

June 24-26—Electric & Hybrid Marine Expo, Amsterdam, Netherlands. www.electricandhybridmarineworldexpo.com/en.

SEPTEMBER

September 10-11—Digitalisation in Shipping: Europe Summit, Rotterdam, Netherlands. www.wplgroup.com/aci/event/digitalisation-in-shipping-europe.

September 10-11—International Antifouling Conference, Gothenburg, Sweden. <https://international-antifouling-conference.confetti.events>.

September 10-12—INMEX SMM India, Mumbai, India. www.inmex-smm-india.com.

September 15-19—London International Shipping Week, London, U.K. www.LISW.com.

September 24-25—European Carbon Dioxide Utilisation Summit, Antwerp, Belgium. www.wplgroup.com/aci/event/co2.

September 26—The Maritime Standard Transportation and Climate Change Conference, Abu Dhabi, United Arab Emirates. <https://tmstaccc.com>.

September 29-October 2—OCEANS 2025 Great Lakes, Chicago, Illinois. <https://greatlakes25.oceansconference.org>.

OCTOBER

October 6-8—AAPA Annual Convention, Québec City, Canada. <https://aapa.getregistered.net/2025-annual-convention>.

October 22-24—WISTA International AGM & Conference, Barcelona, Spain. <https://wistainternational.com>.

NOVEMBER

November 4-6—Deepwater Operations and Topsides, Platforms & Hulls Conference and Exhibition, Galveston, Texas. www.offshore-event.com.

For more industry meetings, visit sea-technology.com/meetings. **ST**



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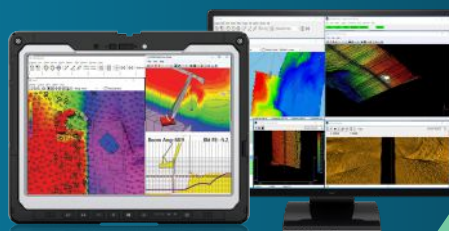
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contracts

Elomatic, Turku, Finland, has signed an agreement with a multimodal logistics provider in northwestern Europe to install its patented Elogrid tunnel thruster technology on two new RoRo vessels under construction. The thruster reduces resistance and lowers fuel consumption while minimizing noise and vibrations throughout the vessel. CLdN.

JDR Cables, Houston, Texas, a global subsea cable supplier and service provider, part of the TFKable Group, will supply and coordinate the delivery of custom-engineered cables for an upgrade to the IceCube Neutrino Observatory, an advanced international research project in Antarctica dedicated to studying neutrino subatomic particles. Michigan State University.

Svitzer, Copenhagen, Denmark, has ordered another battery-powered tug for its fleet. The tug will be used in the Øresund Strait between Denmark and Sweden. It will also contribute to achieving the ambitious targets Svitzer has set for decarbonizing its global operations. Undisclosed.

Wärtsilä, Helsinki, Finland, will supply its EnergoFlow solution and fixed pitch propellers for three pure car/truck carrier vessels owned by an international RoRo cargo operator. The combination of these upgrade solutions will improve the propulsion efficiency of these existing vessels, in turn reducing fuel consumption and CO₂ emissions. Sallaaum Lines.

Cavotec, Lugano, Switzerland, has signed three shore power orders for Italian ports. The first order is for Cavotec's PowerMove and PowerFeed systems to support cruise vessels at multiple ports across western Italy. The second order includes PowerMove technology for cruise and RoRo vessels in Tuscany. The third order is for two PowerMove systems to connect cruise vessels and a Power-

Extend to connect container ships at a port in southern Italy. Various.

Oman Oil Marketing Co., Mina al Fahal, Oman, and an international marine fuel joint venture (JV) founded by Trafigura, Frontline, and Golden Ocean have established a bunker fuel JV to supply vessels visiting Oman's ports of Duqm, Muscat, and Sohar. TFG Marine.

Lhyfe, Nantes, France, a producer and supplier of green and renewable hydrogen, has signed a memorandum of understanding to explore potential co-development opportunities in large-scale green hydrogen production projects in Europe. Abu Dhabi Future Energy Co. PJSC – Masdar.

HydroSurv, Exeter, U.K., in partnership with WASSP Multibeam via Furuno UK, has delivered a REAV-28 USV equipped with a WASSP multibeam echosounder system. This new collaboration marks the first delivery of the turnkey system, ideal for cost-effective bathymetric survey in marine construction and dredging applications. Foyle Marine & Dredging.

Ulstein Design & Solutions AS, Ulsteinvik, Norway, has secured its largest aftermarket design contract to date for the cable-laying vessel *Orient Adventurer*. The contract involves basic design and engineering provided by several of the companies in Ulstein. Dong Fang Offshore.

ABS Wavesight's, Spring, Texas, Nautical Systems Maintenance Manager and Purchasing Manager modules have been chosen for maintenance and inventory processes of a shipping company operating tanker vessels that transport ammonia across Asia. UNI-FLEET SDN BHD.

