

A photograph of an underwater shipwreck. The hull is heavily damaged, with large sections missing and debris scattered around. A bright orange starfish is visible in the bottom right corner. The water is dark blue.

November 2022

ON&T

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OCEAN NEWS & TECHNOLOGY
UNDERWATER IMAGING



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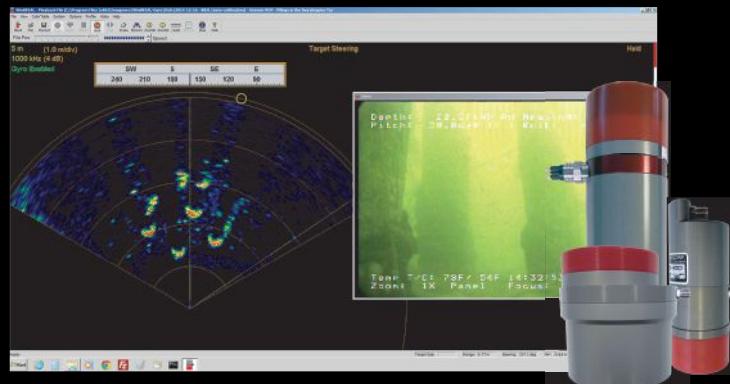
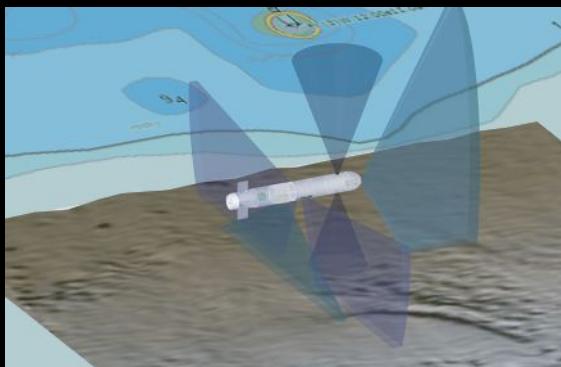
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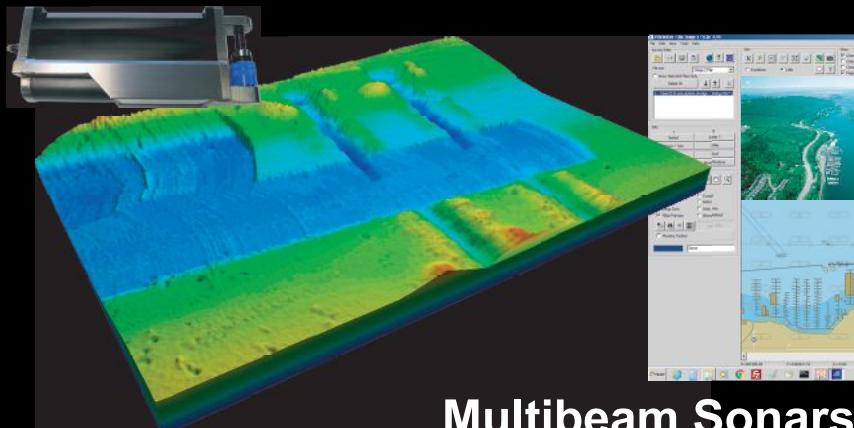
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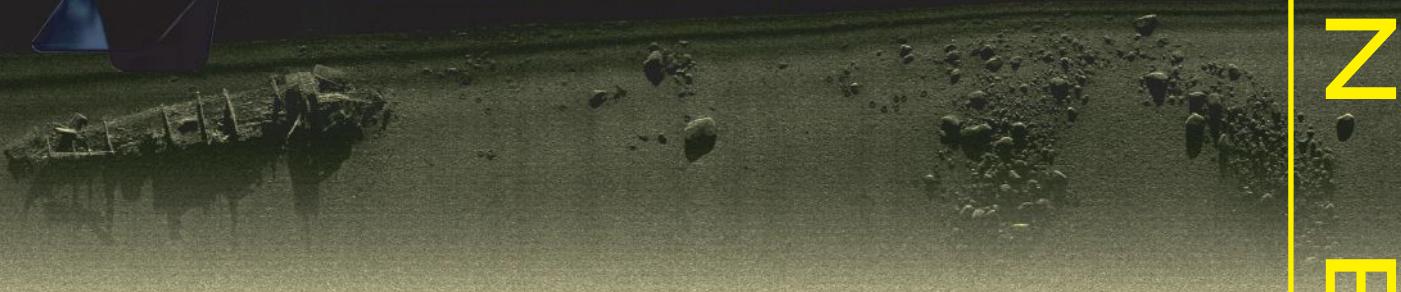
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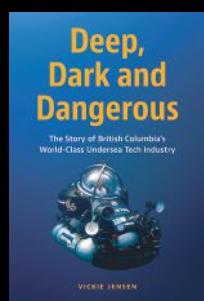
Multibeam Sonars



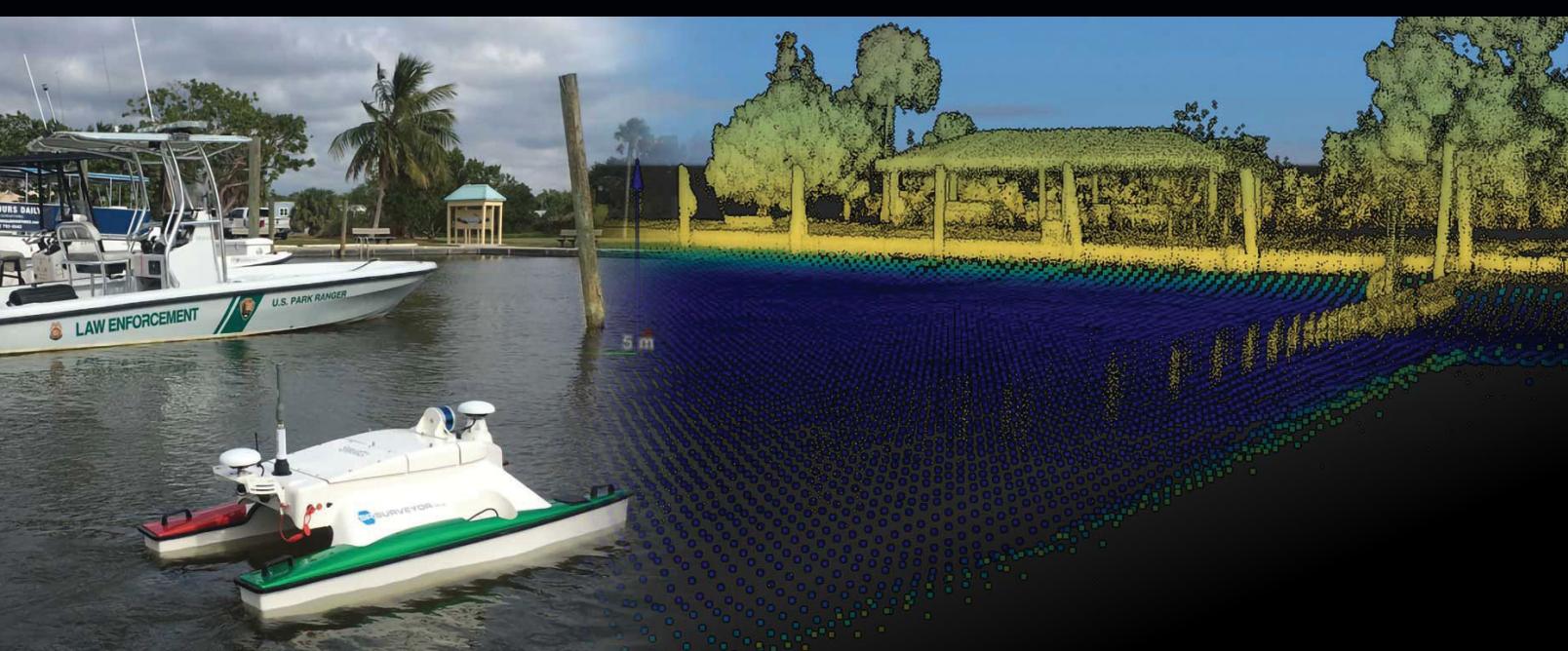
Sidescan Sonars

Deep, Dark and Dangerous: The Story of British Columbia's World-class Undersea Tech Industry

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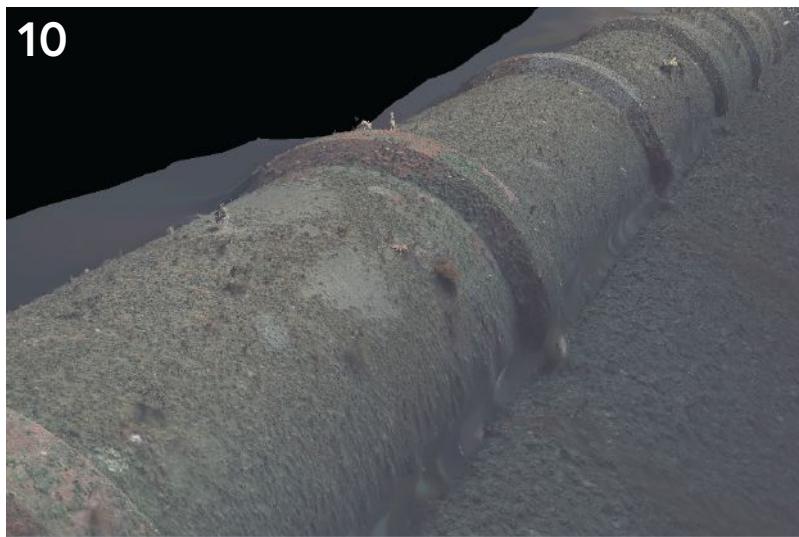
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ON THE COVER:

Stills image captured by Scripps Institution of Oceanography, using Voyis Observer Camera on a REMUS 600 AUV. (Photo credit: Voyis Imaging)

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[WITH THANKS - Ed.]

The rate of successful exploration, recording, and documentation of underwater environments has been greatly accelerated in recent years thanks to significant advances in the methodical application of new hardware and software designed to acquire and process images and 3D data more efficiently and accurately than ever before.

November's ON&T shines a light on some of the technical innovations helping us form an ever more complete picture of what lies below the waterline. Our thanks this month go to Voyis Imaging, Valeport, Verlume, Nortek, and Teledyne Marine.

Next up is ON&T's end-of-year Special Edition, *The Future of Ocean Technology in 2023*.

