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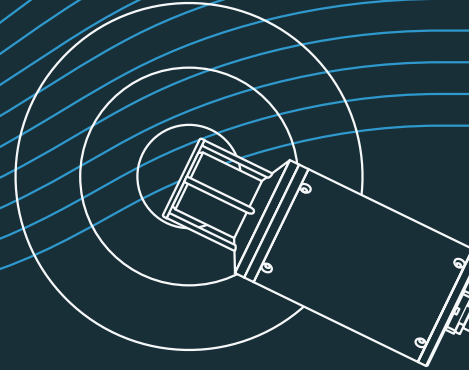
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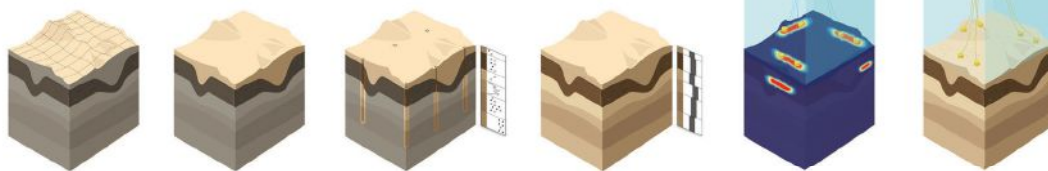
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10



18



26



FEATURES

10

GEODATA FOR WIND POWER

Niek ten Elzen (*Fugro*) demonstrates how geophysical survey supports floating wind farms off California.

14

ADVANCED UNDERWATER INSPECTION

Patricia Sestari (*Voyis*) introduces visual technologies that enhance offshore wind ROI.

18

WIND-ASSISTED PROPULSION SYSTEMS

Giorgio Provinciali (*AYRO*) shows how wingsails have emerged as a WAPS frontrunner.

22

OFFSHORE THERMAL ENERGY

Sam Johnston and Dan Grech (*Global OTEC*) describe how OTEC harnesses untapped power from the ocean.

26

REFINING METOCEAN DATA

Pierre Swiegers (*DHI*) explains the power of cloud computation combined with data portals.



DEPARTMENTS

6

Soundings

7

Editorial

29

International

31

Ocean Research

32

Product Development

34

Marine Renewables

36

Marine Resources

37

Marine Electronics

38

Contracts/Meetings

39

People

40

Professional Services Directory

41

Soapbox

42

Advertiser Index

COVER IMAGE

The integration of wind-assisted propulsion systems is steadily increasing, with a growing number of vessels, both retrofits and newbuilds, incorporating the technology. (Credit: Jifmar Group)

NEXT MONTH

Structural monitoring data on FPSOs ... Tagless fish detection for hydropower industry ... AI navigation systems for GPS-denied environments ... Wave analysis to support offshore energy projects ... A framework for marine conservation in China.

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)) UN Report on Economic Effects of Piracy. The UN Conference on Trade and Development (UNCTAD) has released “Navigating Troubled Waters. The Impact to Global Trade of Disruption of Shipping Routes in the Red Sea, The Black Sea and the Panama Canal.” In the wake of recent attacks to shipping, the Red Sea’s maritime trade routes through the Suez Canal have become severely disrupted, further impacting the global trade landscape. This development compounds the ongoing disruption in the Black Sea due to the war in Ukraine, which has resulted in shifts to the oil and grain trade routes. Additionally, the Panama Canal, a critical artery linking the Atlantic and Pacific Oceans, is confronting a separate challenge: dwindling water levels. Diminished water levels in the canal have raised concerns about the long-term resilience of global supply chains, underscoring the fragility of the world’s trade infrastructure. UNCTAD estimates that transits passing the Suez Canal decreased by 42 percent compared to its peak. Total transits through the Panama Canal plummeted by 49 percent compared to its peak. Ships are avoiding the Suez and the Panama Canals and seeking alternative routes, resulting in longer cargo travel distances, higher greenhouse gas emissions, and rising trade costs and insurance premiums. The full impact of higher freight rates will be felt by consumers within a year in the prices of food and fuel, to name just two examples.

)) Collaboration to Improve Ship Ecosystem. NAPA Studios is an initiative that has launched to foster cross-industry partnerships to deliver new data-driven solutions and insights on some of the most imminent ship design, safety and operational challenges faced by the maritime industry as it contends with critical uncertainties in the energy transition, among other issues. The initiative will bring together data and industry expertise from shipowners, charterers, shipyards, classification societies, and financiers and insurers in joint projects that will provide more clarity on the practical implications of deploying new technologies or contracts. The collaborations will also help to develop the new technologies and operational frameworks needed for the transition to net zero. Modeling will provide a data-driven picture of the future impact of deploying new technologies, such as weather routing, wind propulsion and/or batteries, on a vessel’s safety, operations and cargo capacity. It will also be used to validate the performance of new systems on board.

)) Micro Laser Scanner for Cold-Water Coral Research. Voyis is working with Memorial University of Newfoundland on a scientific expedition to the Galápagos Islands funded by Schmidt Ocean Institute, with the participation of the Charles Darwin Foundation and the Galápagos National Park. This is a groundbreaking effort to explore and document the enigmatic world of cold-water coral ecosystems thriving on the cliffs of this UNESCO World Heritage site. The Galápagos Islands, renowned for their unique biodiversity, are home to a multitude of cold-water corals, including those residing in vertical habitats. These deep-dwelling corals, shrouded in mystery due to their inaccessibility, hold vital ecological significance. The expedition is equipped with advanced technology, including Voyis’s Insight Micro laser scanner, to unlock the secrets of these vertical coral reefs. Cold-water corals on cliffs have long presented challenges to researchers due to their depth and inaccessibility to ship-based sensors. The Insight Micro laser scanner will capture high-resolution 3D data and crisp still images with low power consumption to overcome these obstacles. The Galápagos Marine Reserve, one of the world’s largest marine protected areas, ensures that its cold-water coral ecosystems have remained untouched by destructive human activities. This pristine environment provides an unprecedented opportunity to study undisturbed ecosystems. The resulting baseline data will be shared with local colleagues and used in regional conservation efforts. While tropical and shallow-water corals are well-documented, cold-water corals constitute approximately half of the global coral population, yet they remain largely unexplored.

)) High-Res Earth Digital Twin to Model Water Cycle. The Digital Twin Earth Hydrology Platform aims toward a virtual replica of the terrestrial water cycle by combining new high-resolution satellite observations and cutting-edge modeling, according to a study in *Frontiers in Science*. As the climate changes and human impacts on the water cycle increase, the exceptionally detailed and complex modeling—incorporated in a simulation tool anyone can use—demonstrates the technology’s potential for managing water resources and mitigating water-related natural disasters. Scientists funded by the European Space Agency have built the most detailed models created to date. A digital twin of the Earth, constantly updated with new data, enables simulation of best- and worst-case scenarios, assessment of risks, and tracking of the development of dangerous conditions before they occur. Such information is vital for sustainable development and protecting vulnerable populations. Digital twin models combine new Earth observation data that measures soil moisture, precipitation, evaporation, river discharge and snow depth, including measurements taken more frequently across space and time: as often as once a kilometer and once an hour. The scientists use the data to develop their modeling, which is integrated into a cloud-based platform that can be used for simulations and visualizations. The ultimate goal is an interactive tool anyone can use to map risks, such as floods and landslides, and manage water resources. The scientists began by modeling the Po River valley, then expanded the digital twin to other parts of the Mediterranean Basin. Upcoming projects plan to cover all of Europe, and future collaborations will enable the same principles to be applied around the world. **ST**

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Steering into a Tech-Driven Offshore Era

In the offshore vessel sector, a paradigm shift is underway as digital technologies begin to play a crucial role in enhancing efficiency and environmental sustainability. This industry, traditionally anchored in conventional operational methods, now faces an era of transformative change, as increasingly mature digitalization solutions are redefining operational excellence and supporting compliance with environmental standards.

The journey toward integrating digital solutions into offshore operations is filled with both opportunities and challenges. Real-world applications demonstrate the potential for substantial improvements in fuel efficiency and operational effectiveness through data-driven strategies. Yet, the path to widespread digital adoption is lined with obstacles, from technological hurdles to behavioral resistance to change. Navigating these challenges is essential for realizing a future where digital innovation can help steer the sector toward greater sustainability and economic viability.

Several substantial barriers emerge in the journey toward digitalization in the offshore sector. One is how to integrate new digital tools into the existing operational and reporting infrastructure of offshore vessels. This integration demands significant technological updates and necessitates a workforce skilled in digital operations and analysis. This transition is further complicated in some cases by an ingrained cultural resistance to change within the industry, often characterized by a preference for established practices over new, technologically advanced methods.

Data security and ownership issues also play a crucial role in hindering progress toward digital adoption. Addressing these barriers requires a concerted effort to shift organizational mindsets toward recognizing the long-term benefits of digital transformation. This necessitates technological solutions, strategic planning and educational initiatives to foster a more digitally receptive culture in the offshore sector.

At a time when the offshore market is reactivating, following years of slow growth, a relative shortage of vessels has driven up demand for everything from drilling rigs and subsea construction boats to offshore supply vessels. The resulting increase of time charter and spot market day rates places a significant premium on availability and operational uptime. Suddenly, it really pays to be able to optimize the deployment of offshore vessels. The latest digital insights into operational behavior are playing a big role in fleet efficiency.

Working hand-in-hand with shipowners and charterers helps them to navigate the complexities of market changes and regulatory pressures. Tools that yield data-driven insights can enable users to optimize operations, leading to better fuel efficiency and reduced emissions. This has been crucial in an industry where environmental regulations are becoming increasingly stringent, and the push toward decarbonization is growing stronger. Good data management can achieve operational efficiencies and position offshore operators for long-term sustainability and compliance.

As we envision the future of the offshore sector, digitalization stands as the cornerstone of a new era. It is a journey toward redefining operational efficiency and pushing the boundaries of what is possible in fuel management and environmental sustainability. Vessel operators must be ready to enter a future where digital tools are not just add-ons but essential elements driving optimization and sustainability. Embracing these technologies now means laying the groundwork for an industry that is more efficient, cost-effective, and responsive to the energy and environmental challenges of our time. **ST**

SEA TECHNOLOGY® 2024

JANUARY

Annual Review & Forecast

****EUROMARITIME 2024**, January 30-February 1, Marseille, France

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

****Oceanology International 2024**, March 12-14, ExCel, London, U.K.

MARCH

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

****UDT 2024**, April 9-11, ExCel, London, U.K.

****OCEANS 2024 Singapore**, April 14-18, Singapore

****XPONENTIAL 2024**, April 22-25, San Diego, CA

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

****Offshore Technology Conference**, May 6-9, Houston, TX

MAY

Communications, Telemetry, Data Processing

JUNE

Seafloor Mapping/Sonar Systems/Vessels

****Sea Technology supports these shows**

BONUS INFORMATION

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4 EDITORIAL CALENDAR

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JULY

Deck Gear, Cable, Connectors, Power Systems & Salvage

****IMAGE 2024**, August 25-30, Houston, TX

AUGUST

Ocean Resources Development & Coastal Zone Management

****OCEANS 2024 Halifax**, September 23-26, Halifax, Canada

SEPTEMBER

Geophysical Exploration/Seafloor Engineering

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

****EURONAVAL 2024**, November 4-7, Paris, France

****CLEAN GULF**, November 18-20, San Antonio, TX

****MAST Australia 2024**, November 19-21, Adelaide, Australia

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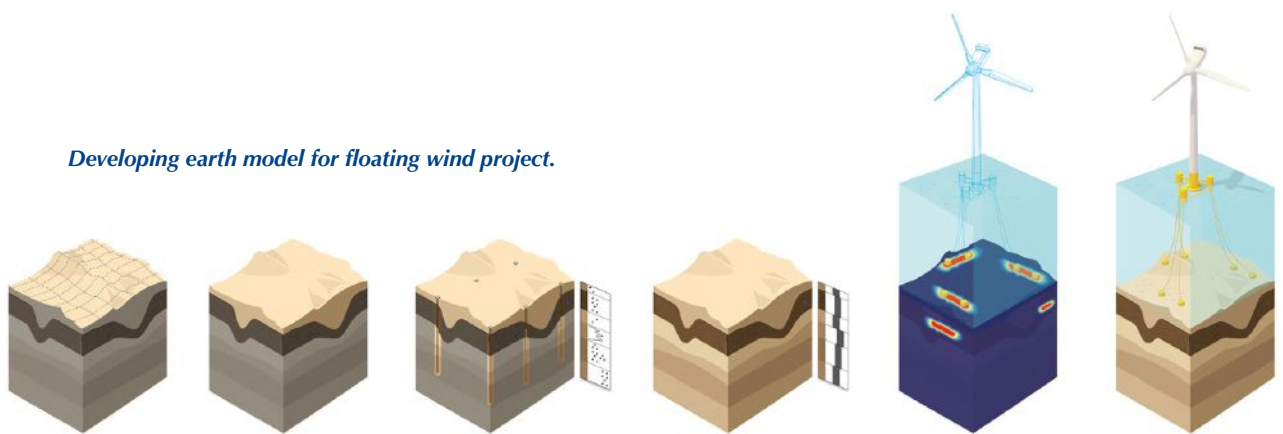
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Geodata for Wind Power

Geophysical Survey Supports Floating Wind Farms off California

By Niek ten Elzen

Developing earth model for floating wind project.



Imagine looking down from the 86th-floor observation deck of the Empire State Building in New York City, where the people below resemble a colony of ants on the bustling sidewalk. Or, if heights make you uneasy, picture yourself in the Champ de Mars, the public area surrounding the Eiffel Tower in Paris. As you look up, the towering structure extends 100 stories into the sky. These iconic structures provide a sense of scale for the floating wind turbines planned off California's coast near Morro Bay and Humboldt.

It's hard to comprehend the enormity of this new infrastructure, especially when envisioning around 400 of them positioned about 20 mi. off the central and northern California coasts. But similar to people viewing from the top of the Empire State Building, the proposed wind farms will be barely noticeable from the shore. Floating in depths up to 1,300 m, each wind turbine will weigh an estimated 10,000 tons or more and be designed to withstand storms and earthquakes to power up to 8,000 households per year.

This isn't just a California dream; it's a national ambition. With the U.S. government targeting 15 GW of floating offshore wind by 2035, these giants will collectively

power around 3.5 million households—a true engineering marvel of the modern era.

The Case for Floating Wind

As part of the ongoing energy transition, society increasingly supports renewable sources like offshore wind to meet our growing energy needs. The requirement for alternative energy extends to various sectors, from industrial processes and transportation to domestic consumption and other uses.