Atlas Professionals, Hoofddorp, Netherlands, has renewed a contract to allow continued provision of skilled wind turbine generator support services located in the U.K., Denmark, Germany and the Netherlands. Ørsted. **ST**

Wind-Assisted Propulsion Will Propel Us Toward Sustainability—*Floriane Grussenmeyer*

Floriane Grussenmeyer is the sales manager in Vaisala's Maritime Offshore Operations team. She has extensive experience in global sales and business development of sensors and wind LiDAR-based solutions for various weather-related markets. Grussenmeyer contributes her expertise to developing new applications for Vaisala in the maritime sector. She has been part of the Vaisala team since 2018.



From reduced fuel consumption to lower greenhouse gas emissions, wind-assisted ship propulsion, or WASP, helps the maritime industry forge ahead toward a more sustainable future.

A 2024 industry survey conducted by Vaisala and the International Windship Association, following up on 2022 baseline data, reveals significant shifts in how different maritime players approach wind measurement and optimization for WASP systems. The findings reveal rising interest in remote sensing solutions among WASP technology providers and vessel operators.

Maritime wind measurement is a growing priority. To achieve optimal performance, vessels must dynamically adjust their sails, wings, rotors or kites to changing wind conditions. However, obtaining reliable wind measurements is no longer feasible with mechanical anemometers alone.

Even in the best-case scenario, anemometers provide localized wind data from their specific installation points. While this might work in some environments, such data can be misleading in a dynamic maritime setting. Anemometers are often located in areas prone to wind shadowing, which can result in wind speed readings with up to 50 percent error. Even worse, harsh sea conditions can lead to mechanical anemometer inaccuracies, par-

ticularly as the marine environment accelerates sensor wear over time.

The maritime sector recognizes this challenge, with 75 percent of respondents now rating local wind measurements as “very important,” up from 20 percent in 2022.

The survey also reveals that 87.5 percent of respondents use wind measurements to directly adjust and optimize their WASP systems, boosting efficiency and effectiveness. Safety enhancement is another benefit, cited by 50 percent of respondents, while nearly 40 percent utilize wind data for operational state control.

Weather forecasting integration has become a standard practice, with more than 80 percent of respondents incorporating forecast data into optimization strategies.

However, the industry appears divided on the relative importance of local observations versus forecasts, with 31.3 percent favoring local measurements and an equal percentage preferring forecast information. The disparity suggests that both data sources serve distinct yet complementary roles in WASP system optimization.

The current wind measurement technology ecosystem reveals promising solutions. Underscoring prevalent sensor preferences and deployment strategies, the survey revealed that ultrasonic anemometers lead current installations, with 68.8 percent of respondents utilizing these devices in marine environments. The prevalence of such sensors stems from advantages in maritime applications: no moving parts to maintain, rapid sampling rates and proven resilience in harsh conditions. However, mechanical anemometers maintain a significant presence, used by 43.8 percent of respondents.

Sensor placement strategies reflect an intricate understanding of vessel wind flow dynamics since the most common installation locations

are: mast (68.8 percent of respondents); bridge-top (56.3 percent); and bow-mounted (50 percent).

Each location presents distinct advantages and challenges. Mast installations typically provide the least disturbed measurements but face vessel motion effects. Bridge-top placements offer practical advantages but must account for superstructure flow distortion. Bow-mounted sensors provide early warning of wind changes but require compensation for vessel movement and wave effects.

While previous data showed a preference for dual-sensor configurations, the 2024 survey found 62.6 percent of respondents now desire three or more sensors per vessel—implying greater recognition of comprehensive wind field analysis and redundancy in measurement systems as valuable.

The survey's most striking finding is industry-wide interest in remote sensing, particularly wind LiDAR. While no respondents indicated interest in wind LiDAR systems in 2022, 68.8 percent now view remote wind measurement as a desired data source for WASP vessels.

Maritime wind LiDAR applications offer unique advantages, particularly in providing upstream wind measurements for predictive system adjustments. Survey respondents identified the following key benefits: system optimization and adjustment (75 percent); enhanced safety capabilities (56.3 percent); and route optimization potential (25 percent).

The evolution of maritime wind measurement technology reflects the shipping industry's increasing sophistication in vessel operations and efficiency, with a marked shift in attitudes toward remote sensing, multi-sensor deployments, and integrated data analysis. As WASP technology matures, predictive wind measurement capabilities will propel the industry forward. **ST**

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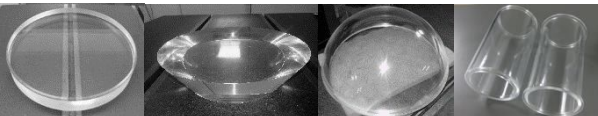
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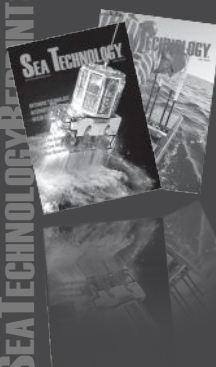
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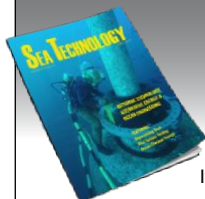
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