Happy reading!

editor@oceannews.com

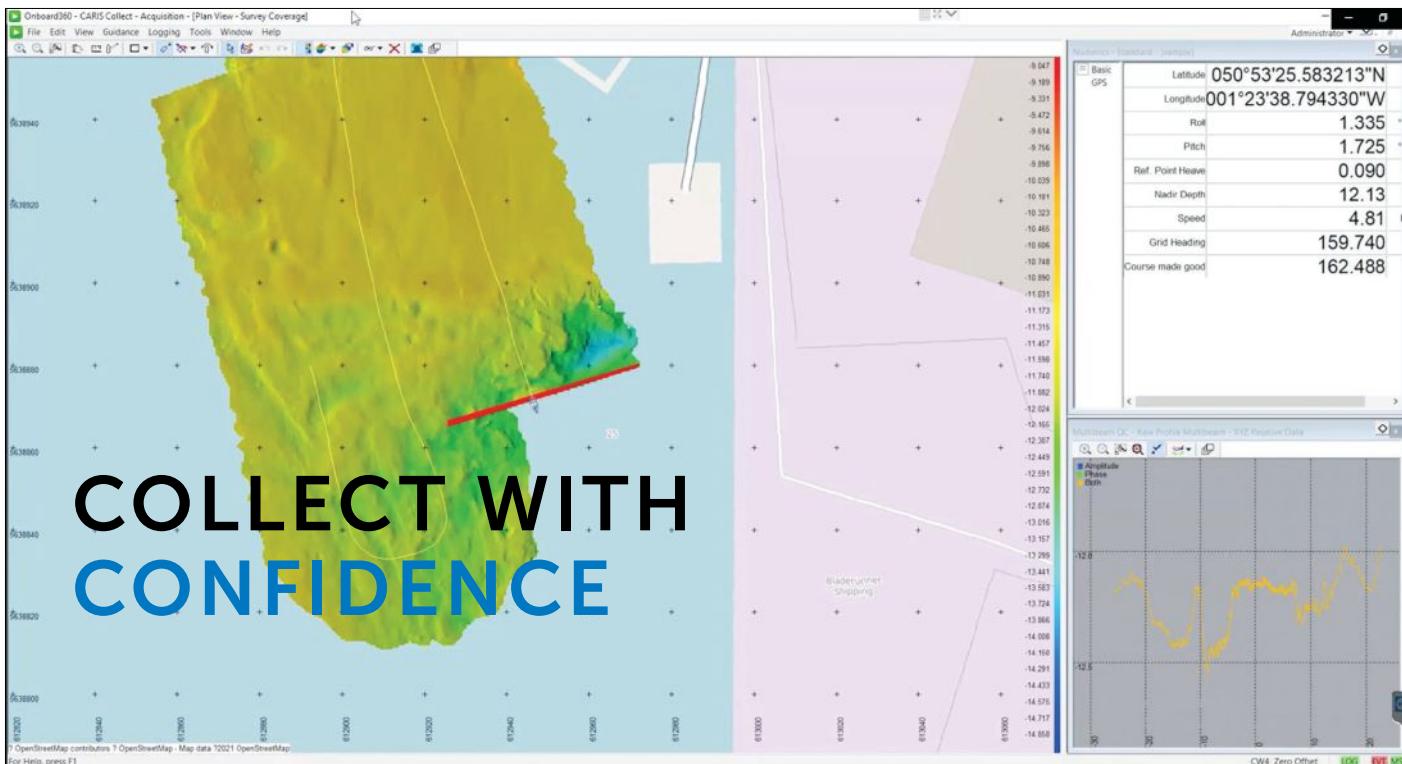
Ed Freeman

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POWERFUL IMAGING SONARS TO DRIVE FUTURE SUBSEA EXPLORATION



By Ole Søe-Pedersen,
Vice President & General Manager,
Teledyne Marine Instruments & Imaging



TELEDYNE MARINE
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Imaging sonars are in high demand following the exponential growth in the market for underwater drones. The goal is to reach more autonomy and allow drones to conduct extended missions for longer durations. Subsea resident drones and a higher degree of automation drive the need to explore emerging and disruptive technologies for future advancement in subsea robotics systems and field operation procedures.

Imaging sonars also fulfill many vital roles in the future of underwater drones. They are imperative in aiding the vehicle in transit, avoiding obstacles in the water column, and imaging seabed and objects of interest for survey purposes. For all applications and missions, software support to aid navigation and onboard decision-making is an integral part of any subsea application. Maintaining accurate localization for the duration of a mission is essential for a variety of tasks, but it doesn't end there.

A HISTORY OF INNOVATION

Teledyne Marine Imaging provides subsea imaging solutions that include advanced multibeam echosounders, sonar solutions, and imaging products in the form of subsea and marine cameras, LED lighting, and underwater strobes that serve various markets and applications.

We pride ourselves on innovation; whether we are creating more powerful sonar systems to do onboard computations or increasing machine learning and AI for detection and classification tasks, we are always at the forefront and leading the way. We have assembled over 23 leading-edge subsea technology brands through collaboration and acquisition, turning Teledyne Marine into a frontrunner in the industry with a reputation for delivering premium products with unparalleled service.

Our image-rendering technologies to improve image resolution differentiate our products and make a difference for our clients in the field. Our mission includes driving cutting-edge technologies, improving system integration and usability, and delivering more innovative underwater systems. Teledyne Marine has been a pioneer with a rich history of innovation to meet the challenges of the marine environment.

A FUTURE OF SOLUTIONS

We understand that future autonomous systems need to be more modular, capable, and easier to operate with a complete turnkey system. New stable platforms that are compact and require low power for longer-duration missions will expand ocean observations. Standardized communications will improve interoperability and enable coordinated behavior, while sensors will have more onboard processing capabilities.

Our focus on operations, hardware, and control continue to pave the way for advances and improvements in autonomy. We continue to build systems with standard interfaces to keep consistency across systems, whether in communications, mounting points, or software interfaces. Our onboard analytics deliver information rather than raw sensor data. We bring all the pieces, including sensors, hardware, software, and controls, into a single package with a turnkey control solution. By fusing sensor data, we can provide a unified experience over a wide array of products.

This excellence through synergy encompasses a wide range of business segments providing clients with the best solutions possible. Because of the variety and breadth of technologies and products that fall under the Teledyne Marine umbrella, our customers have a central access point to our technology toolbox for the best possible solutions to any subsea challenge.



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SUBSEA COLOR IMAGING FOR PHOTOGRAHMTRY



By Chris Gilson,
CEO,
Voyis



& Patricia Sestari,
Marketing Lead,
Voyis

Efficient wide-area optical exploration with Image Mapping is the key to uncovering the ocean's mysteries and is vital for documenting and managing the habitats, history, and critical infrastructure that we all rely upon.

One of the main challenges with observing the ocean is the trade-off between coverage and resolution in subsea instruments. While sonars can capture data across large areas, they often do not have the resolution required for gathering quantifiable and actionable data. Optical sensors like high-resolution stills cameras can provide localized visual data to see the fine details, but historically could not be extended to wide areas. Now the advent of efficient photogrammetry algorithms enables thousands of images to be combined into a wide area quantifiable 3D model that provides a complete understanding of the subsea environment.



▲ Pipeline data captured using Voyis' optical sensors and color correction technology. (Image credit: Voyis)

Ocean surveyors have historically relied on subsea video cameras deployed from Remotely Operated Vehicles (ROVs) or Autonomously Operated Vehicles (AUVs) to gain a visual understanding of underwater targets for inspection and exploration. But the operating mechanism of video—high compression and blurry features—significantly limits its use for advanced image processing and photogrammetry. Stills Imaging offers fundamental advantages in that short-exposure images and uncompressed raw formats can provide the crisp features and high-dynamic-range information necessary for effective machine vision.

When an underwater vehicle conducts an optical survey for the purpose of photogrammetry, it is paramount that the imaging system provides both consistent and reliable image capture, and fully automated image correction. There are, therefore, three overarching challenges of such a system: effective color correction, even illumination, and consistent focus. With these in mind, Voyis endeavors to produce underwater imagery where the effects of the water medium are removed, enabling the direct use of standard terrestrial processing algorithms like photogrammetry and machine learning.

UNDERWATER COLOR CORRECTION

To understand the challenges with color image correction underwater, we must first understand the problem. Humans perceive color based on how different wavelengths of light (color channels) reflect off objects and reach our eyes. Underwater, the perceived color is altered because red wavelengths are absorbed more than blue and green,

and standard cameras are not designed to account for this color shift. Corrections cannot just be done manually on single images; they must be globally consistent so that features can be matched throughout the image sequence as the camera's perspective shifts. At each point of image capture, both a feature's perceived color and brightness will change as its position relative to the camera and the light source changes. A solution must therefore balance color reproduction effectiveness and image-to-image consistency in its performance.

To address these colorization challenges, Voyis has developed a survey-grade color correction solution that leverages machine learning to efficiently train a correction model. By analyzing an initial image dataset, a model can be generated that accurately characterizes the color degradation and illumination patterns present in the imaging system. This can then be efficiently applied to correct each image in real-time without operator input, utilizing raw image data to maintain image quality.

EVEN ILLUMINATION

The next challenge is producing an even illumination across the entire camera field of view, a problem that is again due to water's light absorption, with the amount of absorption growing with target distance. Since light rays directed towards the corners of the image must travel further through the water, more of it is absorbed, and the image corners are perceived as darker.

To achieve effective photogrammetry, features in the image must be detected and



▲ Hibbard pipeline photogrammetry data captured using Voyis' optical sensors and color correction technology. (Image credit: Voyis)

matched across the entire field of view, both in the center of the image and in the corners. When these images are combined into a final model, image brightness must be consistent across both an individual image and between sequential images to avoid visible stitch lines.

Voyis imaging systems employ a two-pronged approach to combat uneven lighting, utilizing both physical and algorithmic lighting correction.

LEDs inside the lights are individually oriented based on the selected camera separation to distribute the artificial light, biasing more to the corners of the image. The second prong is utilizing high dynamic range data—the ability of the camera to resolve a wide range of light intensities—to further optimize. A common example is resolving bright reflections off the target and weak reflections off the dull seabed.

Intelligent image enhancement algorithms can utilize this extra intensity information to effectively brighten dark areas of the image without any loss of quality.

CAMERA FOCUS

The final factor is consistent image capture. Many underwater camera systems utilize Auto Focus to continuously optimize image focus as the scene varies throughout a survey. When employed to survey complex structures, the focus algorithm will often lock onto different features in sequential image captures and noticeably adjust the overall camera focus. This focus inconsistency hinders both the ability of photogrammetry to match a feature between frames and can also create focus variation artifacts in the 3D model. Moreover, when a lens' focus

changes, its parameters change, altering the camera's calibration and reducing the accuracy of final photogrammetric 3D model.