But developing this energy is not without challenges. Onshore and nearshore wind projects face significant obstacles, including public resistance due to concerns about visual and noise impacts, competition for land with activities such as agriculture and housing developments, and limited wind resources.

By strategically siting offshore wind projects farther from the coast, many of these challenges can be mitigated, garnering broader public support and unlocking greater power potential. This is exemplified in the Morro Bay and Humboldt wind zones, where average annual wind speeds hover around 10 meters per second—approximately twice the onshore average wind speeds in



Deploying an AUV for deepwater geophysical surveys.

the U.S. Harnessing this energy potential involves key decisions. Depending on water depth, wind turbines can either be fixed directly to the seabed or left to float, anchored to the ocean floor. For depths up to 60 m, fixed seabed foundations are viable. Beyond that, floating wind technology becomes the more economical and practical solution. Boasting higher and more consistent wind speeds than seen on the U.S. East Coast and Gulf of Mexico, California will be the first region in the country to employ this novel approach on a commercial scale.

Many Advantages, Many Challenges

With only a handful of small-scale floating wind projects existing globally, mostly for demonstration purposes, best practices are still being developed. That means project owners must navigate simultaneous engineering, regulatory, funding, supply chain and logistical hurdles, even before securing a lease within the designated wind energy area.

Understanding these challenges is crucial for assessing whether a specific lease aligns with a developer's risk tolerance. And the potential risks are massive, much like the wind turbines themselves, which are still close to a decade of capital investment away. For the five renewable energy developers who won the California lease sale in December 2022, roughly \$40 billion in total capital expenditures is at stake. And operational costs over the 25-year life span are expected to add another \$25 billion.

One of the first tangible issues to solve at the early stage of a floating wind project is the efficient acquisition and analysis of reliable seabed information. Employing geophysical and geotechnical techniques, these site characterization activities provide essential data for the

optimal design and positioning of floating wind turbine generator (WTG) foundations, the anchoring system, and the cable route connecting the project to the shore.

De-risking Floating Wind with Geodata

Before delving into the requirements of a floating wind site characterization program, it's important to understand the fundamentals of what allows these structures to float and remain securely positioned. The turbine is mounted on a floating platform, typically a steel hollow substructure that may include concrete for added stability. Mooring lines then connect the floating platform to anchors firmly embedded in the seabed.

The mooring lines can consist of woven synthetic materials or a combination of steel chains linked to the anchors on one side and synthetic mooring lines on the other. Importantly, not all anchors work with all mooring systems. The two components must be carefully paired, allowing the lines to endure substantial stress, transmitting forces from wind and water elements to the anchor, which are the ultimate foundation component. For expansive floating wind farms, an anchor may connect to up to three mooring lines from nearby turbine platforms.

In California's deep waters, suitable anchor types include drag or plate anchors, suction piles, driven anchors, and drilled and grouted anchors. These anchors cater to varying soil conditions, such as soft soils, clays, hard clay/sand and rocky surfaces.

Without insights into the soil, topography, and potential geohazards of a lease area, determining the appropriate anchor type for each floating wind turbine location is impossible. Using the wrong anchor type can lead to installation delays or, worse, jeopardize the foundation's ability to withstand mooring line stresses.



Survey crew working in an office-based remote operations center (ROC).

This makes the geodata acquired during the site characterization program essential to a successful floating wind farm project. Comprehensive surface and subsurface geodata guide engineering decisions with detailed insights into soil types, seismic activity, landslides, gas seeps, sediment transport and volcanic activity, among other features.

Deepwater Geophysical Survey Solutions

While geophysical surveys are performed by towed survey vessels in waters of up to 200-m depth, which are common on the U.S. East Coast, ROVs and AUVs are needed for the much greater depths in the wind energy areas on the U.S. West Coast.

As an industry leader in remote and autonomous surveys, Fugro manages geophysical survey activities from shore based remote operations centers (ROCs) whenever possible. For deepwater projects, such as those off the California coast, that means limiting the number of crew required on the geophysical survey vessel for launch and recovery of the AUV. This approach enhances both the safety and sustainability of the overall geophysical program.

Once in the water, the AUVs follow a predetermined pattern about 40 m above the seafloor. These high-tech underwater explorers are outfitted with systems such as side scan sonars, multibeam echosounders, sub-bottom profilers, and magnetometer sensors to collect high-resolution imagery, bathymetry, subsurface geology, and to detect submerged objects and other geohazards. Identifying geohazards is especially crucial in the Pacific Ocean given the region's dynamic seismic conditions.

Powered by high-capacity batteries, the AUVs can map trajectories continuously for several days. Process-

ing and analysis occurs in near real time, which results in the first phase of the earth model: a 3D map of the seabed terrain with accurate depths and slopes, along with subsurface imaging and specific soil characteristics.

Deepwater Geotechnical Solutions

Building on the information obtained from the geophysical part of the site characterization program, geotechnical surveys offer crucial mechanical insights into how soil and rock respond to stress and strain. In this phase, subsurface samples are obtained through drilling and coring, and cone penetration testing (CPT) is conducted to assess soil resistance, providing a continuous profile beyond the borehole. The CPT tool measures soil resistance, friction, and pore pressure, determining properties such as density, shear strength, and compressibility. Integrating these geotechnical inputs provides clear insights into the soil type and its behavior under specific conditions at each investigated location.

Since large-scale floating wind developments are still in their early stages, they come with significant upfront costs. Fortunately, adapting proven technologies and methods from oil and gas projects can provide valuable insights and enhance efficiencies in deeper water site investigations. A prime example is seafloor drilling technology. Seafloor drills can be containerized and shipped all over the world quicker and more flexibly than a conventional deepwater drilling ship. Operating autonomously from the seabed instead of the drillship deck, weather-related downtime is significantly reduced, while operations become safer and more standardized through reduction of the human intervention. Winch deployment, instead of drill string buildup from the vessel deck, contributes significantly to the efficiency of operations in

Rendering of the Fugro Blue Dragon next-generation seafloor drill, capable of operating at steep slopes in deep waters up to 1,500 m.



deeper waters. While not ideal for all geologies, in areas that are suitable, these innovative systems hold immense potential for improving geotechnical schedules and data quality, as well as safety and sustainability.

To illustrate these advantages, consider the California floating wind energy areas. A traditional drillship, mobilized from Europe or Asia, would take 50+ days to arrive on site versus up to a few weeks for a mobile seafloor drill. And the technology keeps improving. Fugro's next-generation Blue Dragon system is scheduled for testing and commissioning in 2024. Once available, it will perform CPT, sampling, and coring in a single dive, utilizing automation and robotic technologies for minimal human intervention. These advancements will further enhance the speed, safety and sustainability of site characterization during floating wind projects.

Building a Digital Twin of the Lease Area

The key to optimizing site characterization is prompt utilization of geodata. By merging the acquired geophysical and geotechnical data in near real time, a detailed

earth model emerges. This digital twin is improved throughout the site characterization program to reveal evolving insights about the seabed and its behavior under different conditions.

Fugro delivers this information to clients using a web-based platform called VirGeo that serves as both a geodata delivery system and a collaboration hub. Geodata experts can work seamlessly with developer teams to guide the ongoing site characterization program and to facilitate early assessments about foundation engineering and cable route design.

In the Morro Bay and Humboldt wind energy areas for example, the seabed typically comprises a combination of sand, clay, or silt, with some areas of boulders and solid bedrock. By analyzing the detailed geodata acquired up to this point, offshore wind consultants can work with developers as the site characterization work is progressing to recommend the most suitable anchor types for each foundation interval, as well as to advise on the optimal cable route based on identified geohazards.

Beyond site characterization, the digital twin can support the entire project life cycle. VirGeo incorporates diverse data streams as the project advances to enhance decision making during all project phases, including engineering design, construction, operations and maintenance, and, eventually, decommissioning.

Ensuring Long-Term Success

While the challenges of deepwater wind development are significant, advancements in geophysical and geotechnical solutions, coupled with the power of digital twins and delivery platforms, offer a compelling path forward. By prioritizing efficient site characterization activities and leveraging cutting-edge technology, floating wind is poised to transform from a promising concept into a robust reality.

The upcoming California projects will serve as a foundational pillar and driving force for the development of floating wind farm projects globally. Through continuous technology innovations, we are unlocking the potential for scalable renewable energy production, harnessing wind power on the high seas. The pending geodata acquisition campaigns on the U.S. West Coast are therefore instrumental in our collective pursuit of a more sustainable energy future for generations to come. **ST**

Niek ten Elzen is Fugro's offshore wind (Americas) senior manager. Having worked for established engineering firms and renewable energy developers in northern Europe, he is now based in California, dedicated to shaping Fugro's floating wind business strategy and driving advancements in geodata acquisition technology, especially on the U.S. West Coast.



Advanced Underwater Inspection

Visual Technologies Enhance Offshore Wind ROI

By Patricia Sestari



Voyis Discovery stereo camera, a compact platform for real-time 3D modeling and computer vision applications.

As the global demand for renewable energy continues to rise, offshore wind farms have become integral to meeting sustainability targets. However, the path to profitability in offshore wind investments is fraught with challenges, including high initial costs, ongoing maintenance expenses, and the need to navigate unpredictable environmental conditions. A crucial area where substantial improvements can be made to enhance the return on investment (ROI) is through optimizing underwater inspections. In this article, we delve into the challenges facing offshore wind return on investment (ROI); explore the applications of underwater stereo cameras, photogrammetry and underwater laser scanners; and highlight how these advanced technologies can revolutionize underwater inspections to drive greater ROI in the offshore wind industry.

Challenges Impacting Offshore Wind ROI

The challenges surrounding the ROI for offshore wind projects are multifaceted and complex. The substantial upfront investment needed for constructing and installing offshore wind farms often presents a barrier to achieving a favorable ROI. Beyond initial capital expenditures, ongoing maintenance costs are critical for ensuring the sustained performance and durability of offshore wind infrastructure in the face of relentless marine conditions. The harsh environment, characterized by rough seas and corrosive saltwater, not only increases maintenance requirements but also introduces the risk of equipment

failure and structural degradation, further impacting the financial outlook of offshore wind ventures. Consequently, meticulous planning and robust risk management strategies are indispensable for mitigating these challenges and safeguarding the financial viability of offshore wind projects over their operational lifetimes.

Furthermore, the logistical complexities inherent in offshore operations add another layer of challenge to achieving a satisfactory ROI. Transportation planning, including vessel availability and weather-related delays, contributes to project timelines and costs. Additionally, the need for specialized offshore infrastructure further drives up expenses, making it imperative for developers to carefully assess and optimize project designs to maximize efficiency and cost-effectiveness. Despite these obstacles, advancements in technology, such as innovative turbine designs and improved offshore installation techniques, alongside strategic planning and regulatory support, are key factors driving progress toward overcoming the challenges associated with offshore wind ROI and unlocking the vast potential of offshore wind energy as a sustainable and economically viable renewable energy source.

Advanced Underwater Inspection Technologies

In addressing the challenges confronting offshore wind ROI, advanced underwater inspection technologies emerge as indispensable tools for optimizing asset



Offshore wind cable protection inspection: 3D model generated in real time with Voyis Discovery stereo camera.

management and operational efficiency. Foremost among these technologies are underwater stereo cameras, such as the Discovery Stereo camera from Voyis, and the application of photogrammetry techniques. These innovative tools offer many benefits for underwater inspections, facilitating comprehensive assessments of offshore assets with unprecedented precision and accuracy.

The Discovery stereo camera captures both high-resolution imagery and accurate 3D models of underwater structures, enabling operators to assess the condition of foundations, cables and turbines with precision. This visual data are invaluable for detecting cracks, corrosion, or other signs of damage that may require repair or maintenance. The camera's real-time processing facilitates active monitoring of underwater assets, allowing operators to respond immediately to emerging issues and minimize downtime.

Photogrammetry is a technique used to create accurate 3D models of underwater structures with overlapping images captured by the stereo camera. These 3D models provide valuable insights into the condition of offshore assets and can be used for precise measurements and analysis. By integrating imagery and 3D models with data analytics tools, operators can identify trends and patterns, aiding in predictive maintenance and cost reduction.

Applications of Underwater Stereo Cameras In Offshore Wind

The Discovery stereo camera and photogrammetry techniques have numerous applications in the offshore wind industry. These include: inspection of foundations, cable monitoring, turbine inspections and environmental monitoring.

The stereo camera can be used for vertical inspections;

to determine the condition of offshore wind turbine foundations; and detecting cracks, corrosion or other signs of damage that may require repair or maintenance. By capturing detailed imagery, the camera enables operators to assess the structural integrity of foundations and ensure the safety and reliability of offshore wind turbines.

Furthermore, the camera can be deployed to monitor subsea power cables, identifying areas of wear or damage that could lead to power outages or other operational issues. By detecting early signs of cable degradation, operators can take proactive measures to mitigate risks and ensure the uninterrupted transmission of electricity from offshore wind farms to onshore facilities.

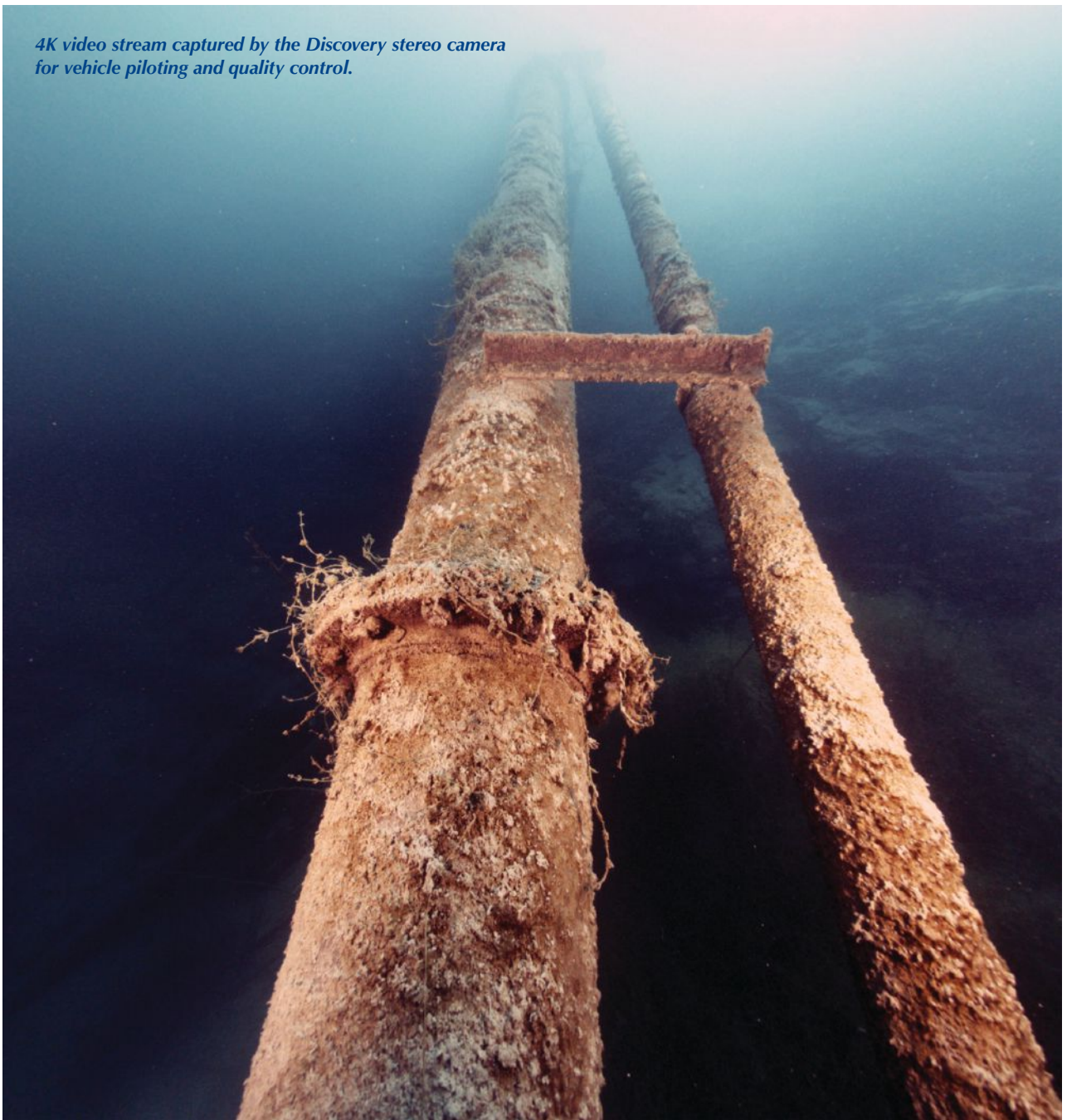
Lastly, in addition to structural inspections, it can be used to monitor marine life and environmental conditions around offshore wind farms. By capturing imagery of underwater habitats and species, operators can assess the ecological impact of offshore wind development and implement measures to minimize environmental disturbances.

As an example of the Discovery stereo camera in action, Voyis recently did a collaborative demonstration at the Offshore Renewable Energy Catapult, the U.K.'s leading innovation center for offshore renewable energy. This showcased the seamless integration of Discovery with the advanced capabilities of Voyis's sister companies, Sonardyne and EIVA, in conjunction with Atlantia Marine. Central to the success of this demonstration is the Discovery camera's ability to capture high-fidelity visual data, generating 3D models in real time in addition to high-resolution images and video.

Underwater Laser Scanner

Voyis presents a comprehensive suite of underwater optical sensors tailored for the demanding environments

4K video stream captured by the Discovery stereo camera for vehicle piloting and quality control.



of offshore wind farms. Among these offerings, the Insight Underwater Laser Scanner stands out as a solution for underwater downward inspections. This system is meticulously engineered to deliver precise and accurate 3D mapping of submerged structures.

This high level of precision plays a crucial role in early issue detection, mitigating the potential for costly repairs and minimizing operational downtime. Unlike conventional methods reliant on human divers, ROVs or sonar-based techniques, the Insight scanner optimizes efficiency, expediting inspection processes while maintaining cost-effectiveness.

Furthermore, the integration of this technology significantly enhances safety by reducing the necessity for human presence in hazardous underwater environments. By minimizing the risks associated with traditional in-

spection methods, both personnel and equipment are safeguarded from potential harm.

When integrated seamlessly into offshore wind farm operations alongside the Discovery stereo camera, the collective impact on ROI is profound. These optical sensors revolutionize underwater inspections, fostering benefits that resonate throughout operational and financial landscapes.

One of the most evident advantages lies in the reduction of maintenance costs. Early detection of structural issues coupled with streamlined inspection procedures mitigates the need for expensive repairs and prolonged maintenance downtime. Consequently, the overall uptime of wind farm assets is maximized, ensuring a consistent and optimized energy production rate.

Moreover, the deployment of optical sensors fosters

“The Discovery stereo camera captures both high-resolution imagery and accurate 3D models of underwater structures, enabling operators to assess the condition of foundations, cables and turbines with precision.”

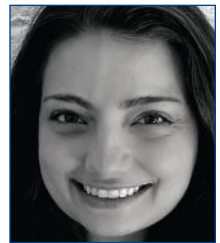
a culture of enhanced safety within offshore operations. With fewer human interventions required in perilous underwater environments, the inherent risks associated with such activities are significantly diminished, promoting a safer working environment for all personnel involved.

Additionally, the wealth of visual data and 3D maps generated by these sensors facilitates data-driven decision-making processes. Armed with comprehensive insights into asset conditions, operators can make informed choices regarding maintenance schedules, resource allocation, and overall asset management strategies, thereby optimizing operational efficiency and prolonging asset life span.

In conclusion, maximizing ROI in offshore wind investments requires a comprehensive approach that addresses the challenges of high capital costs, ongoing maintenance expenses and operational risks. Advanced underwater inspection technologies such as the Discov-

ery stereo camera and photogrammetry offer a powerful solution for enhancing inspections and driving greater ROI in the offshore wind industry. By providing high-resolution imagery, real-time monitoring capabilities, and valuable data for analysis, these technologies empower offshore wind operators to optimize maintenance strategies, minimize downtime, and ensure the long-term viability of their investments. **ST**

Patricia Sestari is the marketing manager of Voyis.



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Wind-Assisted Propulsion Systems

Wingsails Emerge as WAPS Frontrunner

By Giorgio Provinciali



AYRO's OceanWings wingsails on Canopée. (Credit: AYRO)

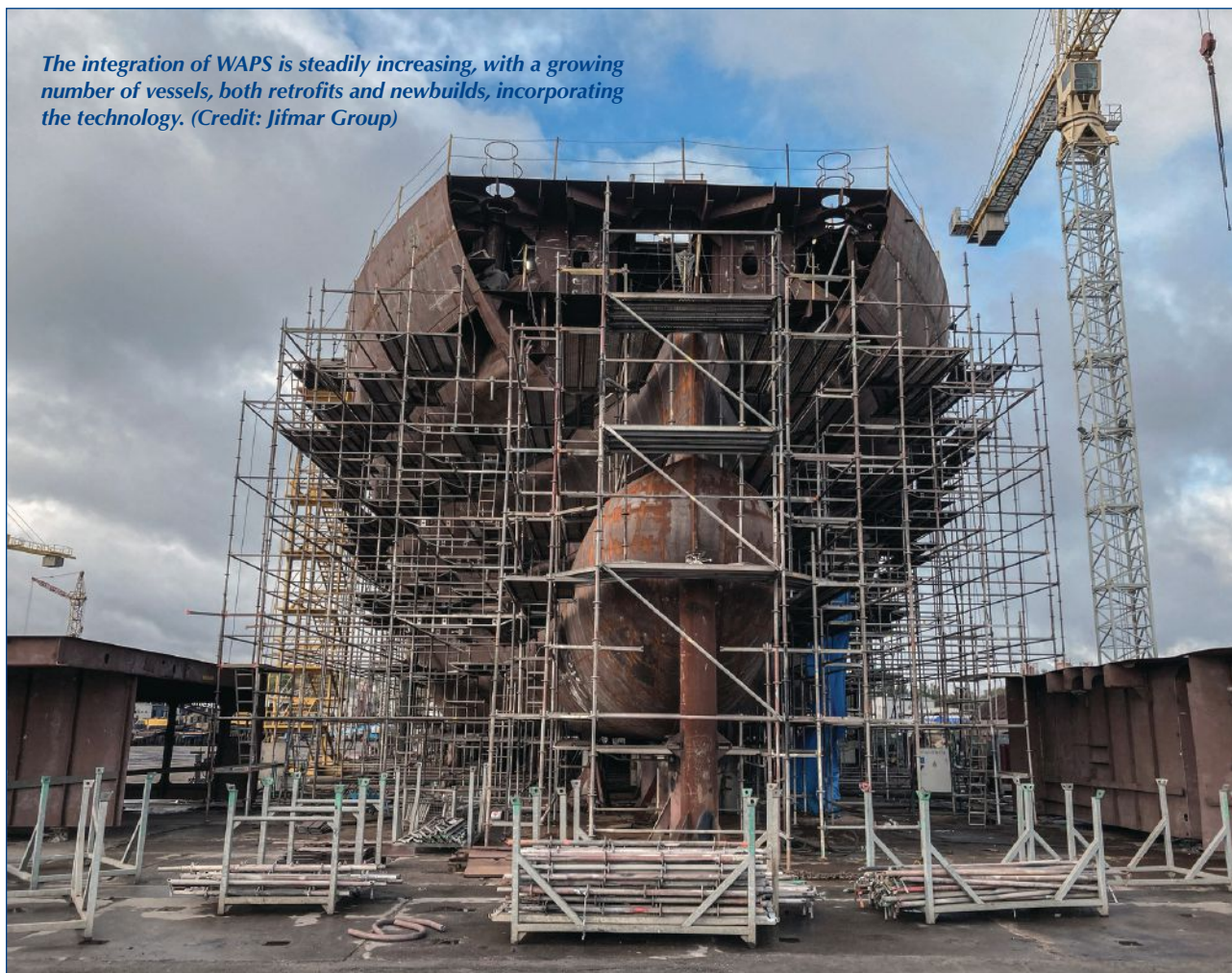
Wind-assisted propulsion systems (WAPS) are emerging as a cornerstone technology in the maritime industry's journey towards net-zero carbon emissions. These innovative systems harness wind power to augment traditional propulsion methods, offering a substantial reduction in fuel consumption and associated greenhouse gas emissions. The diversity of WAPS technologies allows for versatile applications across various ship types and operational requirements.

The integration of WAPS is steadily increasing, with a growing number of vessels, both retrofits and new-builds, incorporating the technology. Their effectiveness

in reducing fuel consumption is influenced by a range of factors, such as the specific technology's characteristics, ship design, operational conditions, and prevailing environmental factors. WAPS form part of a multifaceted strategy that includes the adoption of future low-carbon fuels and the digitalization of maritime operations.

The combination of WAPS with advanced fuel technologies and digital efficiencies is pivotal in achieving the goal of net-zero carbon emissions in the shipping sector. This holistic approach necessitates careful consideration of various elements, such as investment costs, operational impacts and regulatory compliance, for ef-

The integration of WAPS is steadily increasing, with a growing number of vessels, both retrofits and newbuilds, incorporating the technology. (Credit: Jifmar Group)



fective implementation. The mainstream availability of future fuels and standardized digital platforms continues to be “on the horizon” in the broader context of maritime decarbonization. In contrast, WAPS technologies can meet the immediate need of the maritime industry to consume less fuel.

As these systems gain traction, they are increasingly recognized as a key component in the industry’s commitment to sustainability and environmental stewardship, aligning with global efforts to combat climate change. The maritime sector, including offshore, is taking a significant step forward in its transition to a cleaner, more sustainable future by embracing wind-assisted propulsion along with other innovative technologies.

Types of WAPS

WAPS employ various technologies to harness wind power for ship propulsion. According to the European Maritime Safety Agency (EMSA) report titled “Potential of Wind-Assisted Propulsion for Shipping,” there are several WAPS technologies currently in play, each with distinct characteristics.

Functioning similarly to traditional sails, hard sail WAPS generate aerodynamic lift and drag forces. They have a rigid geometry, often made from materials such as composite or metal, and are usually automated to adjust

to wind directions. Their wing-shaped design offers more lift and a higher lift-to-drag ratio compared to traditional sails, and automated operations can allow for a larger part of the wind window to be utilized, thus allowing for more efficient voyaging. Installed systems currently range from 12 to 37 m high (the latter with an area of 363 m²).

Hull aerofoil designs involve shaping the hull like a symmetrical aerofoil to generate lift. This technology is applicable only to newbuilds, which, while important in the overall context of maritime decarbonization, limits potential impact due to the sheer number of vessels that will require retrofit solutions in the coming decades.

As an ancient technology updated with modern materials and design capabilities, kites can be attached to a ship’s bow in order to generate lift and drag. Kites can harness higher wind speeds at altitude, with a trade-off between altitude and drive-force. There are two types: passive kites, which follow the wind direction, and dynamic kites, which move actively to increase lift. Sizes range from 10 m² for small boats to 1,000 m² for larger ships, with developments of up to 5,000 m² in progress.

Rotor sails are spinning cylinders driven by electric engines, mounted vertically on the deck. The rotation, combined with wind, creates a pressure difference (the Magnus effect), providing propulsive force. Rotor sails are most effective in beam wind conditions (90° or 270°)

“The system is not only automated but also boasts features such as being reefable and furlable, meaning that wind power can easily integrate with engine power with minimal human intervention.”

but offer little to no savings in headwind or tailwind due to drag. These sails typically range from 18 to 35 m in height, with diameters up to 5 m.

Modern soft sails can also be wing-shaped to maximize thrust. Modern designs offer advantages such as being lighter and better at sailing upwind compared to traditional soft sails and some other WAPS technologies. Like hard sails, the technology can also be highly automated, negating the need for extensive training for crew on board a vessel.

Suction wings are wing-shaped vertical structures mounted on the deck. Unlike Rotor Sails, they do not rotate to generate thrust but can be oriented to adjust to wind direction. They employ boundary-layer suction for additional thrust. Suction wings perform best in side winds but offer negligible thrust in head and tail winds. Heights range from 10 to 36 m, and they are often installed in pairs or groups of four.

The effectiveness of WAPS in reducing fuel consumption and emissions is influenced by a range of factors. Key among these are the type and configuration of WAPS, including the number, size and placement of units, and whether they are installed on new vessels or retrofitted. The operational automation of these systems also plays a crucial role. Ship-specific factors, such as size and hydrodynamics, determine the WAPS configuration and the required propulsion power. The ship's power needs, combined with the specific fuel oil consumption of its engines, influence overall fuel consumption.

Environmental conditions, particularly wind speed and angle, significantly impact WAPS performance. The physical attributes of the WAPS dictate their efficiency under varying wind conditions. High wind speeds can increase thrust but also create challenging wave conditions, affecting overall ship performance. WAPS, including hard sails, able to operate safely and effectively in low apparent wind angles can be used more often than those solutions that need prevailing winds.

WAPS efficiency is a complex interplay of system design, environmental conditions and ship characteristics. Optimal integration and operation of WAPS require careful consideration of these factors, highlighting the need for COTS technologies that can be easily applied to diverse vessel types during building and retrofitting.