Voyis has concluded that the use of a fixed focus lens is best suited for a survey-grade camera as it maintains a constant camera calibration and is more robust to a dynamic image scene. By finely tuning the optical system during calibration it is possible to provide both a consistent focus across the field of view, and an effective depth of field across typical imaging ranges.

UNDERWATER PHOTOGRAVIMETRY

The combination of these unique solutions has produced a survey-grade color imaging system that delivers consistently corrected images that remove all aspects of the water medium—color, lighting, and distortions. The result is optical datasets that can be directly utilized in standard photogrammetry software packages to produce incredible wide-area image maps and 3D models that truly bring the ocean to life.

Innovations in subsea technology have made it possible to visually explore vast areas of our oceans more efficiently and with greater detail. It is by deeply understanding the core challenges of underwater optics, both the scientific and practical considerations, that we can push the limits of underwater imaging and provide a robust solution for surveyors to explore and understand the underwater world with extraordinary detail.

Through their seamless integration into subsea vehicles, this is ultimately what our Observer and Nova imaging solutions help users achieve, optimized color images for photogrammetry, machine learning, and survey visualization.

VOYIS 



▲ Shipwreck data captured using Voyis' optical sensors and color correction technology. (Image credit: Voyis)

NEW OPEN-SOURCE IMAGE DATABASE UNLOCKS THE POWER OF AI FOR OCEAN EXPLORATION

A new collaborative effort between MBARI and other research institutions is leveraging the power of artificial intelligence and machine learning to accelerate efforts to study the ocean.

In order to manage impacts from climate change and other threats, researchers urgently need to learn more about the ocean's inhabitants, ecosystems, and processes. As scientists and engineers develop advanced robotics that can visualize marine life and environments to monitor changes in the ocean's health, they face a fundamental problem: the collection of images, video, and other visual data vastly exceeds researchers' capacity for analysis.

FathomNet is an open-source image database that uses state-of-the-art data processing algorithms to help process the backlog of visual data. Using artificial intelligence and machine learning will alleviate the bottleneck for analyzing underwater imagery and accelerate important research around ocean health.

"A big ocean needs big data. Researchers are collecting large quantities of visual data to observe life in the ocean. How can we possibly process all this information without automation? Machine learning provides a pathway forwards, however, these approaches rely on massive datasets for training. FathomNet has been built to fill this gap," said MBARI Principal Engineer Kakanji Katija.

Project co-founders Katija, Katy Croff Bell (Ocean Discovery League), and Ben Woodward (CVision AI), along with members of the extended FathomNet team, detailed the development of this new image database in a recent research publication in *Scientific Reports*.

UNDERWATER IMAGE DATABASE

Recent advances in machine learning enable fast, sophisticated analysis of visual data, but the use of artificial intelligence in ocean research has been limited by the lack of a standard set of existing images that could be used to train the machines to recognize and catalog underwater objects and life. FathomNet addresses this need

by aggregating images from multiple sources to create a publicly available, expertly curated underwater image training database.

Over the past 35 years, MBARI has recorded nearly 28,000 hours of deep-sea video and collected more than 1 million deep-sea images. This trove of visual data has been annotated in detail by research technicians in MBARI's Video Lab. MBARI's video archive includes approximately 8.2 million annotations that record observations of animals, habitats, and objects. This rich dataset is an invaluable resource for researchers at the institute and collaborators around the world.

FathomNet incorporates a subset of MBARI's dataset, as well as assets from National Geographic and NOAA.

"FathomNet is a great example of how collaboration and community science can foster breakthroughs in how we learn about the ocean. With data from MBARI and the other collaborators as the backbone, we hope FathomNet can help accelerate ocean research at a time when understanding the ocean is more important than ever," said Lonny Lundsten, a senior research technician in MBARI's Video Lab, co-author, and FathomNet team member.

As an open-source web-based resource, other institutions can contribute to and

use FathomNet instead of traditional, resource-intensive efforts to process and analyze visual data. MBARI launched a pilot program to use FathomNet-trained machine-learning models to annotate video captured by remotely operated underwater vehicles (ROVs). Using AI algorithms reduced human effort by 81 percent and increased the labeling rate tenfold.

ADVANCING OCEAN EXPLORATION

Machine-learning models trained with FathomNet data also have the potential for revolutionizing ocean exploration and monitoring. For example, outfitting robotic vehicles with cameras and improved machine-learning algorithms can eventually enable automated search and tracking of marine animals and other underwater objects.

"Four years ago, we envisioned using machine learning to analyze thousands of hours of ocean video, but at the time, it wasn't possible primarily due to a lack of annotated images. FathomNet will now make that vision a reality, unlocking discoveries and enabling tools that explorers, scientists, and the public can use to accelerate the pace of ocean discovery," said Katy Croff Bell, founder and president of the Ocean Discovery League and a FathomNet co-founder.



» FathomNet leverages expertly labeled visual data from contributors around the world.
(Photo credit: MBARI)

BORA BLUE OCEAN RESEARCH ALLIANCE CELEBRATES 1 YEAR ANNIVERSARY

October 13, 2022 marked the first anniversary of BORA Blue Ocean Research Alliance, formed between Subsea7 and the National Oceanography Centre (NOC).

Offshore industries operate globally, reaching geographic areas and depths where ocean observations have been lacking and, critically, make repeat operations in locations. Through BORA Blue Ocean Research Alliance, Subsea7 and the NOC are pioneering a new way of working between scientific research and industry to enable greater global access to locations and depths to gather data and develop scientific research to help advance global knowledge for universal benefit.

The foundation of ocean observations is the Essential Ocean Variables (EOV), high-impact parameters that are feasible to measure consistently from diverse platforms. In its first year, the BORA team of scientists and engineers has developed BORAbox™, a system for integrating a novel microfluidics sensor package into the Subsea7 ROV fleet to measure the inorganic carbon EOV. The instruments collect data on the ocean carbonate system (a buffering system that helps to maintain the pH of seawater to within a narrow range) from the ocean sub-surface to the deep seabed and provide crucial information to understand ocean acidification across the globe.

The first BORAbox™ is successfully transmitting data from the west of Shetland, UK, from an ROV on one of Subsea7's vessels, *Normand Subsea*, to NOC scientists. The results compare well with the sparse publicly available data and will expand the measurements spatially and over time. The next deployment is for offshore Brazil this November, with planned subsequent operations in Norway, the UK, Australia and around the globe. The ambition is to have more than ten operational by 2024 and doubling in coming years as support grows. The program will provide baseline carbonate system measurements in areas with no data and the possibility to assess change over time in regions where data already exists.

The collaboration develops other ventures ranging from biodiversity, acoustic and digital imaging projects, aiming to gather data of significant scientific value. It provides a wealth of unique opportunities for local scientific research in areas where hydrocarbon and renewables industries are active, maximizing the data gathering opportunity and offering an efficient solution to offshore environmental data collection.

BORA Blue Ocean Research Alliance is developing a model for how the industry can contribute to global ocean observations with many more projects now in development.



» BORA Blue Ocean Research Alliance at Oceanology International early this year. (Photo credit: BORA)

An advertisement for Subsea7's Ocean Power & Monitoring services. The top section is red with the title "Ocean Power & Monitoring" and the tagline "Transform into the cost-efficient and sustainable future". Below this, there are three circular sections: "OceanPack™ Underway" (a tall black unit), "Racing" (a smaller unit with a screen), and "pCO₂ optical Analyzer" (a unit with a dial). A red circle highlights the "SOCAT ready" feature. The middle section is blue with the title "GHG Monitoring" and the tagline "Modular, easy to use and reliable monitoring incl. pCO₂ and Microplastic". The bottom section is light blue with the title "Subsea Li-Ion Batteries" and the tagline "Highly reliable, efficient and safe underwater power solutions for DC + AC". It shows "Standard Batteries" (a row of cylindrical batteries), "Vehicles" (a cylindrical battery), and "Energy Storage & UPS Systems" (a yellow metal cage containing batteries). A red circle highlights the "API17F Offshore certified" feature. The Subsea7 logo is in the bottom right corner.



SEEING IN THE DARK

By Saab Seaeye

The ability to see, record, and survey below the waterline means that structures can be maintained, dams and bridges kept safe, tunnels kept working, harbours and hulls secured, divers safer, and marine science and eco system studies can flourish. As operators seek to leverage the latest ocean tech innovations to carry out a range of challenging tasks in highly variable conditions—and to ever pressing deadlines—reliability is the single most important factor when considering the best tools for the job.

At Saab Seaeye, reliability is a key focus when creating robotics, from smaller observation vehicles to heavy work class vehicles. Expecting a system to work tirelessly is a measure of success, which is why the all-electric multi-tasking Seaeye Falcon has remained world leader in its class with over a million hours underwater clocked.

In celebration of how far observation class robots have come in recent years, here are a few snapshots of how remotely operated technologies are transforming how we work at sea.

Finding lost ocean tracking stations: Ocean Tracking Network (OTN)

For global aquatic research the OTN has 2,000 acoustic tracking stations across five oceans, spanning seven continents, including in freshwater highways to the ocean for species that migrate between fresh and salt waters.

The OTN use their Falcon to find stranded stations that have shifted from their coordinates, thereby saving valuable equipment and its recorded data.

Mapping the brain: City University of New York and Yale University

Bright bioluminescent and fluorescent proteins found in marine life, when attached to human cells, become light-emitting markers that could help map the brain and trace otherwise invisible nerve damage ready to help study Alzheimer's and other diseases of the mind, along with cancer.

A Falcon was equipped with the most advanced cameras ever fitted to a robotic vehicle, for detailed analysis of bioluminescent marine life.

Japan's floating turbines: Shibuya Diving Industry

Shibuya recognizes that robots are best placed to confirm the stability of deep mooring anchorages and for carrying out periodic inspections of floating turbine structures.

Offshore production tanks: Stinger Technology

Stinger had an ingenious idea to penetrate the labyrinth inside offshore production tanks in search of environmental contaminants prior to decommissioning.



» Subsea robots are ideally suited for periodic inspections of offshore wind structures. (Photo credit: Shibuya Diving Industry)

They managed to squeeze a unique underwater robotic systems configuration, loaded with sampling technology, through a 150 cm square hatch to search the tank's internal maze of baffles and navigate along 25.5 cm diameter pipe-runs of curves and bends.

Stinger turned a Falcon into a 'mother ship' from which was launched a smaller fly-out VideoRay and tiny fly-out Stinger Nano – dubbed 'Mother, Daughter and Little Sister'.