Wingsails in Action

According to EMSA's report, WAPS had been installed on 30 ships by mid-2023, which is more than double

the 2021 figure. There are plans published or installations underway on a further 26 vessels. Rotor sails (a.k.a. Flettner rotors) appear to have the most installations, which is likely due to the technology having been available since the 1920s. None of the contemporary technologies have an established installed use-base beyond testing platforms, however; apart from hard sails (a.k.a. wingsails), which are currently installed and in commercial operation aboard the French RoRo cargo vessel *Canopée*.

Launched in October 2023, *Canopée* operates on a fixed transatlantic course using a wingsail design by French WAPS manufacturer AYRO, called OceanWings 363. With four OceanWings installed, the *Canopée* can operate with massively reduced fuel consumption and greenhouse gas (GHG) emissions. The *Canopée* is a pioneering hybrid industrial cargo ship, representing a significant advancement in green maritime technologies. With dimensions of 121 m in length and 22 m in width, the ship is designed for the transportation of Ariane 6 launcher parts from European ports to Pariacabo port in Kourou, French Guiana. Owned by Jifmar Guiana and operated commercially by Alizés, this ship is unique in its position as the first modern WAPS-capable ship to operate commercially.

The vessel's deployment of WAPS is not just an environmental breakthrough but also a commercially viable solution that does not compromise on performance. It demonstrates a practical application of renewable energy sources in maritime logistics, paving the way for more sustainable shipping practices.

The *Canopée* project is a collaborative effort involving multiple areas of expertise and a commitment to environmental stewardship, showcasing the vessel as a beacon in green maritime innovation. This vessel is not only a significant step in reducing greenhouse gas emissions in maritime transport but also an emblem of the potential for modern technology to bring about sustainable change in the industry.

Wingsails Design

Hard sail systems are highly efficient and user- and environmentally friendly. Their installation aboard *Canopée* is a standout green initiative offering a new level of efficiency in hybrid wind propulsion, optimized for the ship's operational constraints and weather conditions. And while *Canopée* is a brand-new ship, the automated, self-raising and lowering vertical wingsail sys-

tem is designed for use aboard newbuilds and retrofits, the latter making up a significant portion of the future WAPS-installed fleet.

In action, the OceanWings system operates based on a series of intelligent processes. Sensors on the ship measure wind conditions in real time, and AYRO's proprietary software analyzes the data, sending instructions to actuators controlling the wingsails. These actuators then adjust the angle of attack and wingsail camber for each wingsail independently, ensuring optimal efficiency and performance. The system is not only automated but also boasts features such as being reefable and furlable, meaning that wind power can easily integrate with engine power with minimal human intervention.

The ease of operation, combined with the system's inherent safety and reliability, makes it a very user-friendly solution compared to some other WAPS technologies. This is also important to the speed of WAPS adoption over the next few years as a reduced training burden will ensure that more ships can take advantage of complex systems that require only minimal oversight, rather than specially trained personnel.

When looking to maximize fuel and emissions performance, the efficiency of the chosen system is crucial. Wingsails are twice as efficient as a standard sail. The OceanWings operating window is broad, being effective at wind angles from 5° and at apparent wind speeds of up to 100 kt. This allows the system to take load off the main engines more often than other WAPS.

The Wings of Change

With the *Canopée* already operational, we can expect to see more wingsails on the oceans in the coming years. The *Canopée's* achievements in emissions reduction align it closely with the International Maritime Organization's (IMO) checkpoint targets for 2030, highlighting the already available practicality and effectiveness of WAPS, particularly wingsails.

Upcoming projects promise further advancements. A notable initiative involves a 2,500-TEU containership for which OceanWings are set to contribute significantly to CO₂ emissions reduction. Additionally, the Whisper project is exploring OceanWings' applications for bulk carriers. Addressing challenges such as maneuvering large wingsails around port infrastructure is key, and AYRO is actively developing solutions for adjusting the wings' positions.

The *Canopée's* success underscores wind power's potential to reduce emissions, supporting the maritime industry's journey toward net zero by 2050, per the IMO's GHG strategy. This development reaffirms the viability of wind as a free, ubiquitous resource for ship propulsion, essential for the transition toward more sustainable industry. **ST**

Giorgio Provinciali is the CTO of AYRO and former America's Cup performance predictions leader.

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Offshore Thermal Energy

OTEC Harnesses Untapped Power from the Ocean

By Sam Johnston • Dan Grech

When people talk of offshore energy generation, it is common to think of more established renewable technologies, such as offshore wind, floating solar or wave/tidal energy conversion. One that gets left out of many conversations despite its immense potential is ocean thermal energy conversion (OTEC). This technique uses the ocean like a heat pump, running warm surface seawater and cold deep-ocean water through a heat engine to generate electricity 24/7.

There are two main heat cycles for OTEC: open cycle, which flash evaporates warm seawater, creating steam and generating power via a turbine, and closed cycle, which uses seawater to repeatedly evaporate and condense a refrigerant in a closed-loop system with power generation driven by a turbine.

OTEC isn't a new concept. It was originally theorized in the late 1800s by Jacques-Arsène d'Arsonval and later

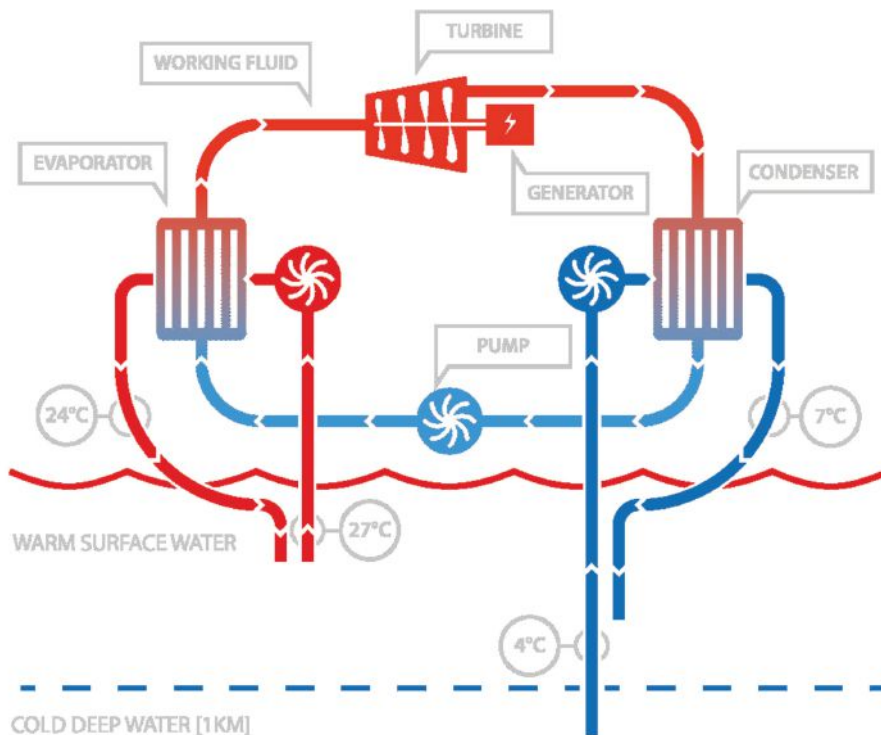
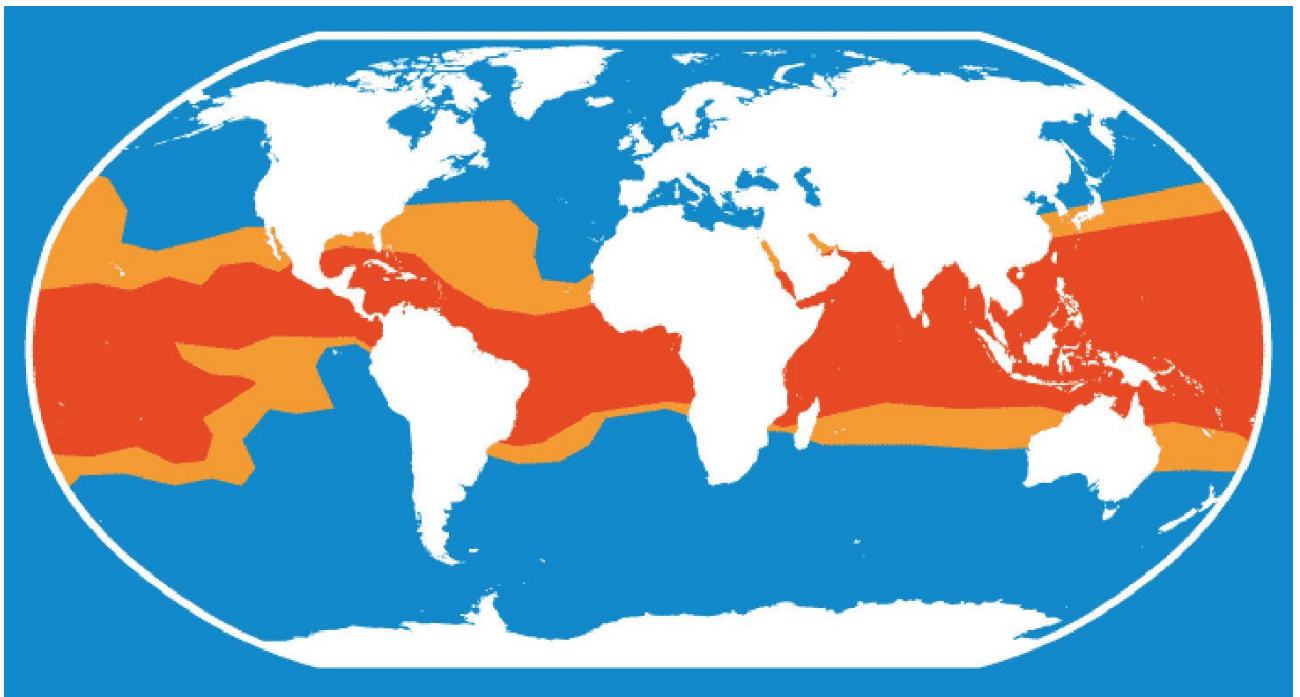
built on by his student Georges Claude. The first OTEC structure generated power in Cuba in 1930, producing 22 kilowatts of electricity with a low-pressure turbine. Various OTEC projects have been executed since then, the most notable being the Mini-OTEC and OTEC-1 closed-cycle projects developed by the U.S. government and the onshore-based Makai OTEC lab in Hawaii.

Having faced a lack of interest over the years, with just two grid-connected demonstrations occurring in the world, OTEC is now gaining momentum with technology that is being adapted to reach commercial viability. Global OTEC is fielding this technology with a focus on tropical islands, a market that has been forgotten in the renewable energy transition.

Nearly a quarter of the world's sovereign states have the tropical ocean as their main natural resource, absorbing 1 quadrillion megajoules of untapped solar energy a



Dominique is the first-of-a-kind 1.5-MW floating OTEC platform, to be installed in São Tomé and Príncipe. It will become a model for other SIDS.



(Above) Areas of the ocean suitable for OTEC. (Left) Closed-cycle OTEC process.

absorbed in one single day in the tropical ocean.

Closed-Cycle OTEC

Global OTEC focuses on closed-cycle OTEC because there are fewer challenges to overcome in turbine design at scale. The cycle has five steps, beginning when a barge draws in warm surface seawater (around 26° C), heated by the sun's rays. This warm water is used to evaporate a working fluid with a low boiling point, thus producing a vapor that spins a turbine to produce electricity using a generator. At the same time, cold deepwater (around 4° C) is drawn up through a pipe from the depths of the ocean. The cold water cools

the vapor, turning it back into a liquid that can then be immediately reused. The cycle runs continuously, and the power generated is transmitted to the grid using a subsea cable.

Why Offshore?

OTEC requires large quantities of seawater from deep in the ocean to be transported by water intake pipes, or risers. For large onshore plants, i.e., greater than 1 MW, these risers will need to be more than 1 m in diameter and several kilometers long to get to the required cold source.

day, yet they rely on aging diesel generators for power.

Applicable Regions

OTEC technology is suitable in over 100 areas around the world, with a resource estimated to be equivalent to more than 7 terawatts. Most of the applicable locations lie within the tropics, where the surface seawater stays warm day and night, all year round, allowing for a temperature gradient of at least 20° C to run an OTEC cycle. In comparison, 170 billion barrels of oil would need to be burned to release the same amount of energy



OTEC floating power generation platform.

This presents a significant challenge as the pipes are incredibly expensive and would need to be strong enough to resist nearshore tidal forces and waves in regions that are prone to tropical storms. Installation of such infrastructure would require large amounts of construction, potentially disturbing coastal marine life, which in the tropics includes reefs and perhaps protected species.

Performing these operations offshore requires significantly shorter riser pipes to be deployed vertically, reducing the material cost of this system by 80 percent. Offshore also makes OTEC easier to scale, which reduces the implementation costs and environmental impacts. Tropical nations regard OTEC as ideal, considering the challenges they face. Furthermore, if capacity needs to be increased over time due to demand, more OTEC platforms can be deployed without the need to install new OTEC pipes.

Global OTEC

Global OTEC's system places a vessel offshore, from which a riser hangs. The riser is then connected to a floating power generation platform, and the platform is connected to shore via a power cable.

Global OTEC offers a cost-effective solution to offshore OTEC by limiting the distance the cold-water pipe needs to travel. This is done by mooring in deep waters and hanging the large-diameter riser from a vessel. By using this methodology, the only shore connection required would be the power cable.

This opens up many more opportunities for where OTEC power could be used, as the power cable shore landing requires much less space and infrastructure and allows for a wider range of shore topographies than large-diameter pipes landing at shore would require.

Global OTEC's power generation platform is cost effective and scalable. A simple mooring solution ensures quick installation of a new vessel on location, and a cable would be sent back to shore. For larger systems, or installations with planned future capacity increase, this could be made even more efficient by using an offshore substation with a higher capacity shore-power cable.

These operations are well understood and time-tested in the pioneering work done by the offshore oil and gas and offshore wind sectors, meaning that many of the techniques required to install this first-of-a-kind system have been de-risked. Global OTEC is constantly forging new partnerships with key industry players to ensure a successful project roll-out, taking established industry knowledge and baking it into the design of the platform.

Pioneer Platform

Dominique is the first-of-a-kind 1.5-MW floating OTEC platform being developed by Global OTEC. It is set to be installed in São Tomé and Príncipe, in the Gulf of Guinea, Africa. This project will help the country decarbonize its energy production. It will be stationed 10 km off the eastern coast of the São Tomé Island. As it currently stands, this represents the equivalent of 10 percent



of the diesel power production on the island and would be the largest operating closed-cycle OTEC plant in the world.