Roman wrecks: National Center for Underwater Archaeology of Spain

Wine destined for the Roman colony in Cartagena remained undiscovered at the bottom of the Mediterranean until it was spotted on a sonar, before sending down a Falcon to investigate and film.

Thousands of clay wine jars were found carefully packed in the hold of the ship where they had lain undisturbed for over 2,000 years.

Offshore pipeline surveillance: SISTAC Brazil

Online fibre optic video surveillance of the 'Pull in – Pull out' pipeline connection process using their Falcon's HD camera is monitored by operators onboard throughout the operation.

Bridge and dam inspection: IDCBTP

Precision data can identify repairs needed and help maintenance planning and spot trends in structure condition. For a clear and accurate analysis of the condition of the structures, IDCBTP's Falcon is fitted with a range of systems including lasers, multibeam sonar, profiler sonar and navigation and positioning systems.

GLOBAL MARITIME'S EVENT SIMULATION TOOL SUPPORTS OCEAN WINDS GLOBAL PROJECT PORTFOLIO

Global Maritime (GM) announces that their OPSIM software has been selected by Ocean Winds to support in the production of complex simulations during early phase project development.

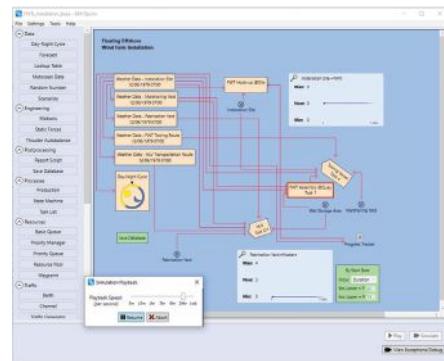
OPSIM is a proprietary software that GM have developed over the last ten years. Originally developed to support the specialist consultancy GM provide, OPSIM is now used widely across the energy sector and has been under increased demand within the offshore wind sector in particular.

Utilizing discrete event simulation methodology, OPSIM is able to produce complex simulations that enable users to develop credible transport and installation strategies, mitigate risk, and optimize their

engineering resources accordingly. OPSIM's playback mode allows for visualization of the simulation at a variable speed, in order to verify and QA model behavior, allowing for maximum confidence in the final results.

"We are extremely proud of OPSIM and its development journey," stated Matthew Bernstein, Senior Software Engineering at Global Maritime and creator of OPSIM. "OPSIM versatility addresses the lack of flexibility experienced in other tools. Its module-based construction also allows the quick and easy customization of the software to include new features and reporting for specific projects, quickly and easily."

"OPSIM will play a key role during our early-stage evaluation of projects," added Pilar



» OPSIM software is used widely across the energy sector. (Image credit: Global Maritime)

Crespo, Head of Offshore Installation at Ocean Winds. "It will enable us to determine key and fundamental aspects that allow onward development."

OPSIM is one example of a suite of software solutions developed within GM. Other examples include GMoor, a specialist frequency domain software which provides mooring analysis. GMoor has been utilized across the energy sector for over a decade and is now being optimized to provide complex analysis into the floating offshore wind sector.

An advertisement for MSI Transducers. It features a yellow submarine-like vehicle with a conning tower and a fin, shown from a side-on perspective. The vehicle is emitting several curved blue lines representing sonar beams against a dark blue background. To the right of the vehicle, the text reads: "Custom Sonar & ACOMMs Solutions for Challenging Applications". At the bottom right, the website "MSITRANSUCERS.COM" is listed.

An advertisement for MSI Transducers. On the left, there is a graphic consisting of several overlapping white circles on a black background, set against a backdrop of underwater coral reefs. To the right of this graphic, the letters "MSI" are written in large, bold, black, sans-serif capital letters. A registered trademark symbol (®) is located at the top right of the "I". Below "MSI", the word "TRANSDUCERS" is written in a smaller, bold, black, sans-serif font. The entire logo is set against a background of blurred underwater imagery.

UNVEILING THE NEXT GENERATION IN CTD DATA COLLECTION



By Guy Frankland,
Head of Marketing, Valeport Ltd



The most recent innovations added to Valeport's precision marine instrument portfolio, the SWiFT CTDplus Turbidity and SWiFT CTDplus Chlorophyll a, bring a new era of accuracy and convenience for hydrographers.

A CTD is one of the most used instruments in marine survey. Recognizing that accurate, measured Conductivity, Temperature and Depth data is essential for some surveyors, we have evolved the CTD profiler to not only make it easier to use and more accurate, but to combine it with turbidity and fluorometry observations.

These new sensors are the next generation in the SWiFT profiler range and provide survey-grade sensor technology coupled with the convenience of Bluetooth® connectivity, rechargeable battery and GPS to deliver the highest quality data.

INNOVATION IN THE FIELD

Designed with the intention of seamless workflow, the SWiFT CTDplus Turbidity and SWiFT CTDplus Chlorophyll a have all the benefits of the SWiFT profiler range and feature an integral GPS module so every profile the SWiFT CTD produces is timestamped and geo-located without the user having to log positions manually or cross-reference with another GPS source.

With Bluetooth connectivity the SWiFT CTDplus does not need to be plugged into a cable to be configured or to download data, instead data can be quickly and easily downloaded wirelessly, and uses Valeport's Ocean software for iOS, Android and PC platforms. The data can then be easily instantly shared in industry standard data formats.



» SWiFT CTDplus Turbidity and Chlorophyll a sensors' end cap feature user-friendly LED indications for operational status, GPS, battery, and Bluetooth. (Photo credit: Valeport)

Developed with simplicity in mind, the SWiFT CTDplus is devised with a straightforward switching on/off action, the magnetic switch ring is easy to operate, even with cold hands, it simply turns through 90 degrees and reassuringly clicks into position. The end cap features user-friendly LED indications for operational status, GPS, battery and Bluetooth® wireless technology.

Problematic battery changes are also a thing of the past with the SWiFT CTDplus profilers. The rechargeable battery, with greater than 100 hours battery life, is simple and easy to recharge.

RESULTS WITH ENHANCED ACCURACY

Using Valeport's world-leading high accuracy sensor technology to combine sensors for multiple profiles in a single drop, the SWiFT CTDplus Turbidity and SWiFT CTDplus Chlorophyll a feature a new fast response temperature probe and both operate down to 500 m as standard, delivering directly measured Conductivity, Temperature and Depth with turbidity or fluorometry observations.

In addition to the directly measured CTD, each of the SWiFT CTDplus profilers deliver computed Salinity, Density and Sound Velocity which is calculated using the UNESCO international standard algorithm and the Chen and Millero equation, delivering highly accurate data.

Valeport's turbidity technology in the new SWiFT CTDplus Turbidity is essentially based on two sensors in one. The first is a "classic" nephelometer, using a 90° beam angle for turbidity levels between 0 and 2,000 NTU. The second sensor uses Optical Backscatter (OBS) for turbidity levels up to 10,000 NTU. The sensors output data separately and simultaneously at a programmable rate. This means that there is no need to switch ranges as conditions vary. Intelligent sampling and the use of a 24 bit ADC eliminates the need to switch gain.

STREAMLINING MARINE SURVEY

With an operational battery life of up to five days and the convenience of charge via USB, the SWiFT CTDplus is intended for offshore, coastal, harbor, and inland environmental and hydrographic survey use.

Constructed from titanium to provide unrivalled durability and for its corrosion resistant properties in salt water, the SWiFT CTDplus is robust. The conductivity sensor with its ceramic core is housed in a strong acetal protective cage, and an additional deployment cage is also available to bolt onto the instrument to secure additional weight and so help the SWiFT CTDplus get to depth in fast-flowing currents.

Both SWiFT CTDplus profilers are easily portable, ø78 mm x length 350 mm, weighing in at just 2.7 kg (in air) / 1.65 kg (in water).

They are supplied in a durable system transit case, with PC Bluetooth adapter, USB interface and charging cable, Valeport Ocean software and the operating manual.



» SWiFT CTDplus Chlorophyll a is intended for offshore, coastal, harbor, and inland environmental and hydrographic survey use. (Photo credit: Valeport)



» SWiFT CTDplus sensors are supplied in a durable system transit case. (Photo credit: Valeport)

SENSOR PIONEERS

Developed by Valeport's own in-house Research and Development team, the new SWiFT CTDplus profilers come with a three-year warranty from new. All Valeport's CTD profilers are calibrated and pressure checked in Valeport's state-of-the-art laboratories and workshops before dispatch from Valeport's UK-based premises.

Beyond the three-year warranty, Valeport's Service and Calibration department are able to keep Valeport instruments performing as new for many years and offer a unique 12-month warranty on all serviced Valeport instruments.

Valeport's Research & Development team are continually working to evolve the SWiFT range of profilers and new parameters are anticipated in 2023.

For over 50 years, Valeport has been designing and manufacturing precision oceanographic and hydrographic instrumentation which includes: CTD & Environmental, Current, Echosounders & Bathymetry, Sound Velocity and Tide Gauges.

Valeport technology is trusted by leading subsea, hydrographic, hydrometric, metrological & positioning, oceanographic, ports, harbors & dredging, renewable energy and scientific research organizations worldwide.

The SWiFT CTDplus Turbidity and SWiFT CTDplus Chlorophyll a are now available to order; for more information visit valeport.co.uk or contact: sales@valeport.co.uk.

NASA'S S-MODE FIELD CAMPAIGN DEPLOYS TO THE PACIFIC OCEAN

When the research vessel Bold Horizon sailed from Newport, Oregon, in early October, it joined a small armada of planes, drones, and other high-tech craft chasing the ocean's shapeshifting physics.

NASA's Sub-Mesoscale Ocean Dynamics Experiment (S-MODE) team has been deploying a new generation of tools to a patch of sea 110 nautical miles off the coast of San Francisco to observe whirlpools, currents, and other dynamics at the air-sea boundary. The goal: to understand how these dynamics drive the give-and-take of nutrients and energy between the ocean and atmosphere and, ultimately, help shape Earth's climate.



» NASA's S-MODE mission brings a new generation of observational tools to study ocean surface currents. (Image credit: NASA Goddard Space Flight Center)



» NASA's S-MODE field campaign brings to bear a densely equipped research vessel and a new generation of observational tools to study dynamics near the ocean surface. (Photo credit: NASA)

Perhaps the most familiar "sub-mesoscale" features are the phytoplankton-rich swirls, or eddies, that can be seen spiraling across the ocean from orbiting Earth satellites.

"Some of the coolest images of ocean sub-mesoscale eddies come from photographs taken on the Apollo spaceflight missions," said Tom Farrar, a scientist at the Woods Hole Oceanographic Institution in Massachusetts and principal investigator for S-MODE.

Such features are challenging to analyze because, spanning up to 6.2 miles (10 kilometers), they are larger than any vessel but smaller than regions typically studied with satellite

measurements. Infused with energy, they can change within hours. Farrar says researchers' ability to model these dynamics on a computer has outpaced their ability to tackle them at sea—until recently.

This work is important because while the surface layer makes up only about 2% of the ocean, it plays an outsize role in the climate system. It is there, at the air-sea boundary, where nutrients, gases, and heat are traded—a process called vertical exchange.

The process is not fully understood, and S-MODE's observations may help reconcile differences among today's models. The implications for climate science are significant. By some estimates, the net effect of sub-mesoscale eddies on the vertical exchange of heat is an order of magnitude larger than the planet's energy imbalance linked to the greenhouse effect.

Clocking the Ocean Surface

Protruding from the belly of a King Air B200 aircraft from NASA's Armstrong Flight Research Center in Edwards, California, is an instrument Farrar calls one of the stars of the mission. From its perch 28,000 feet (8.5 kilometers) in the air, DopplerScatt uses radar to bounce electromagnetic energy off wind-tossed ocean surface and measure the energy that scatters off.

Developed at NASA's Jet Propulsion Laboratory in Southern California, the instrument can simultaneously map surface currents and winds. "With S-MODE, we're trying to observe two things at the same time: how the ocean moves, and how ocean and atmosphere communicate

and affect each other," said Nadya Vinogradova Shiffer, S-MODE program scientist and physical oceanography program manager at NASA's Headquarters in Washington.

"The team relies on state-of-the-art weather forecasting to identify rough, windy conditions because radar can't 'read' a calm, flat sea," said Dragana Perkovic-Martin, principal investigator for DopplerScatt at JPL. "A glossy sea surface produces very little radar signal. We need wind to disturb the surface and produce the signal we are after," she added. "Being part of a mission of this scale can be exciting and nerve-wracking."

Aboard another aircraft is an instrument that can image microscopic marine life in billions of colors. Resembling a metal basketball, JPL's Portable Remote Imaging SpectroMeter (PRISM) will ride inside a Gulfstream III jet, spying phytoplankton blooms in hundreds of wavelengths ranging from ultraviolet to infrared.

By tracking chlorophyll, a telltale signature of these algae, PRISM will help scientists visualize ecology interacting with ocean currents, providing exponentially more information than familiar three-channel (red, green, blue) cameras. It will also inform next-day flight planning during the campaign, said David Thompson, JPL principal investigator for PRISM.

"PRISM is one of our eyes chasing sub-mesoscale features across the ocean," he said. "The mission is incredibly interdisciplinary, and we all come together around this instrument."

This was the second of three deployments, with S-MODE's final deployment slated for spring 2023.

NARROWING THE OCEAN DATA GAP WITH BACKYARD BUOYS

A new ocean science effort to improve equity and inclusion is underway, thanks to a \$4.98 million cooperative agreement to three regional associations of the NOAA-led U.S. Integrated Ocean Observing System. The National Science Foundation (NSF) provided the funds through a cooperative agreement for Backyard Buoys, a project to improve ocean data access for Indigenous communities.

Backyard Buoys empowers Indigenous and other coastal communities in the Pacific Northwest, Alaska and the Pacific Islands to collect, steward and use wave data captured by strategically placed buoys to complement their existing knowledge. The effort will support their blue economy, which includes maritime activities, food security and coastal hazard protection.

The initiative brings together a geographically and culturally diverse group of partners that include three regional associations of the NOAA-led U.S. Integrated Ocean Observing System (NANOOS in the Pacific Northwest, AOOS in Alaska, and PacIOOS in the Pacific Islands); Indigenous and education partners from each region; and the wave buoy and sensor company Sofar Ocean. Together, they



» Alaska Eskimo Whaling Commission staff hold Sofar buoys at a co-production workshop. (Photo credit: James Kendall/BOEM)

are working to close the gap in access to coastal and ocean data, especially for Indigenous communities in remote coastal areas.

The initiative is one of six Phase II projects aligned to the Track E: Networked Blue Economy. It is funded through the NSF Convergence Accelerator, a program created to find solutions to large-scale societal challenges related to climate, sustainability, food, energy, pollution and the economy through research, innovation and partnerships. See this Alaska Ocean Observing System press release for more information. For more information, see the Backyard Buoys 2022 Phase 2 press release on the Backyard Buoys page of the PacIOOS website.

TRANSFORM YOUR CAPABILITY

USBL POSITION TRACKING IN ALL ENVIRONMENTS

SeaTrac Acoustic Positioning Beacons

Accurate, reliable USBL positioning even in the most challenging underwater environments. Real-time ROV, AUV and diver tracking over a 1000m range.

Depth rated to 300m or 2000m.

seatrac

A detailed image of a SeaTrac Acoustic Positioning Beacon. It is a cylindrical device with a black housing and a blue band around the middle. The band has the text "SEATRAC" and "X150" printed on it. The device is shown in an underwater environment with bubbles and light rays.

www.blueprintsubsea.com
enquiries@blueprintsubsea.com

ADVANCED NAVIGATION LAUNCHES BOREAS D70

Advanced Navigation, the world's most determined innovator in artificial intelligence for robotic and navigation technologies, has launched Boreas D70, a fiber-optic gyroscope (FOG) inertial navigation system (INS).

The D70 is the latest release in the Boreas digital FOG (DFOG) series, offering a new performance grade with superior accuracy, exceptional stability and reliability. The technology is well suited to surveying, mapping, and navigation across subsea, marine, land and air applications.

"We are thrilled to expand the Boreas series with the D70. It's a system that will provide additional flexibility in the Boreas family, making ultra-high accuracy inertial navigation far more affordable than previous FOG INS systems," said Xavier Orr, CEO and co-founder of Advanced Navigation.

"This patented technology opens the possibility for adopting FOG INS systems across a much broader range of vehicular applications, particularly autonomous vehicles and aircraft, where weight and size are at a premium."

D70 Unrivaled Performance

Boreas D70 combines cutting-edge closed-loop DFOG and accelerometer technologies, with a dual antenna RTK GNSS receiver. These are coupled with Advanced Navigation's AI based fusion algorithm to deliver accurate and precise navigation.

The system features ultra-fast gyro compassing, acquiring and maintaining an accurate heading under the most demanding conditions. While D70 does contain a GNSS receiver, it's not required for gyrocompass operation.

Based on revolutionary DFOG technology, D70 delivers a 40% reduction in size, weight, power and cost (SWaP-C), when compared to systems of similar performance.



THE FUTURE OF FIBRE OPTIC GYROSCOPES

BOREAS D70 - GNSS / INS

- 0.01° Roll and Pitch
- 0.1° Sector Heading (Gyrocompass)
- 0.01°/hr Bias Instability
- 10mm Position Accuracy

The Boreas Series

The Boreas DFOG series features ultra-fast gyro compassing and can acquire heading, either stationary or dynamically, in under 2 minutes. The gyro compassing allows the system to determine a highly accurate heading without any reliance on magnetic heading or GNSS.

The technology stems from Advanced Navigation's AI sensor fusion algorithm allowing the system to extract significantly more information from the data. It is designed for control applications, with a high level of health monitoring and instability prevention to ensure stable and reliable data.

Advanced Navigation designed Boreas from the ground up for reliability and availability. The hardware and software are designed and tested to international safety standards and have been environmentally tested to MIL-STD-810. The system achieves a mean time between failure (MTBF) of over 70,000 hours.

Additional features of the Boreas D70 include Ethernet, CAN and NMEA protocols, as well as disciplined timing via a PTP server and 1PPS. A rich, responsive embedded web interface provides full access to all of the device's internal functions and data. Internal storage allows for up to 1 year of data logging.

UNIVERSITY OF PLYMOUTH INVEST £1.2 MILLION IN NEW UNDERWATER COMMUNICATIONS NETWORK

The University of Plymouth is leading a £1.2 million project to upgrade the offshore infrastructure of Smart Sound Plymouth.

The initiative, supported by funding from the Heart of the South West Local Enterprise Partnership, will further enhance the unique proving ground for businesses to test, trial, prototype and commercialize new products and services.

The Smart Sound Connect Subsurface project builds on the Smart Sound Connect infrastructure launched in March 2022.

Working with Plymouth Marine Laboratory, it will install an underwater acoustic communications network that will be integrated with the existing private 4G/5G and wave relay mesh networks that provide connectivity more than 20 nautical miles offshore.



UNIVERSITY OF PLYMOUTH

Combined, this upgraded network will reinforce Smart Sound Plymouth as a unique fully connected proving ground for businesses to develop advanced marine technologies across all domains; above, on and below the water.

In addition, the Smart Sound Connect Subsurface project will be enhanced by new specialist lab facilities at City College Plymouth's Centre for Higher Technical and Maritime Skills at Oceansgate.



See the depths like we see the surface.