Dominique will work with a closed cycle, ensuring reliable power. Global OTEC integrates several turbines atop a robust steel hull for efficiency. The platform's dimensions are approximately 90-by-28-by-5.5 m, a footprint significantly smaller than what the equivalent solar PV installation would require.

The company has achieved significant milestones over the past year, including approval in principle from Lloyd's Register for the OTEC platform and a certificate of approval for the cold-water riser installation methodology, which has been a long-standing challenge for previous offshore OTEC platforms. This certification has been issued by the marine warranty surveyor company ABL Group, and it holds particular importance given OTEC's historical technical challenges. These early validations highlight the company's commitment to meeting structural prerequisites.

A Solution for Severe-Weather-Prone Areas

Global OTEC is the leading technology developer in a pan-European consortium funded by the European Union, for which the company is working to develop and test a scaled offshore OTEC structure that can face severe tropical weather. Named "PLOTec" and gathering seven partners across Europe (Global OTEC, AGRU, CleanTech Engineering, University of Plymouth, PLOCAN, WavEC and Quality Culture), the project has already designed a cylindrical hull, cold-water riser pipe and gimbal, and fabrication was begun in March 2024.

The installation of the scaled 1:5 prototype structure will happen off the coast of Gran Canaria, Spain, in a pre-consented marine energy test center. This will subject the platform to the challenging weather conditions of the Atlantic Ocean over 12 months. The knowledge gained from this project in marine engineering design and novel materials, as well as the computational modeling, will not only improve the accessibility of OTEC solutions but also improve the design and materials available to other offshore floating energy and marine devices.

Challenges

With OTEC technology being in its commercial infancy, there are still several challenges to overcome to make the project commercially viable in the long term. Global OTEC's vision for the OTEC platforms is to transition to remote operations, with personnel only required for routine maintenance procedures. To do this, a robust

network of sensors and alarms will be required to ensure all faults and maintenance issues are captured quickly and placed in a triage register to ensure staff are only mobilized to the vessel when necessary. These will range from condition monitoring for the moorings and riser to leakage alarms for process equipment. To address the long-term viability of the structure, not only must there be an effective reporting system to log any faults, there must also be preventive maintenance.

Upcoming Milestones

This year, Global OTEC will undergo several key milestones with both the *Dominique* and PLOTec projects. The company will complete its next phase of the OTEC system design, which entails refining the riser connection gimbal and the process engineering for maximum system uptime. We've already engaged with key strategic partners across the supply chain to make this phase as efficient and cost effective as possible. In addition, construction and installation of the PLOTec project will commence, marking the company's first scaled test of a storm-resistant structure. Internally, the company will develop the riser hang-off based on findings from the PLOTec testing. Work will also commence on the detailed design and analysis of the cold-water riser system, with a key industry partner at the forefront of riser system design with a significant offshore industry track record for water intakes.

Conclusion

Partnering with SIDS DOCK, an UN-recognized international organization that represents 32 small island developing states (SIDS) and low-lying developing states, Global OTEC plans to replicate the success of its first-of-a-kind *Dominique* project. Beyond the African twin islands, countries such as Belize, Fiji, Grenada and Tonga have expressed their interest in being powered by OTEC.

As said by the SIDS DOCK Secretary General Dr. Al Binger at COP28: "We, SIDS, really have no choice in terms of energy. We are running out of land, and we don't have much space for solar. But we have one space that we can't ever run out of, which is our oceans. So it's only enlightening that we can see partnerships that focus on this resource, a resource that can save us but also can save the planet." **ST**

Sam Johnston is the lead engineer of Global OTEC, responsible for multi-disciplinary coordination of all technical packages of the OTEC platform. Since 2018, he has undertaken detailed investigations into the structural and mechanical design of OTEC platform designs to better understand their structural integrity and perfect their electricity generation process.

Dan Grech is the founder and CEO of Global OTEC. He founded the company to decarbonize tropical island states. Grech was spurred into action while watching ice caps cascade into the ocean during an episode of "Frozen Planet." He realized he needed to do something to help. He quit his job the next day to research emerging technologies, which needed a robust commercial plan to scale. Grech went on to assemble a world-class OTEC and offshore engineering team to provide clean, renewable power to tropical islands. He negotiated an agreement with SIDS DOCK and has raised several million dollars to execute the team's plans.

Refining Metocean Data

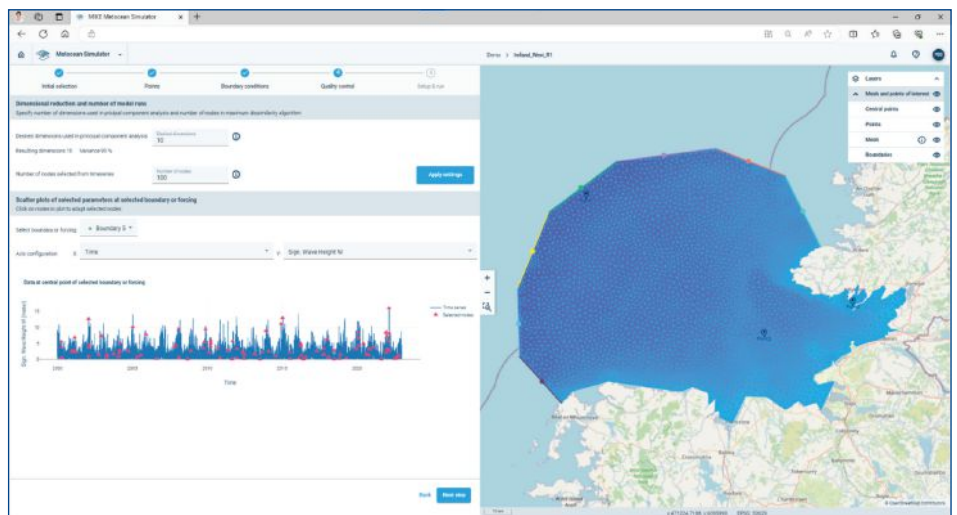
The Power of Cloud Computation Combined with Data Portals

By Pierre Swiegers



In the ever-evolving landscape of marine and off-shore industries, the role of technology has become pivotal in reshaping how professionals assess metocean conditions. Technological innovations are driving transformation toward more accessible, efficient and accurate methods for evaluating critical metocean conditions that influence decision making in various projects. This article explores the advancements of technology that are redefining the way we obtain, refine and share high-quality, long-term metocean data.

Traditionally, obtaining metocean conditions data posed significant challenges. The reliance on manual methods and limited data sources often resulted in time-consuming processes, high costs, and potential inaccuracies. However, professionals are now empowered



(Top) Metocean data can support decision making in various maritime sectors, including ports. (Bottom) An image from the MIKE Metocean Simulator user interface. High-resolution, long-term wave data are available on the same day.

“User-friendly interfaces, intuitive design, and automation allow nonspecialists to harness the power of advanced modeling tools, data analytics, model validation tools, and data reporting.”

with technologies that offer unprecedented accessibility, speed, precision and reliability in metocean condition assessments.

Cloud-Based Solutions

One of the key innovations in metocean condition assessments is the adoption of cloud-based solutions. These solutions leverage the power of cloud computing to process vast amounts of data quickly and efficiently, without the need for users to maintain hardware. Cloud-based solutions not only enhance the speed of assessments but also enable web-based collaboration among stakeholders, fostering a more dynamic and responsive decision-making process.

Advanced Simulation Tools

Technological advancements have ushered in a new era for techniques that enhance traditional modeling methods. High-resolution, long-term metocean data, once a challenge to acquire, are now readily available through sophisticated simulation tools, such as DHI's MIKE Metocean Simulator for waves. These simulation tools, powered by advanced statistical or numerical techniques and cloud computation, provide professionals with same-day delivery of accurate long-term conditions.

Democratization of Expertise

Evolving technology enables democratization of expertise. User-friendly interfaces, intuitive design, and automation allow nonspecialists to harness the power of

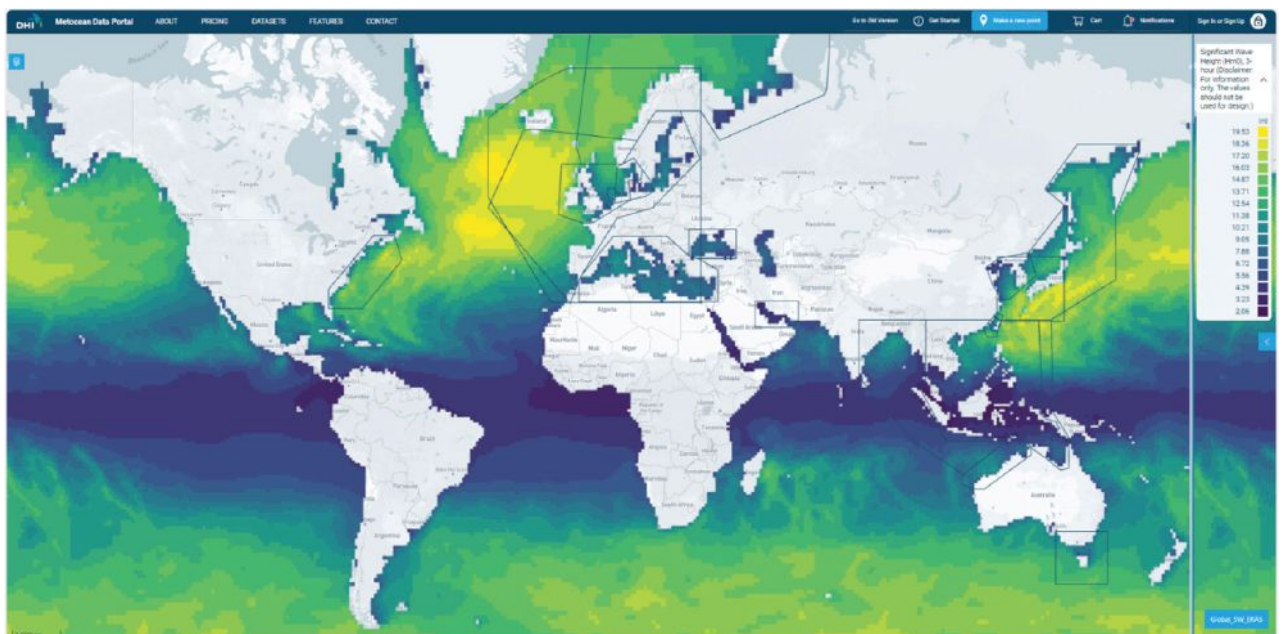
advanced modeling tools, data analytics, model validation tools, and data reporting. This inclusivity not only accelerates the learning curve but also empowers a broader range of professionals to contribute to decision-making processes.

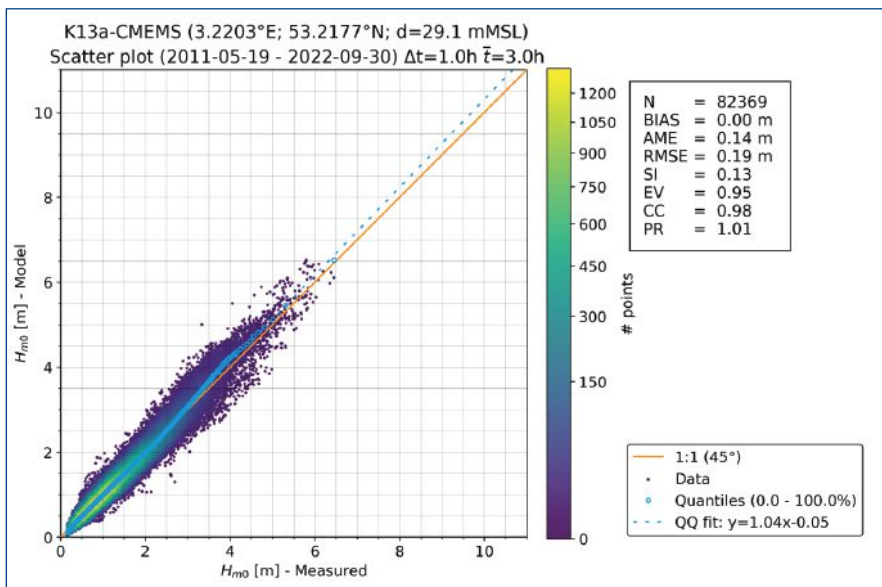
Integration with Data Portals

Access to comprehensive global and regional data sets is essential for metocean condition assessments. Data portals such as DHI's Metocean On-Demand provide both free and licensed access to wave, current, water level, and atmospheric data.

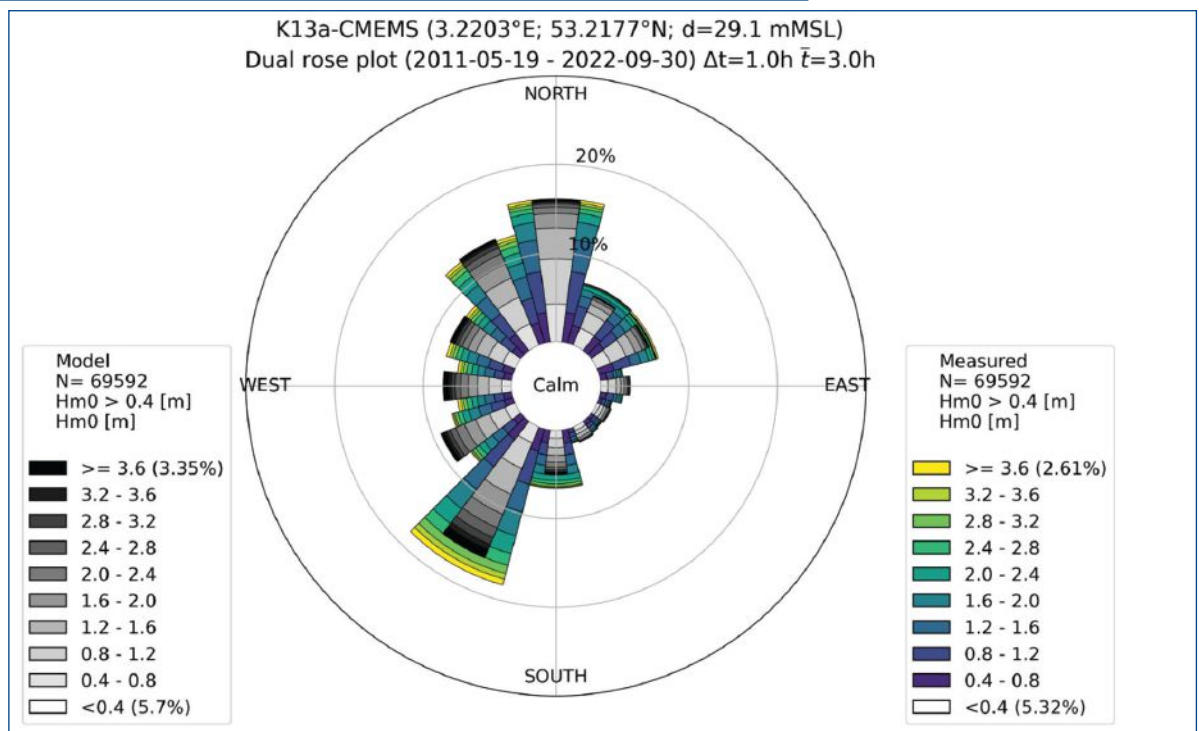
Data portals are gradually increasing resolution and quality of data sets, yet there is an ever-increasing need for even higher resolution data. Technology has facilitated the integration of data portals and advanced simulation tools. For example, the MIKE Metocean Simulator is now integrated with the Metocean On-Demand data portal. This allows for boundary conditions to be automatically read from the data portal and simulators to return higher-resolution simulation results back to the portal. The data returned to the data portal can be shared on a global map, validated against in-situ measurements and analyzed using tools available in the data portal.