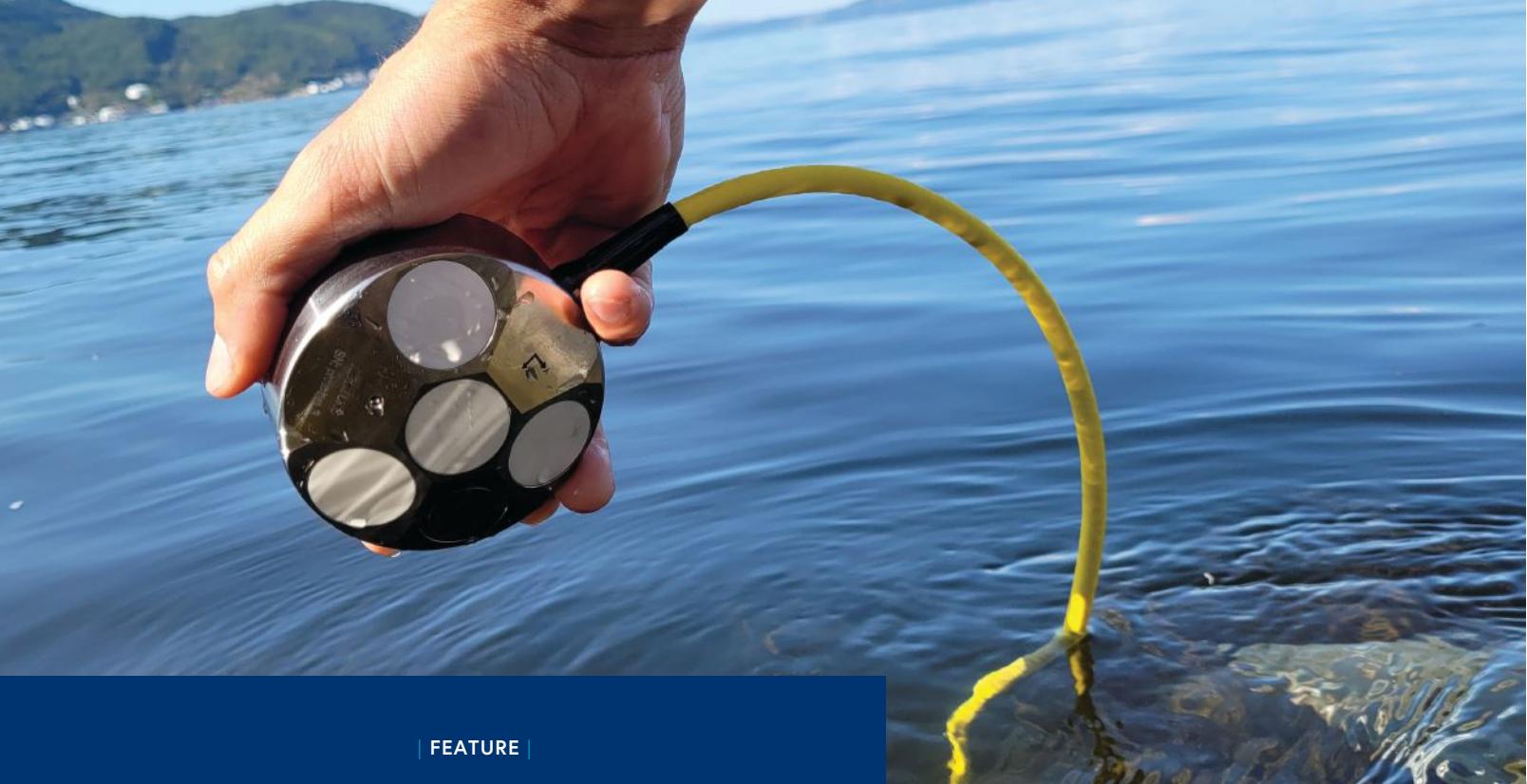
SURVEY-GRADE COLOUR IMAGING

Our high-resolution Observer cameras paired with our Nova LED panels produce crisp, evenly illuminated stills images at high vehicle speeds and long ranges.

- Faster results by capturing crisp images at high speeds
- Enable survey autonomy with onboard machine learning colour correction
- Complete visual understanding with simplified 3D photogrammetry integrations



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| FEATURE |

GROWING LOW-COST SUBSEA VEHICLE MARKET ENABLED BY SENSOR INNOVATIONS

The subsea vehicle market is no longer limited to companies and institutions with deep pockets and highly specialized expertise. There is a new subsea community using small, low-cost and easy-to-operate ROVs and AUVs thanks to advances in subsea technology.

RIGHT-PRICED, COMPACT SUBSEA NAVIGATION SENSOR

For these vehicles to maximize their usefulness, the vehicle pilot or operator needs to know where the vehicle is throughout operation. Once it arrives on location, the operator must make use of sensor-aided vehicle control to maneuver the vehicle and perform a task. This need is exemplified when using ROVs to inspect fish farms, maintaining

navigational consistency for offshore subsea survey vehicles, or deploying ROVs to perform visual inspection of a wind turbine in high currents.

Both of these operational requirements, navigation and vehicle control, require a suite of sensors to understand where and how the vehicle is moving. The challenge is composing this suite of sensors in a form factor small enough for the space available and keeping costs low enough to fit in an overall mission budget.

A Doppler velocity log (DVL) is a critical component of a subsea vehicle used to provide accurate navigation, station keeping and altitude measurements. Historically, low-cost small ROVs and AUVs have not been equipped with a DVL due to the prohibitive cost, size and complex integration requirements.

» New sensors, like Nortek's Nucleus1000, are fueling the development of small, low-cost subsea vehicles for commercial and research projects previously beyond the budget and capabilities of many ROV users. (Photo credit: Nortek)



By Torstein Pedersen,
Product Manager – DVL,
Nortek

Low-cost vehicle operators are not looking for the survey-grade DVLs Nortek traditionally has offered. What they want is something that makes their life a lot easier—a device with all the functionality they are familiar with, but at a size and cost that is complementary to the vehicle.

If one digs a little deeper, we see that vehicle operators and manufacturers desire a complete sensor package that saves cost and time for system integrators. Aiding those who have to integrate, test and calibrate several sensors, is something we have been thinking about for some time.

A smaller and more affordable DVL comes with compromises: reducing the size of a DVL while keeping costs low generally means it will have lower accuracy than

a larger sensor of the same frequency. However, many small, low-cost vehicles don't require the same level of accuracy provided by a survey-grade DVL to benefit from increased navigation and control abilities.

Users want to have something that is small, in their price class—and the performance has to be proven and sufficient for their needs.

PRIORITIZING EASE OF USE FOR A BROAD RANGE OF USERS

Ease of use is an increasingly important part of the package. The expanding ubiquity and usefulness of smaller subsea vehicles means more people from a broader range of backgrounds are involved in underwater robotics, emphasizing the importance of user-friendliness for all experience levels. Vehicle and sensor manufacturers are therefore focusing on this in their product development.

Enabling small and affordable vehicles to perform crucial and often complicated tasks via sensor integration opens doors for many coastal operations. Users of all experience levels would be able to perform tasks such as station keeping, operating at a constant depth, or navigating to a site in areas of unpredictable current or complex seabed topography.

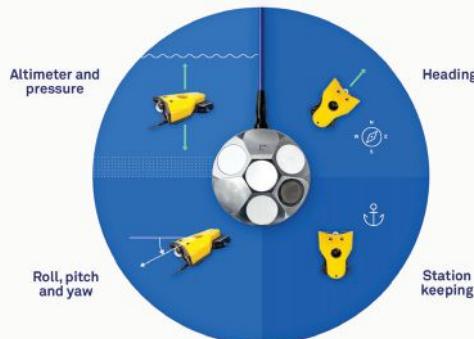
We can imagine that, in the future, many coastal facilities or vessels will have a small vehicle that any of the personnel or crew would have the ability to launch and use to conduct an inspection.

SENSOR SUITE FOR ULTRA-COMACT INSTRUMENTS

Sensors need to be integrated onto the vehicle, calibrated, and synchronized to provide useful navigation and positioning data. In many cases, the job of integrating the altimeter, attitude and heading reference system (AHRS), pressure sensors and temperature sensors will be the responsibility of the vehicle manufacturer before the vehicle meets its end user.



» As the core of your vehicle's navigation system, the Nucleus1000 enables users of even the smallest subsea vehicles to control and navigate them efficiently and effectively. (Photo credit: Nortek)



» The Nucleus1000 is a compact and integrated subsea navigation package that synchronizes all the necessary sensors required for vehicle control of small subsea vehicles. (Image credit: Nortek)

To alleviate the difficulties vehicle manufacturers face with this multi-sensor integration, Nortek offers the Nucleus1000, a three-transducer 1 MHz DVL with integrated AHRS, pressure and temperature sensors.

The Nucleus1000 provides a suite of sensors for control and navigation in a compact instrument that weighs just under 300 g in water and measures 90 mm in diameter by 42 mm in height—about the size of a standard can of tuna. The small instrument is rated to 300 m depth and performs with low power consumption.

The Nucleus1000 is unique in having all the sensors necessary for navigation and control in an ultra-compact package. The temperature sensor together with an estimate of salinity is necessary for the DVL's accuracy by estimating speed of sound in water. The vehicle's position in the water column is provided through the pressure sensor (depth), along with a dedicated altimeter—a vertically oriented transducer that provides altitude estimates directly below the vehicle. The Nucleus1000 incorporates a high-grade MEMS-Magnetometer AHRS for direction and information on how the vehicle is tilting.

The sensor also offers water tracking to maintain DVL capability when the bottom is out of range. It can be used for current profiling using alternate pings, an important feature when conditions are potentially dangerous for divers or for ROV deployment.

The Nucleus1000 is offered with two levels of accuracy. One is export-license-free with around 1 percent accuracy—sufficient for a wide range of tasks. If the user needs greater accuracy for higher-grade applications, there is also a 0.3 percent accuracy option (which is export controlled).

Pre-calibration and alignment of multiple sensors saves users time and money, while opening doors for new, less experienced subsea vehicle operators. The rapidly expanding subsea robotics industry will need to rely on instruments like the Nucleus1000—an affordable, compact and streamlined sensor ideal for integration on small vehicles.

For more information, visit: www.nortek.com.





PROPELLER ANNOUNCES \$100 MILLION FUND TO INVEST IN OCEAN-CLIMATE COMPANIES

Propeller, a climate-tech fund that invests in and builds ocean-climate companies, has announced its inaugural \$100 million fund to support founders looking to address the climate crisis by advancing planet-saving, ocean-based science and technology solutions.

Propeller is bolstered by a world-class leadership team—including Brian Halligan, Co-founder and Executive Chairperson of HubSpot, Devdutt Yellurkar, General Partner at CRV, climate scientist and oceanographer Dr. Julie Pullen, ocean investor and entrepreneur Reece Pacheco, and Steven Fox, international business builder and investor. Collectively, they bring a wealth of business acumen and decades of investment expertise to Propeller aimed at catalyzing growth of the \$2.5 trillion blue economy.

Amidst the landscape of emerging climate funds, Propeller is distinguished by its focus on the ocean and a unique partnership with Woods Hole Oceanographic Institution (WHOI). This collaboration will provide access to the brightest minds and intellectual property (IP) in ocean science and innovation, ensuring that the most promising, scientifically-sound oceanic solutions receive the mission-critical capital, tools and resources required to attract private sector capital and scale. For more than 90 years WHOI has been pushing the boundaries of knowledge about our ocean and its relationship with the rest of our planet, and is a world leader in critical discovery science, technology development, and ocean communications.

"Our ocean holds tremendous potential for scaling up climate and carbon solutions, yet only a fraction of the venture capital dollars that have flooded into climate tech flow to the seascape of ocean-based solutions," said Brian Halligan, founder of Propeller. "The Propeller team together with our partners at Woods Hole Oceanographic Institution launched this fund to change this

dynamic—to invest in the planet's best hope to decarbonize the global economy and turn today's ocean startups into tomorrow's 'harwhals.'"