The Metocean On-Demand data portal provides access to more than 50 licensed and free, global and regional wave, ocean, and atmospheric data sets.





Examples of validation plots carried out in the Metocean On-Demand data portal for a public, open data set in the Dutch sector of the North Sea.



“The Metocean On-Demand data portal is a leap forward when it comes to the availability and accessibility of decades of high-quality metocean data,” said Anders Sørrig Mouritzen, director and technical lead of C2Wind ApS. “It has already greatly improved our responsiveness within planning and FEED design of support structures in the offshore wind sector.”

Conclusion

The role of technology in assessing metocean conditions has evolved from being a mere tool to becoming a driving force behind innovation in offshore energy and marine infrastructure industries. Cloud-based solutions, advanced modeling techniques, the democratization of expertise, and the integration of simulation tools with data portals have collectively transformed the landscape,

making metocean condition assessment more efficient, accurate, transparent, and accessible than ever before. As technology continues to advance, professionals in various maritime industries can look forward to even more sophisticated tools that will further shape the future of how we navigate and understand the dynamic forces of the sea. **ST**

Pierre Swiegers, senior metocean engineer at DHI, leads a team developing innovative features for both MIKE Metocean Simulator and the Metocean On-Demand data portal. With a background in metocean assessments, dynamic mooring studies and port engineering, he transitioned to offshore wind in 2022.



international

CCS JDP

DNV has entered into a joint development project (JDP) with Singapore-based shipping company SDTR Marine to cooperate on a carbon capture and storage (CCS) feasibility study for the latter's 85,000-dwt Kamsar-max bulk carrier. DNV's FuelPath will be used to evaluate the economic viability of different fuel and technology approaches under various fuel and CO₂ price scenarios. The model takes into account future decarbonization mandates and SDTR Marine's ambitious emission targets to improve energy efficiency and contribute toward decarbonizing shipping.

Raising Maritime Awareness

Wallem Westminster, Manila, has partnered with the International Maritime Organization-endorsed Adopt a Ship program.

Working together with San Antonio Elementary School, Wallem Westminster's senior officers embarked on a 10-week immersive curriculum to raise maritime awareness. Wallem provided educational materials and interactive content that explained maritime concepts, supported interactive activities that engaged students' creative learning and skill development, and encouraged collaborative efforts to effectively integrate maritime education within the framework of the Department of Education curriculum.

Clam System Monitors Subsea Xmas Tree

Sentinel Subsea has successfully installed its WellSentinel Clam to monitor a subsea Christmas tree. This operation, in collaboration with Baker Hughes, was executed on a producing asset at a depth exceeding 400 m and marks a significant advancement in subsea technology.

Remote WellSentinel systems provide reliable and continuous monitoring without the use of active subsea power, data communication or complex intervention. The solution enhances detection capabilities, providing a proactive approach to risk mitigation. Early alerts and continuous monitoring enable swift responses to potential issues.

Underwater Services Merger

The underwater services division of the MIE Group, a company under the Fameline Holding Group, and H & S Diving Consulting, an underwater services company based in Durban, South Africa, have merged. The strategic partnership will allow both companies to consolidate their customer base and networks and synergize the MIE Group's commercial expertise and H & S's operational excellence with diving safety standards, hull cleaning equipment, and reclamation.

The new company operates under the H & S brand. All underwater services previously managed by the relevant department of the MIE Group will be transitioned to the new entity. The new joint venture is located in Limassol, Cyprus, the largest ship management center in Europe.

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Trelleborg Test Facility in Qingdao

Trelleborg Marine and Infrastructure has added a state-of-the-art marine fender test facility to its Qingdao manufacturing site in China to verify and test fenders in line with the forthcoming PIANC WG 211 guidelines. Trelleborg has been integral to the development of the new guidelines.

The PIANC WG 211 guidelines represent best practices that aim to enhance safety and efficiency in port operations by providing comprehensive recommendations for fender design, manufacturing, and testing. They have been drawn up by industry leaders and will include stringent requirements for designing fenders, with a specific focus on fender testing.

Global Maritime Acquisition

As part of its “globally active, locally present” strategy, Global Maritime has acquired engineering specialist Iberian Offshore to strengthen its footprint in the emerging Spanish offshore wind sector and create a gateway for future expansion into the Mediterranean region. This is in line with anticipated growth in both fixed and floating offshore wind markets.

Iberian Offshore brings in-depth knowledge of the local market and significant experience in the fixed-bottom offshore wind industry, including foundation and monopile design and other specialist engineering and maritime consultancy.

Zero-Emission, Hydrogen-Powered Barge

Dutch shipowner Future Proof Shipping (FPS), the EU-funded Flagships project, and the Interreg-funded ZEM Ports NS project have launched the groundbreaking *H2 Barge 2*, a hydrogen-powered vessel that will ship goods completely emission-free on the Rhine between Rotterdam, Netherlands, and Duisburg, Germany.

The *H2 Barge 2* is the first of two demonstrators in the EU-funded Flagships project, and the second demonstrator of the ZEM Ports NS project. The vessel was built as a conventionally powered containership and, in 2023, was stripped of all combustion engines and fossil fuel tanks at Holland Shipyards Group. Now, the vessel has a completely new emission-free propulsion system, including PEM fuel cells, hydrogen storage, battery packs and an electric drive train. Six fuel cells from Ballard Power Systems raise the total power installed to 1.2 MW.

H2 Barge 2 is expected to eliminate 3,000 tonnes of CO₂ annually when sailing the Rhine. With 80 percent of all cargo flows on the Rhine sailing between Rotterdam and Duisburg, the vessel proves that much of the fleet can be fully zero emission today.

Cutter Suction Dredger for Indonesia River Maintenance

Immediately after completion at the Damen Dredging Equipment yard, the first-of-series Cutter Suction Dredger (CSD) 600 has been sold to an Indonesian customer, PT. Dua Samudera Perkasa. The dredger is part of a complete dredging package that includes ship transportation, training of the crew on location, and dredge spares to fa-

cilitate maintenance duties. The CSD600 is a brand-new type of dismountable dredger, with a cutter power of 250 kW and a maximum dredging depth of 16 m. Its main activity will be performing river maintenance dredging operations on the island of Kalimantan, Indonesia. PT. Dua Samudera Perkasa is a key player in the port industry on the island.

Purchase of AIRMAR

AIRMAR Technology Corp., specializing in ultrasonic transducers and chirp technology, has been bought by Amphenol Corp., one of the world's largest providers of high-technology interconnect, sensor and antenna solutions, headquartered in Wallingford, Connecticut.

Airmar is now part of the Amphenol Interconnect and Sensor Systems Division, joining several other sensor and interconnect businesses. It retains its headquarters in Milford, New Hampshire.

Subsea Fiber-Optics to Improve Internet Through Hawaii

University of Hawaii and Ocean Networks Inc. (ONI) have announced a \$120 million public-private partnership to construct a submarine optical fiber cable system that will connect the Hawaiian Islands and improve and expand high-speed broadband internet throughout the state. The Hawaiian Islands Fiber Link (HIFL) project is a key component of the state's broadband initiative, which aims to ensure that people from all walks of life have reliable and affordable access to high-speed internet.

ONI will construct, operate and maintain the inter-island cable system. When it goes online, HIFL will be able to process a high volume of data with minimal delay as the inter-island backbone. HIFL will be a carrier-neutral, open-access system with landing sites on Oahu, Hawaii, Maui, Kauai, Lanai and Molokai. The system will have 24 fiber pairs with a design life of 25 years and is expected to be ready for service in late 2026.

Fire Rescue Boat for Norfolk

Silver Ships has expanded its *Endeavor* series with the delivery of the first *Endeavor 32* workboat, designed for Norfolk Fire-Rescue (NFR) in Virginia. The multi-mission fireboat will provide critical support to the city of Norfolk and the Port of Virginia. The workboat will be utilized for firefighting operations from the water, as well as water supply operations, water rescue emergencies, patient transport and patient treatment capabilities.

Spire Partners with Signal Ocean

Spire Global Inc., a global provider of space-based data, analytics and other services, and Signal Ocean, specializing in shipping technology, will partner to drive digitization of the maritime economy. Spire will contribute its proprietary data sets for precise monitoring of the maritime domain. Signal Ocean will bring its expertise in artificial intelligence, machine learning and natural language processing to create solutions for digitalization of the maritime economy while enhancing global security and transparency in the oceans. **ST**

Water Electrolysis to Combat Anoxia in Baltic Sea

The Baltic Sea Oxygenation and the Super-Green Hydrogen Economy project (BOxHy) is a collaboration between Lhyfe, a pioneer in green and renewable hydrogen production for mobility and industry; Flexens, a regional developer of hydrogen projects; and Stockholm University's Department of Ecology, Environment, and Plant Sciences.

The project aims to tackle the problem of anoxia in the Baltic Sea by injecting oxygen into the water through the production of offshore hydrogen from water electrolysis, an existing and adapted technology.

The project will evaluate suitable offshore locations for conducting a pilot study of the reoxygenation of marine ecosystems via the oxygen produced during water electrolysis.

Begun in October 2023, the BOxHy project, coordinated by Flexens, is expected to conclude in October 2024. The Baltic Sea Action Plan (BSAP) Fund is financing the project.

Injecting pure oxygen below the pycnocline could, in conjunction with external nutrient input limitation, eliminate anoxia in the Baltic Sea. Deep oxygen injection (DOI) is a method where pure oxygen gas is released deep under the water's surface, below a region where strong changes in water density occur, using a system that distributes the oxygen evenly with micro-bubbles. This type of system is already used in several freshwater lakes in the United States.

Improved Uplink Speed For Seismic RV

Marlink has upgraded the smart hybrid VSAT installation on the seismic research vessel *Ramform Hyperion* to provide an uplink speed of more than 250 Mbps using GEO VSAT. This throughput enables the transfer of seismic data from the vessel to its land-side headquarters for processing in real time. The increase in capability and efficiency for the vessel's network reflects the

very high value of the exploration 3D, high-density 3D and 4D under-sea imaging it produces.

Marlink's in-house team of engineers designed a technical solution based on a 1.5-m VSAT antenna, enabling seamless transfer of 2.7 terabytes of data from ship to shore in 24 hr. The data transfer was achieved using Marlink's network of high throughput GEO satellites, with the focus on delivering data at the required speed specifically to shore.

Beyond theoretical specifications, the trial aimed to evaluate the real-world performance of VSAT services in a dynamic maritime environment. Factors such as signal stability, latency and adaptability to varying weather conditions were integral to the assessment.

The achieved throughput easily surpassed that possible on LEO services and demonstrates the performance possible using GEO VSAT for guaranteed quality of service. The hybrid network also provides a global service without geofencing to territories and locations.

TDI-Brooks Adds to Fleet

TDI-Brooks has expanded its fleet with the RV *Nautilus* (formerly known as *Nautical Geo*). The DP2 vessel was built in 2000 and measures 75 m in length.

After undergoing a six-month retrofit period in Las Palmas, Spain, the vessel is currently en route to the U.S. East Coast to provide support for offshore wind operations.

Equipped with the newly acquired Geomil Manta-200 CPT, which can be deployed through the mid-ship moonpool, the system can penetrate the soil up to 40 to 50 m.

The vessel was expected to be fully prepared for the first offshore wind program by March.

It provides a wide range of offshore support, including subsea services; construction assistance; exploration and production; and AUV, ROV and diving support. It also caters to military operations, scientific marine research and survey map-

ping. To facilitate comprehensive surveys, the *Nautilus* is equipped with a Teledyne RESON multibeam echosounder rated to 2,500-m water depth.

How Lahaina Wildfire Affects Reefs

Before August 2023, Lahaina was a well-known, historic resort town on Maui's western coast. Now, Lahaina is also known as the site of the deadliest wildfire recorded in modern U.S. history. Aided considerably by drought conditions and swift winds, the fire spread rapidly over five days before it was extinguished. During this time, 2,170 acres were engulfed, and thousands of structures were reduced to ash. An estimated 100 lives were lost to the blaze.

As Lahaina residents start down the long road of rebuilding, many members of the community have expressed their concern for the impact the fire has had on Maui's coasts.

Dr. Andrea Kealoha identified nutrient pollution as a serious concern threatening the health of coastal corals.

Because Lahaina was built right on the coast, organic debris from the fire (ash, burnt wood, dead vegetation) will easily reach ocean waters. As these materials sink to the bottom of coastal lagoons and nearby reefs, they will begin to release CO₂ as they decompose, further contributing to acidification and decreasing oxygen levels in the water. Coral cannot survive in hypoxic waters, and coral death can have far-reaching trophic ramifications. Kealoha also noted that seasonal Kona storms could exacerbate the situation by promoting greater runoff and agitation of the waters.

PME has donated three miniDOT loggers with antifouling measures to Kealoha and her colleagues to aid in current and future research efforts to understand the ecological impact of the Lahaina fire on Maui's coasts. This research will provide insight to Maui residents and enhance the field of oceanography, given the rarity of urban fires so close to coral reef systems. **ST**

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Radar Training



SPx Radar Trainer, a software package designed to aid in the instruction and learning of the proper usage of maritime radars, makes it easier for students to familiarize themselves with radar controls by providing a modern simulation of a typical radar display, supported by chart and 3D environment views. It includes custom scenario creation for instructors and runs in a browser window for ease of use. Cambridge Pixel Ltd.

Cybersecurity Monitoring

Cydome Everlight supports a ship's full scope of cybersecurity management through real-time monitoring of onboard IT and OT assets. The ClassNK-verified solution aims to reduce cyber and operational risks by clearly identifying and visualizing cyber threats in an onboard network. Functions include: attack simulation and vulnerability scanning, compliance management automation, intrusion detection, and risk scoring. Cydome Security Ltd.

Data Logger

The C-FLUOR Logger connects to one Turner Designs C-FLUOR sensor. The logger records measurements internally at various sample rates. Data are offloaded from the logger to a computer via a standard USB cable. The logger is self-contained and waterproof. Operating for roughly 200,000 samples, it measures chlorophyll, rhodamine, fluorescein, phycocyanin (freshwater), refined fuels, CDOM/FDOM, turbidity and more. PME Inc.

AI Engine

An AI-driven platform, CyberSmart digitizes maritime operations by using advanced cloud infrastructure and proprietary algorithms to identify trends from aggregated and historical data. Modules include: Smart Inspect, Smart Navigation, Smart Data, Smart Analytics, Smart Operation, Cyber Shell and Smart EMRV. SHIP IP Ltd.

Service Operation Vessel

The new 48-m SOV features an optimized hull form and machinery configuration, built on a dynamic diesel-electric platform. The vessel is designed to have less environmental impact, and its unique SWATH hull design enables operations in challenging sea conditions and boosts sea-keeping capabilities and uptime. BMT Group Ltd.

Dual-Fuel Engine for LNG



DNV has calculated that owners of LNG carriers could expect an overall energy savings of 6 to 7.5% using the new Dual Fuel, Electric+ (DFE+) solution. Comprising MAN's four-stroke 49/60DF dual-fuel engine and ABB's Dynamic AC power distribution and control system, the solution has been developed to overcome efficiency challenges that are specific to the vessel type. ABB and MAN Energy Solutions SE.

Boat Control System

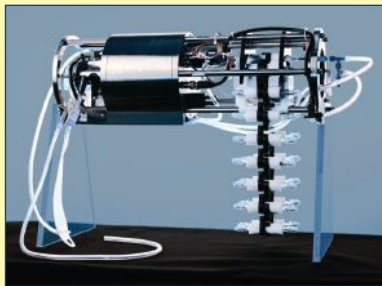
Control options have been expanded with the introduction of the Zipwake Mini Controller and availability of the Zipwake Dynamic Trim Control Solution with new boatbuilding partners. The Mini Controller acts as an "eyes-free" remote for the system, giving boat-

ers total control for optimal trim in any conditions. Users can view Zipwake performance data on their MFD without a dedicated Zipwake control and display. The system can work automatically or enable manual adjustments. IMTRA Corp.

Water Monitoring

The HOBO MX800 Data Logger series provides a single integrated platform for monitoring a range of critical water parameters. Bluetooth 5.0 enables fast and easy wireless data offload. A fully submersible model (MX801) and a direct-read model (MX802) offer convenient data offload without having to remove the sensor from water. Sensors are interchangeable, and users can connect two sensors to one logger to get measurements, such as salinity-adjusted dissolved oxygen, directly, with no need for post-processing. Onset Computer Corp.

eDNA Sampler



The Robotic Cartridge Sampling Instrument (RoCSI) is an in-situ autonomous oceanographic sampler that collects and preserves water samples into industry standard 0.22 and 0.45 micron Sterivex filter cartridges for later eDNA analysis. RoCSI allows for 50 or more samples in a compact instrument depth-rated to 6,000 m. It is adaptable to vehicle integration, long-term mooring systems, buoy mounts, bottom landers and shipboard applications. McLane Research Laboratories Inc.

Instrument Management

Fathom software enables users to view instrument status and diagnostics, execute setup and deployment, acquire and display real-time measurements, and process and visualize data. Responsive plotting allows data to be more interactive, provid-

ing visual feedback to users' processing choices. Sea-Bird Scientific.

Antifouling Coatings

Copper- and biocide-free Silic One and Hempaspeed Thin Film (TF) acrylic are available for distribution in the state of Washington for the first time. Silic One is a silicone-based bottom coating that incorporates hydrogel technology. Hempaspeed TF is a hard, thin-film coating for boats of fiberglass, steel, and aluminum in both fresh- and saltwater. Hempel (USA) Inc.

Compact Tug

ASD Tug 1810, measuring 18.25 x 10.23 m, saves on space by moving most of the items conventionally found on deck into the deck house and bulwark. The winch is installed in the deck house so that towing operations both fore and aft can be undertaken with a single winch. The tug has 30 tonnes of bollard pull ahead and 28 tonnes bollard pull astern. Damen Offshore & Specialized Vessels.

Oceanographic Monitoring Glider

The Slocum Sentinel Glider has been developed in response to more demanding user requirements for greater endurance and payload capability, building on the technology of the Slocum G3 Glider. The new glider is 13 inches in diameter and over 8 ft. long, allowing for over 3.5 times as many lithium primary batteries as the standard Slocum Glider and accommodating up to eight sensor or hardware integrations. Teledyne Webb Research.

Medium Vibrocorer

Midi Vibrocorer is a hybrid vibro-coring system that fits between the traditional Vibrocorer and the popular Mini Vibrocorer. The Midi is supported by a traditional deployment frame. It can sample dense or compacted sediments, and its light weight enables deployment in off-grid areas or from vessels of opportunity with restricted handling capabilities. It comes in 2- or 3-m configurations, with capacity for 4 hr. of continuous use. OSIL. **ST**



Southeast Asia's First Tidal Power Plant

Energies PH Inc., through its affiliate San Bernardino Ocean Power Corp., has contracted with Inyanga Marine Energy Group to build Southeast Asia's first ever tidal power generation plant. The site will be at the remote Capul Island of Northern Samar in the Philippines, along the San Bernardino Strait, a passage well-known for the strength of its marine currents.

The contract for engineering, procurement and construction has been awarded to Inyanga Marine Energy Group. The 1-MW project, which is expected to deploy in late 2025, will use Inyanga's HydroWing tidal stream technology.

The HydroWing tidal stream turbines will be connected to the electrical network of Capul, an off-grid island currently relying on a 750-kW diesel power plant. The

first stage of the project consists of a 1-MW tidal power plant, to be connected to a microgrid network coupled with solar PV and energy storage, delivering a reliable, sustainable and cost-competitive alternative to fossil fuel-based power generation.

Other tidal power generation sites planned for subsequent deployment by San Bernardino Ocean Power Corp. are in San Antonio Island, also in Northern Samar, and the Calintaan Island in Matnog, Sorsogon, Philippines.

Simulator for Offshore Wind Training Center

In a landmark agreement signed in December 2022, Nippon Yusen Kaisha (NYK-Line) partnered with Damen Services to introduce an advanced full mission bridge simulator tailored for offshore wind operations. The simulator, built in

cooperation with VSTEP Simulation, achieved a critical milestone with the successful completion of factory acceptance testing (FAT) in October.

To be officially inaugurated in April, the simulator, housed at a newly established training center in Akita, Japan, is set to become a focal point for specialized training in offshore wind installations. Targeting technical personnel and workboat crews, the training programs impart essential skills for maneuvering, crew supply, and maintenance in offshore wind parks.

UTEC O&M for Butendiek Offshore Wind Farm

UTEC, a geo services brand in Acteon's Data and Robotics division, has been awarded a three-year contract by Siemens Gamesa Renewable Energy (SGRE) to provide subsea balance of plant operations and maintenance (O&M) services to the Butendiek offshore wind farm. Led by UTEC, the work will be supported with services from Acteon brands Clarus, Deepwater

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and Seatronics. Acteon will perform annual subsea foundation ROV inspections, array cable and foundation seabed survey, and corrosion protection survey covering the wind turbine generators (WTG) and the offshore substation (OSS). UTEC will perform a multibeam echosounder seabed survey of the array cables and OSS/WTG scour protection while Deepwater's POLATRAK Drop Cell - DC II equipment will be used for the corrosion protection survey.

Located approximately 32 km west of the island of Sylt in the German sector of the North Sea, the Butendiek wind farm's turbines from Siemens Gamesa, with a rated power of 3.6 MW, have a total capacity of 288 MW. Butendiek has been fully operational since 2015.

Investment in CSOVs

Institutional investors advised by J.P. Morgan Asset Management have entered into two offshore wind farm construction service operation vessels (CSOV) contracts with Ulstein Verft. The CSOVs will be equipped with a hybrid battery propulsion system and be prepared for green methanol fuel to enable carbon-neutral operations. The contracts include two additional options.

AirWing Unit for Shipping Vessel

GT Green Technologies, in collaboration with Carisbrooke Shipping and the University of Bristol, is set to revolutionize commercial shipping with its groundbreaking wind propulsion solution, AirWing. The project has been awarded a £3.7 million grant under the Clean Maritime Demonstration Competition Round 4 to install a 20-m AirWing unit on a Carisbrooke Shipping vessel in the U.K., signifying a transformative shift toward greener maritime practices.

The AirWing system will propel the vessel on its U.K.-Canada-U.K. route with an expected fuel and carbon emission savings of 8.3 percent, resulting in annual cost savings exceeding £139,000. Over its 25-year life span, the AirWing has the po-

tential to reduce CO₂ emissions by an estimated 14,250 metric tonnes.

Fugro Expands in South Korea

Fugro has opened a new office, "Fugro UST21," in Incheon, South Korea, as part of a joint venture with UST21, a South Korean marine technology company. This new office will provide geodata solutions for South Korea's growing offshore renewable energy sector, which Fugro has been actively supporting

in collaboration with UST21 since 2019. The creation of Fugro UST21 establishes Fugro's first permanent presence in the country.

WINDGLAZ Acquisition

DORIS, specializing in energy engineering, advisory and project management, has acquired WINDGLAZ, a specialist in analysis and optimization of fixed and floating offshore wind and floating solar systems. **ST**

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Guidance to Mitigate Invasive Species Threat

The transfer of marine invasive species through the movement of vessels from one region to another has long been recognized as a significant environmental risk, with the International Maritime Organization's (IMO) first guidance on the issue published in 2004.

Marine invasive species can negatively impact ecosystems by eating or acting as parasites on native species; outcompeting native species for food, light or spawning sites; bringing new diseases; and causing economic harm.

To support members to take proactive measures to mitigate the impacts of invasive species on marine environments, IMCA has produced new guidance: "Mitigation of Marine Invasive Species: Biofouling and Ballast Water" (IMCA ES002), which aims to minimize transmission and highlights best practices from case studies from DeepOcean, Fugro, TechnipFMC, and SBM Offshore. The guidance is available at: www.imca-int.com/product/guidance-on-mitigation-of-marine-invasive-species-biofouling-and-ballast-water.

Funding for Ammonia Cracker Tech

Corvus Energy has been awarded funding for the integration of ammonia cracker technology with its Pelican fuel cell system. The project, APOLO, is a collaboration between several partners and aims to solve the challenges of power conversion from ammonia and to develop an efficient and flexible ammonia cracking technology for the maritime sector.

The four-year program, which started in January, will demonstrate power conversion from commercially available fuel cell systems using hydrogen from ammonia cracking, with a power output of 125 kW. The program will also test an ammonia cracker coupled with a novel ammonia engine running on an ammonia/hydrogen blend to

compare the different technologies.

Partners in the project are: H2Site, TecNALIA, Technische Universiteit Eindhoven, 1 CUBE, Chalmers Tekniska Hogskola, Nuvera, Astander, Fertiberia and LEC GMBH. TecNALIA will be the coordinator of the project.

Corvus Energy will also lead a work package developing a business case for these systems on board ships.

Hydrogen Fuel Cell Approval

ClassNK has issued an approval in principle (AiP) for a maritime hydrogen fuel cell system developed by Yanmar Power Technology Co. Ltd. This is the first AiP certification for a maritime hydrogen fuel cell system developed by a Japanese manufacturer.

Hydrogen fuel cells are gaining attention as a potential means to help reduce greenhouse gas emissions from shipping.

The maritime hydrogen fuel cell system (300 kW) is designed with key auxiliary components, such as gas valve units integrated within the system enclosure, aimed to facilitate easy installation on ships. The system allows for parallel connection of multiple units and adjustments to the number of hydrogen fuel cell modules, making it adaptable to various ship power output requirements.

First Ship-to-Ship Green Methanol Supply

The Ministry of Oceans and Fisheries and Ulsan Port Authority have announced a world first with the successful completion of ship-to-ship green methanol supply to a very large container ship at Ulsan Port, South Korea.

The Ministry of Oceans and Fisheries established the relevant institutional foundation, including the "Guidelines for Approval of Self-Safety Management Plan for Methanol Supply," and accumulated know-how through two methanol supply demonstrations with Ulsan Port Authority in 2023.

As competition among global ports for the methanol fuel market intensifies, the success of this demonstration will enable South Korean ports to further consolidate their global position as a sustainable marine fueling location and will promote the growth of the country's sustainable marine fueling industry.

New Partner for Ocean Census

Ocean Census (*Sea Technology*, January 2024), a global mission to discover marine life, has a new partnership with Northeastern University's Ocean Genome Legacy center, a research laboratory and public-access marine DNA and tissue bank, as part of the growing Ocean Census Alliance.

This collaboration unites the Ocean Census commitment to accelerate the discovery of ocean life with the Ocean Genome Legacy center's two decades of expertise in marine genomics, with the goal of catalyzing our understanding and protection of marine biodiversity.

Initiated by The Nippon Foundation and Nekton in April 2023, Ocean Census has set an ambitious global target to discover 100,000 new species during this decade using cutting-edge technologies.

Access to Seafood Markets Is Key to Nutrition in Pacific

A new study in the *Proceedings of the National Academy of Sciences* has found that understanding and reinforcing the pathways through which those in Pacific Island communities currently access nutritious food—as opposed to building new technologies and implementing new processes—can support adaptation to emerging environmental and economic changes.

The research highlighted Kiribati, which relies on local seafood and is facing the forces of food importation and climate change. Food system resilience here requires good, consistent access to local seafood. The study showed that access to seafood markets is key, instead of occupation, education, capital or technology. The researchers said that policy should ensure equitable access to markets. **ST**

Investment in Corvus

Corvus Energy, a specialist in zero-emissions energy solutions for maritime, offshore and port applications, has secured an investment from Woven Capital, Toyota's growth fund, to accelerate the development of its growing product portfolio in battery storage and hydrogen fuel cells and to support expansion into new geographies.

Hydrogen is a fast-growing sector with established applications in many industries and is playing a pivotal part in decarbonizing shipping, energy, transportation and heavy industry. With major maritime players embracing clean energy commitments and technologies, the market is growing rapidly.

Woven Capital and Toyota will bring valuable expertise from green mobility, in both fuel cells and batteries. With these partners, Corvus is strengthening its presence in Asia, which will be an important market going forward for the company.

Hybrid Dredger Vessel

Ben Buchele Elektromotorenwerke GmbH has delivered two electric motors to Reintjes for installation on the hybrid dredger *Chicago* at the Port of Hamburg, Germany.