"This is a critical time for the ocean. There is an urgent need to accelerate ocean discovery, exploration, and technology and sustain precious ocean ecosystems for the benefit of humanity and the health of our planet as a whole," said Dr. Peter de Menocal, president and director of the Woods Hole Oceanographic Institution. "We are excited to be a part of Propeller's new fund, which will support ocean science and technology innovation and accelerate the urgent need for ocean-based climate solutions by bringing these ideas to life."

Propeller also offers a novel Ocean MBA Program, a three-day intensive course taught and designed by Propeller's first-rate leadership team and members of their network. It's designed to empower early-stage founders in the ocean space with the skills they need to lead and rapidly grow their ventures. Much of the curriculum is inspired by real-world courses taught at some of the world's premier business schools, including *Scaling Entrepreneurial Ventures* – a popular course Propeller founder, Brian Halligan, teaches at MIT Sloan. In the words of one Ocean MBA Fellow, the Ocean MBA gave them the "lingua franca" of startups and customer focus they didn't have coming out of science/academia.

"The oceans play a substantial role in buffering us from climate impacts," said Dr. Julie Pullen, chief scientist and partner at Propeller. "It's vital to transform ocean science and technology to meet the expanding markets of the new blue economy. Propeller achieves this by bridging capital and science to center the oceans in addressing the scale of the climate crisis."

SONARDYNE'S RANGER 2 USBL FOR STATE-OF-THE-ART RESEARCH SHIP

Monterey Bay Aquarium Research Institute (MBARI) has chosen deepwater positioning technology from Sonardyne for its new, state-of-the-art scientific flagship the R/V *David Packard*.

The 50-m-long research vessel, named in honor of MBARI's founder, David Packard, is being built to undertake a diverse range of missions in Monterey Bay and beyond, supporting the institute's mission to advance marine science and technology to understand a changing ocean.

The R/V *David Packard* will be the command center for the ROV Doc Ricketts, MBARI's deep-diving remotely operated vehicle. The new research vessel will also be capable of deploying a variety of autonomous underwater vehicles (AUVs).

Underpinning this deep-water capability will be Sonardyne's Ranger 2 Ultra-Short BaseLine (USBL) system, with an HPT 7000 transceiver, which will be integrated into the vessel via a Sonardyne deployment machine.

Ranger 2 is also the preferred USBL solution for many of the world's



»The R/V *David Packard* is currently under construction in Vigo, Spain.
(Image credit: Glosten/MBARI)

leading ocean research institutes, where efficient use of vessel time and accuracy are paramount. It provides researchers with the ultimate flexibility, with its capability to track and communicate simultaneously with multiple scientific instruments, vehicles or towed platforms, at ranges up to 10,000 m. With Ranger 2, operations from seafloor geodesy through to AUV survey missions are supported, anywhere in the ocean.

The ship is being built at the Freire Shipyard in Vigo, Spain and the order for the Ranger 2 system for the R/V *David Packard* was placed via Spanish integration company/agent EMA, Sistemas de Monitorizacion.

Gemini 1200ik
Dual Frequency Sonar

High definition image | 120° field of view | 2.4mm range resolution

Available on short lead time

Tritech

A photograph of the Tritech Gemini 1200ik Dual Frequency Sonar, a blue rectangular device with a circular transducer array on top, resting on a concrete dock. In the background, there are several boats and industrial structures. The text "Gemini 1200ik" and "Dual Frequency Sonar" is overlaid on the upper left of the image. Below the sonar, the text "High definition image | 120° field of view | 2.4mm range resolution" is displayed. At the bottom left, it says "Available on short lead time". The Tritech logo, featuring the word "Tritech" above a stylized wave graphic, is located in the bottom right corner.

OFFSHORE CLEAN ENERGY SYSTEMS: DECARBONIZATION AMIDST ENERGY SUPPLY CHALLENGES



By Andy Martin,
Chief Commercial Officer,
Verlume

As the world faces collective challenges around energy security and supply, the deadlines for reaching 2050 net zero targets remain. Despite these global challenges, we have recently seen concrete examples of the momentum around decarbonization gathering pace.

In the United States, the historic Inflation Reduction Act set out significant tax credits for clean sources of fuels, \$27 billion investment into a clean energy technology accelerator to support deployment of carbon reduction technologies, as well as the first nationwide price on greenhouse gases.

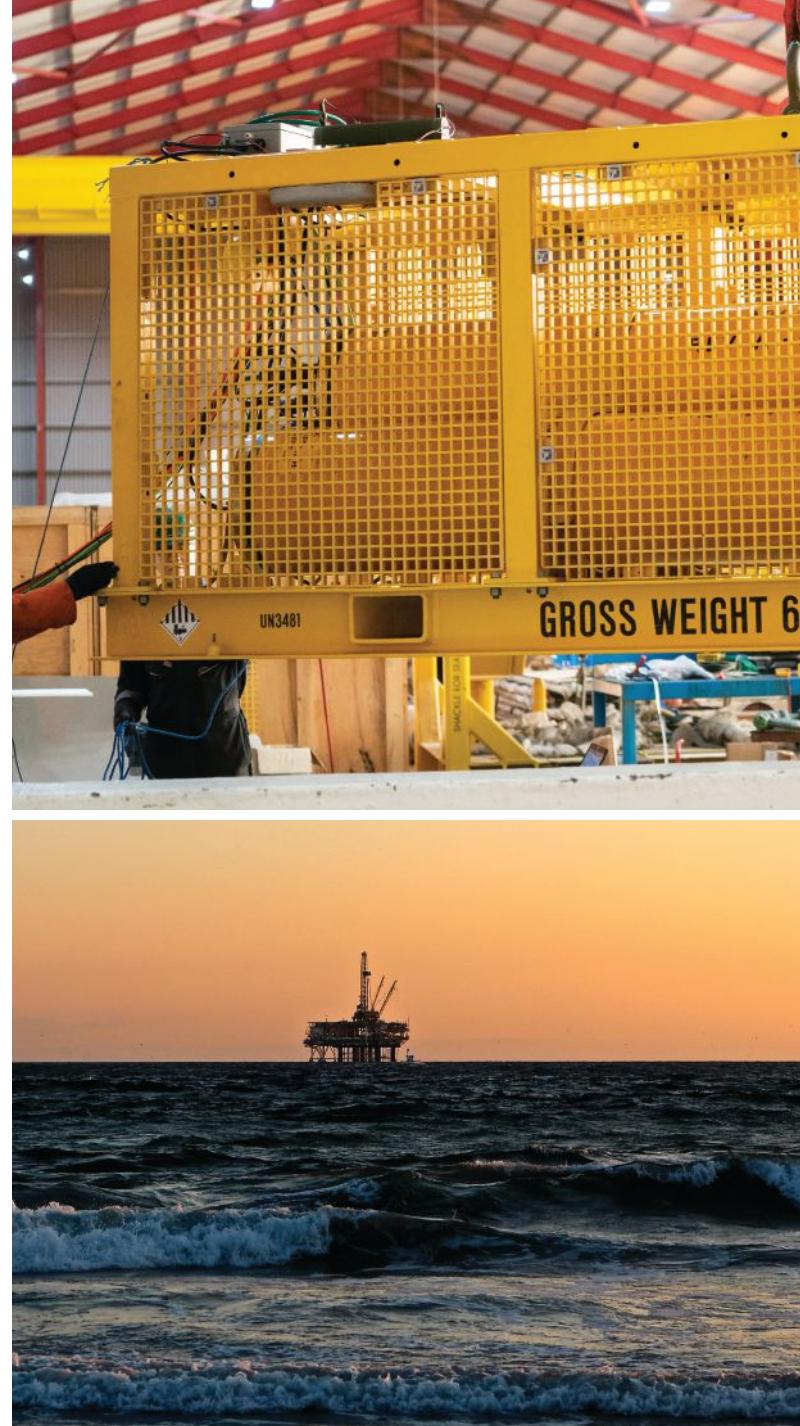
In Canada, the world's fourth-largest oil producer, draft guidelines were recently released for new oil and gas projects to deliver "best-in-class" performance around greenhouse gas emissions. The country aims to cut carbon emissions to around 40% below 2005 levels by 2030.

OFFSHORE ENERGY SYSTEMS FOR DECARBONIZATION

Despite the increasing focus on emissions and integration of clean energy technology, we understand that oil and gas is still a critical element within the world's energy mix and must ensure that it is produced and utilised sustainably. It is, therefore, a high priority to find innovative solutions which reduce overall greenhouse gas emissions related to hydrocarbon production.

At Verlume, we believe that this can be achieved through the electrification of offshore oil and gas operations using renewable energy produced on site.

The advantages of clean energy systems include being able to power longer offsets in the subsea environment without the need for power from shore, thus reducing associated costs and bringing fields to production that would otherwise be marginalised.



» Innovative solutions are required to reduce overall greenhouse gas emissions related to hydrocarbon production. (Photo credit: Verlume)

The ongoing 'Renewables for Subsea Power' (RSP) project is a tangible example of this clean energy approach in action. Renewables for Subsea Power is an active project developed by partners in the UKCS to combine Verlume's Halo seabed battery energy storage system and Mocean Energy's Blue X wave energy converter, together with partners Baker Hughes and Transmark and supported by the Net Zero Technology Centre, Harbour Energy and Serica, to provide a full renewables remote power and communications system for subsea power to a multitude of applications such as a subsea electronics module and an autonomous underwater vehicle. Further applications of this system could include re-enabling failed assets with electrical umbilical failures, enabling in-fill or stranded asset wells, long offsets or the adoption of all-electric subsea systems for carbon capture utilisation and storage.



» The Halo energy storage system has a modular and scalable battery architecture. (Photo credit: Verlume)

As part of the RSP project, Verlume is providing the Halo battery energy storage system—an enabling technology which encourages and further supports the use of renewable energy. Halo has been developed specifically for the harsh offshore environment as a means of providing a reliable, uninterrupted power supply at point of use. It has modular and scalable battery architecture with a fully integrated Intelligent Energy Management System, enabling longer duration operations.

ENERGY STORAGE IN OFFSHORE WIND

The RSP project is powered through a wave energy device, but the Halo system has been designed to be power input agnostic, meaning that it can accept power from any renewable energy source.

Verlume has also developed an industry-leading concept to create multi-MWh intelligent in-field energy storage for offshore wind. In this fast-growing international market, it will be vital that as operations scale up further, there is a sustained focus on the decarbonisation of all offshore activities.