Ben Buchele manufactures standard and custom-built motors for shipbuilders and other heavy-duty applications globally. Reintjes is a specialist in maritime gearboxes and powertrains; in this instance, it was contracted to provide a hybrid powertrain comprising two diesel engines and two electric motors, helping the ship operate at low emissions when close to port.

The end-user wanted an electric motor solution that enabled fully electric power at a speed of up to 6 kt., with the capacity to recharge the batteries, while using the diesel engines. Reintjes asked Ben Buchele for a weight-optimized, water-cooled engine at 60 kW of power, among other criteria.

The dredger shifts sediment in certain areas of the port so that it can be extracted by the suction dredgers.

The twin-engine vessel has two propellers and two prop shafts. Each prop shaft is powered primarily by a diesel engine, but also has an electric motor to enable low-emissions operation. Even when the ship is in electric mode, both propellers are still available, ensuring full maneuverability. This is made possible by the redundancy that allows a single prop shaft to be used if one of the propellers fails.

XR Ship Training

KR, HD Korea Shipbuilding & Offshore Engineering (HD KSOE), HD Hyundai Heavy Industries (HD HHI), and HD Hyundai Marine Solution (HD HMS) have signed a memorandum of understanding to develop a ship education and training program based on extended reality (XR) at HD HHI's Digital Convergence Center in Ulsan, South Korea.

The companies have agreed to establish a virtual reality representation of ships based on 360° footage of actual vessels and 3D CAD models. They will also develop ship trial content to enhance crew education and training services.

HD KSOE will develop advanced maritime training content in collaboration with HD HHI by integrating its digital twin solution, HiDTS, with KR's ship familiarization education and training platform, KR-Real 360. HD HMS will provide the training content.

Octopus Battery System Powers Ferry

EST-Floattech, a provider of maritime energy storage solutions, has announced the successful delivery and commissioning of the Octopus Series battery system on the SFK ferry *Laboe*. The ferry was delivered to SFK by Holland Shipyards Group. It is the sixth in a series of seven ferries to lower SFK's CO₂ emissions.

The *Laboe* is equipped with 560 kWh of the Octopus High Energy system. This battery system ensures that energy consumption remains low during sailing, as the vessel can

easily switch between generators and the battery system. The vessel can even sail fully emission-free around the city of Kiel, where it transports commuting pedestrians and cyclists. The system was integrated by Holland Ship Electric, who decided to collaborate with EST-Floattech on the ferries for SFK.

ROV Cloud Control For Offshore Wind

HonuWorx, with the support of an Offshore Wind Growth Partnership Development Grant, has developed and tested HonuMove, its new cloud-based solution for controlling and supervising ROVs.

ROVs are vital to the growth of the offshore wind sector and are used across the life cycle, from site selection to installation and into operations and maintenance. Through the progressive decrewing of supporting vessels, operators can reduce the cost, safety and environmental burden of subsea work.

HonuMove builds upon the existing capabilities of the HonuWorx cloud architecture to remotely support subsea operations with live video streaming, remote system access and embedded team collaboration. HonuMove has a remote piloting module that allows a geographically distributed pilot to securely request and take control of a subsea robot directly from the cloud platform. The scalable cloud architecture enables trained pilots to actively participate in a subsea operation from any location. The system features a modular architecture that supports a range of vehicles from different manufacturers.

HonuMove enables 24-hr. operations in a reliable remote solution with flexible interfaces and integrated marine connectivity, bringing a new level of collaboration to offshore projects.

The solution has been demonstrated on the VALOR ROV, an observation-class vehicle manufactured by Seatronics. From a test tank in Aberdeen, remote control was conducted from multiple locations in the U.K. and the U.S. using various communications modes, including satellite and 4G LTE. **ST**

contracts

SEACOR Marine Holdings Inc., Houston, Texas, will acquire four energy storage systems for installation on four platform supply vessels to enhance the way the company manages energy consumption and emissions on board. Kongsberg Maritime AS.

ABB, Zurich, Switzerland, has signed a long-term partnership agreement to accelerate the decarbonization and digitalization of a cruise line fleet. The first phase includes a 10-year Azipod propulsion service agreement. ABB will also modernize propulsion control for 11 vessels and provide shore connection installations on board four ships. The agreement covers 14 existing ships, plus four vessels due for delivery from 2025 to 2028. Norwegian Cruise Line Holdings.

Interventek, Aberdeen, Scotland, will supply a new compact and lightweight bore selector technology to enhance the efficiency of global well decommissioning operations. Interventek will also provide life-of-tool support, including training, services and critical spares. Well-Safe Solutions.

Marlink, Oslo, Norway, has won the contract to deploy its smart hybrid network solutions on the fleet of a Japanese shipowner. Marlink VSAT and LEO L-band backup includes the Starlink high-throughput, low-latency LEO internet solution. Fukujin Kisen Co. Ltd.

Exail, Brest, France, has sold eight units of its Rovins Nano inertial navigation systems for integration into a fleet of ROVs to enhance capabilities in offshore installation of subsea equipment. Sapura.

MacArtney Offshore Wind Solutions, Vemb, Denmark, has expanded a partnership, for which it will design and supply CEMAC tensioner systems for a cable-laying vessel (CLV) fleet that includes the world's largest CLV. Jan De Nul Group.

Aether Fuels, Singapore, has created a partnership and global exclusive licensing agreement to commercialize a scalable, economical solution that will produce sustainable fuels from low-value and abundant waste streams. The fuels will help aviation and ocean shipping companies to achieve their net-zero ambitions. GTI Energy.

Wärtsilä Gas Solutions, Asker, Norway, will deliver the fuel supply system for two new EXMAR medium-size gas carriers operating on ammonia fuel. These will be the first ocean-going vessels propelled by dual-fuel engines that can operate with ammonia. WinGD will provide the engines. EXMAR LPG.

Spire Global Inc., Vienna, Virginia, has been awarded two framework contracts to provide space-based automatic identification system (SAT-AIS) data services for ship tracking over a four-year period, including real-time, standard and high-density backup SAT-AIS. European Maritime Safety Agency.

Samson, Ferndale, Washington, will acquire a company in France with a testing facility featuring a machine capable of breaking ropes at a strength of up to 600 metric tons. Corderie Henri Lancelin. **ST**

meetings

MAY

May 6-9—Offshore Technology Conference, Houston, Texas. 2024. otcnet.org.

May 20-23—MTS Buoy Workshop, Sequim, Washington. www.mtsociety.org/buoy-workshop.

May 21-24—International Harbour Masters Congress, Tanger Med, Morocco. <https://harbourmaster.org/events/international-harbour-masters-association-14th-biennial-international-congress>.

May 27-30—Canadian Hydrographic Conference, St. John's, Canada. www.chc2024.org.

JUNE

June 4-6—Capitol Hill Ocean Week, Washington, D.C. <https://marinesanctuary.org/chow-2024>.

June 6—Offshore Carbon Capture & Storage Symposium, Houston, Texas. www.noia.org.

June 10—Speed@Seawork, Cowes, U.K. <https://seawork.com/about-speed>.

June 11-13—Seawork, Southampton, U.K. www.seawork.com.

SEPTEMBER

September 11-12—Oil Spill India, New Delhi, India. <https://oilspillindia.org>.

September 17-19—South America Offshore Wind, Rio de Janeiro, Brazil.

September 23-26—OCEANS 2024 Halifax, Halifax, Canada. <https://halifax24.oceansconference.org>.

OCTOBER

October 7-10—Marine Imaging Workshop, Monterey, California. <https://miw2024.org>.

NOVEMBER

November 4-7—EURONAVAL, Paris-Nord Villepinte, France. www.euronaval.fr.

November 7-10—Europort, Rotterdam, Netherlands. www.europort.nl.

November 12-14—International WorkBoat Show, New Orleans, Louisiana. www.workboatshow.com.

November 19-21—Marine Renewables Canada Conference, Halifax, Canada. <https://marinerenewablesconference.ca>.

November 19-21—MAST Australia, Adelaide, Australia. [Mastconfex.org](https://mastconfex.org).

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

people

The Panama Canal's Deputy Administrator **Ilya Espino de Marotta** will now also serve as the Canal's first chief sustainability officer. With a focus on decarbonization, adaptation and transition, the goal is to implement aggressive emissions reduction targets starting in fiscal year 2025. Espino de Marotta began her career at the Canal as the sole female engineer on the shipyard. She went on to oversee the Panama Canal Expansion Program before becoming deputy administrator in 2020, making history as the first woman to hold the position.



The Indian Register of Shipping (IRS), has promoted **P.K. Mishra**, from head of operations to joint managing director. He joined IRS as a surveyor in 1998 and rose through the ranks to become chief surveyor in 2023, handling key responsibilities as an integral part of the organization. Throughout his time at IRS,

Mishra has consistently demonstrated leadership, strategic thinking and a commitment to excellence.

The American Maritime Partnership, the voice of the U.S. maritime industry, has elected new leadership for two-year terms. **Jennifer Carpenter** takes the helm as president, becoming the first woman to lead the organization. She is joined by Vice President Sara Fuentes and James "Jim" Weakley, who will serve the dual role of secretary and treasurer.

VideoRay LLC has appointed **Jeff Snyder** as the director of applications engineering, integration and testing. Snyder has over two decades of expertise from leadership and field positions at robotics and technology organizations, including SeaVision Underwater Solutions, L3Harris OceanServer and Terradepth.

CEO **Anthony Covelli** of marine safety innovation company Sirius Signal has been appointed by the Radio Technical Commission for Maritime Services (RTCM) as chair of Special Committee 132 on Electronic Visual Distress Signaling Devices. Its standards are incorporated by reference into U.S. Federal Communications Commission and U.S. Coast Guard regulations.

Ashtead Technology's **Richard Lind** has been appointed a member of the Decom Mission board of directors. Lind is general manager of Ashtead's mechanical solutions facility in Aberdeenshire, which provides specialist subsea equipment, solutions and services for the offshore decommissioning sector. He has over three decades of experience in subsea infrastructure removal and well decommissioning. **ST**

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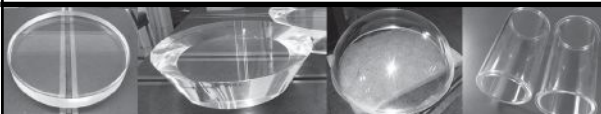
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We Need a Sustained Global Effort to Save Our Oceans—Jan Otte

Jan Otte is co-founder of *Animals Around The Globe*, a platform dedicated to animal conservation and education. Otte met fellow co-founder Christopher Weber while working for Google. They created *Animals Around The Globe* as a passion project, and it has developed into a full-time community base for those who value experiencing animals in their natural habitats: www.animalsaroundtheglobe.com.



We all know that Earth comprises primarily ocean. It composes 71 percent of our planet, housing at least 243,000 marine species, ranging from the smallest of plankton to the largest whales. Even given advanced technology in marine exploration, less than 10 percent of the ocean area on our planet has been explored.

The health of our oceans is integral to the continuation of life on our planet because oceans provide oxygen and climate regulation, food, sustenance, jobs, and livelihoods. It is in the best interest of everyone on the planet, whether they live near an ocean or not, to join efforts to save our oceans from irreparable damage.

There have been a number of threats to the oceans that require immediate attention—many of which are perpetrated by human activity. According to *National Geographic*, more than 80 percent of marine pollution is derived from human activity on land. Mining, overuse of plastics, dredging and climate change are just some of the activities that continue to threaten the sustainability of marine life.

There has already been evidence of irreversible damage to large swaths of ocean life. For example, land-based agriculture and pollutants have caused massive damage to the Great Barrier Reef in Australia. Habitats within the reef that

house all manner of marine life are threatened, and experts have reported that the water quality in the reef is now in “poor condition.”

Global warming is pervasive, especially in coastal areas. Experts forecast that sea level will rise 10 to 12 in. by the next 30 years if we continue with business as usual.

Overfishing is also an issue that needs immediate attention. Because certain species have been victim to years of overfishing, their breeding populations have become too depleted to recover, which leads to endangerment and eventual extinction.

Many of these threats to marine life can be reversible. Doing so, however, requires a global effort.

The danger of irreversible damage faced by our marine life and oceans isn’t a new revelation. Threats to our oceans have been at the forefront of discussions surrounding sustainability and Earth-consciousness for decades, but given the clear effects of global warming, continued overfishing, pollution and land-based threats, efforts to mitigate this damage must expand.

The United Nations has established Sustainable Development Goal 14, “Life Below Water,” which highlights careful management as the key to sustainability. The UN has called for international cooperation to protect our planet’s oceans, which must include government-protected areas and laws on the books that outline how the world intends to reach future sustainability goals together.

Many people have individually taken steps to lessen their impact on ocean pollution, including using less plastic and reducing vehicle pollution that eventually ends up in our waterways. However, until the effort becomes more widespread globally, we can count on the health and sustainability of our oceans to continue to decline.

The need for a global effort to save our oceans is not a new concept. In the 1970s, it became clear that the Mediterranean Sea was in dire straits. A joint effort of several coastal countries called the Barcelona Convention was devised, and the positive results of those efforts continue. Clearly, cohesive action on a global scale works.

The first step in forming a global alliance toward meaningful change for our oceans is spreading the word about ocean life and our part in conservation. Media channels play a large part in this dissemination of information. Through television, streaming channels, online content and other media, more people have access to information about the issues concerning our marine life and oceans than ever before.

Media can also affect public opinion. When global efforts are stepped up to help save our oceans, in-depth media coverage can help give people the information they need to make sound decisions about the personal steps they can take to join the fight.

The UN and individual government entities continue to take steps to lead the global effort to save our oceans. The U.S. Environmental Protection Agency, for example, has released directives on global policies to slow the onslaught of marine litter and plastic pollution.

It’s essential that the momentum does not dull due to fatigue or apathy. Progress toward reducing plastics in our oceans, allowing renewal for damaged areas such as the Great Barrier Reef, and slowing the negative impact of global warming is possible.

Saving our oceans should be a top priority for everyone on Earth because the oceans are essential to our survival. By pushing for a global effort toward sustainable practices and policies, we can start to count on a future where our oceans and marine life can thrive. **ST**

april advertiser index

Blueprint Subsea	21
www.blueprintsubsea.com	
CHC 2024	34
https://chc2024.org/	
EvoLogics GmbH	3
www.evologics.de	
General Oceanics, Inc.	29
www.generaloceanics.com	
*Nautel	17
www.nautelnav.com/offshoreNDB	
South Bay Wire and Cable Company, LLC.....	35
www.southbaycable.com	
SubCtech GmbH.....	39
www.subCtech.com	
R.M. Young Company.....	29
www.youngusa.com	

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