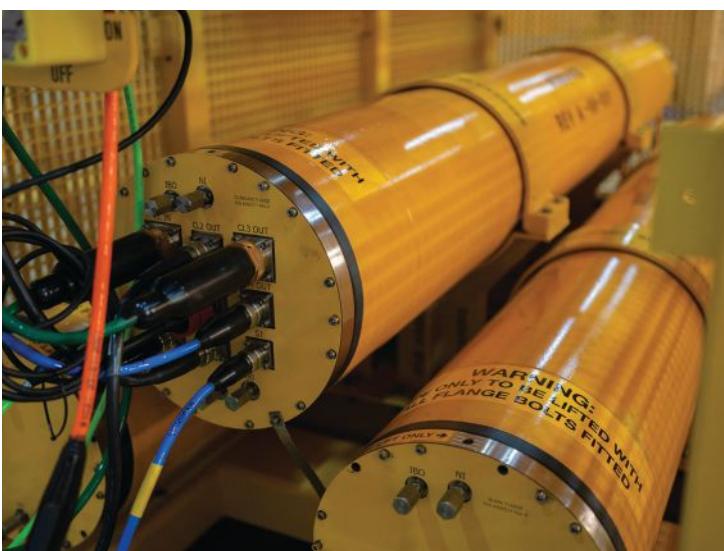
A use case for the Halo offshore wind solution is to provide energy storage services to optimise wind farm performance and operations. It will allow for charging at times of low energy demand from the wind farm, with power distributed 24/7. The solution will also be part of intelligent in-field energy storage and charging infrastructure for a host of vessel types including crew transfer vessels, further facilitating zero carbon emissions from vessel operations.

SCALING UP FOR MANUFACTURING GROWTH

Offshore clean energy systems will play a significant role in creating sustainably produced hydrocarbons and cleaner offshore renewable energy production, whilst also maintaining a focus on 'keeping the power on 24/7'.



» Left to right – Angus MacDonald (Operations Manager), Jonny Moroney (Chief Operating Officer), Paul Slorach (Chief Technology Officer) at Verlume's recently inaugurated 20,000 square foot facility in Aberdeen.



» Verlume's Intelligent Energy Management System (IEMS) integrated as part of the Halo device. (Image credit: Verlume)

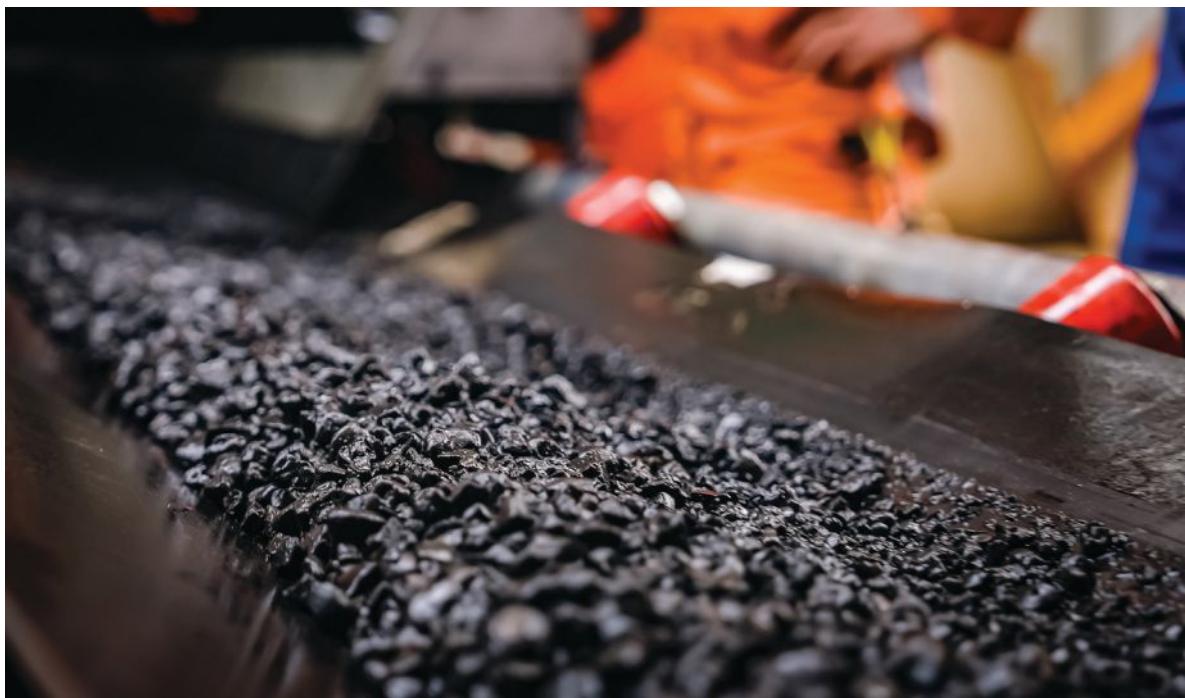
Recognizing the growing role that intelligent energy management and energy storage systems will contribute to this transition, as well as establishing strategic commercial partnerships, Verlume has recently invested in a new, larger operations and manufacturing facility in preparation for the company's ambitious growth plans.

Located in the former Weatherford building within the Raiths Industrial Estate in Dyce, Aberdeen, the 20,000 square foot facility boasts a generous workshop floor, craneage, office space and laboratory areas.

The new facility is six times the size of Verlume's previous operational base and will accommodate manufacturing operations for the company's range of products and services, including project assemblies for the award-winning flagship Halo modular battery energy storage system. On-site laboratories will be used for industry-leading product and software development.

For more information, visit: www.verlume.world.

verlume



» Polymetallic nodules complete their 12-minute-trip from seafloor to the *Hidden Gem*. (Photo credit: TMC)

THE METALS COMPANY AND ALLSEAS ACHIEVE HISTORIC MILESTONE

The Metals Company (TMC) has successfully collected an initial batch of seafloor polymetallic nodules, and transported them up a 4-km-long riser system to the surface, in what represents the first integrated system test conducted in the Clarion Clipperton Zone of the Pacific Ocean since the 1970s.

Having successfully completed at-sea construction of the riser system and its integration with the flexible jumper hose and pilot nodule collector vehicle, the dedicated team of 130 crew and engineers aboard the *Hidden Gem* commenced initial nodule collection runs, driving the pilot collector 147 meters in one hour on a pre-determined path and collecting 14 tonnes of nodules.

From inside the collector, nodules were channeled to the jumper hose and into the riser where they were lifted on compressed air in a 12-minute-trip from seafloor to the *Hidden Gem*, where the return water was discharged to the midwater column at depth.

A comprehensive monitoring program to assess the environmental impacts of the collector system trials includes over 20 strategically positioned sediment collection stations; acoustic moorings and landers to measure sound propagation; two Autonomous Underwater Vehicles (AUVs) conducting underwater mapping; two Remotely Operated Vehicles (ROVs) collecting water samples in the plume; optical backscatter and laser diffraction sensors to measure sediment particle settling velocity; trace metal samplers; seven fixed landers equipped with Acoustic Doppler Current Profilers (ADCPs) and conductivity, temperature, and depth (CTD) sensors.

Gerard Barron, CEO & Chairman of The Metals Company said: "With the first nodules making their way from seafloor to surface using an integrated pilot collection system, we find ourselves at a historic moment in the development of this industry. Once again, our strategic partner Allseas have shown why they're the best in the business when it comes to pioneering offshore engineering and operations. This is just the beginning, and we look forward to sharing more news as the trials and impact monitoring continue this quarter."



» This is the first integrated system test conducted in the CCZ since the 1970s. (Photo credit: TMC)

NEW REPORT REVEALS U.S. SAW 60% GROWTH IN OFFSHORE WIND LONG-TERM TARGETS IN Q3

Landmark federal policy, record investments, and new state-level actions drove the U.S. offshore wind industry forward in the third quarter of 2022, with coastal states increasing their long-term targets by 58 percent, a new record for quarterly growth. The Business Network for Offshore Wind, the leading non-profit working to accelerate offshore wind development and build a robust U.S. supply chain, recently released its inaugural U.S. Offshore Wind Quarterly Market Report, which examines the factors contributing to this historic expansion and provides insight on key market trends, supply chain and technology advancements, and the key challenges.

The report details three important developments that made the third quarter among the most consequential for the American offshore wind industry, including:

- The passage of the Inflation Reduction Act (IRA), which appropriated \$369 billion in new, clean energy funding, including billions in tax credits for critical offshore wind manufacturing;
- Federal support to stand up a floating wind turbine industry in the United States, with the Biden Administration announcing a Floating Offshore Wind Shot initiative and a goal to deploy 15 gigawatts (GW) of offshore wind power by 2035; and
- Ambitious new targets set by coastal states including California, which announced its planning goal to deploy 25 GW of floating offshore wind generation by 2045, and New Jersey, which increased its target from 7.5 GW by 2035 to 11 GW by 2040.

"Our inaugural quarterly report could not come at a more exciting time for offshore wind," said Liz Burdock, President and CEO of the Business Network for Offshore Wind. "With historic federal funding, new support for floating wind turbine technology, and increasingly ambitious state-level goals, the longstanding aspirations of the American offshore wind industry are poised to become reality. Despite this tremendous growth, the industry still must overcome challenges to upgrade our grid and transmission system, localize a robust supply chain, and train a skilled workforce. Capitalizing on this momentum requires continued coordinated action from our state and federal government to deploy a comprehensive national offshore wind industrial strategy that includes critical investments in our infrastructure, ports, and manufacturers."

Key takeaways from the report include:

- New federal investments from the IRA and the Infrastructure Investment and Jobs Act, combined with efforts to bring greater transparency to the federal permitting system, underpin the beginnings of a National Offshore Wind Industrial Strategy and put the United States in striking position to achieve its goal of deploying 30 GW of offshore wind by 2030.
- The United States is taking serious steps to become a key competitor in the floating wind turbine industry, launching a

new initiative aimed at driving down construction costs by at least 70 percent and allocating critical funding for R&D.

- While attention has been trained on California for setting the nation's largest planning goal, East Coast states remain at the forefront of offshore wind commitments, development, and deployment, with notable actions in Massachusetts, New Jersey, New York, and Rhode Island moving the market forward at breakneck speed.
- Supply chain development continues at pace, with domestic shipbuilding and port redevelopment seeing gains, but additional domestic growth is needed to meet the demand for the growing pipeline of projects.



YOUR COMPLETE RESOURCE FOR TRACKING PINGERS

A large black cylindrical acoustic pinger device is shown partially submerged in the ocean. The device has a digital display screen showing the number '178' and several control knobs labeled 'VOLUME' and 'MAGNITUDE'. The background shows the surface of the ocean with waves crashing. To the right of the device, there is text and a logo.

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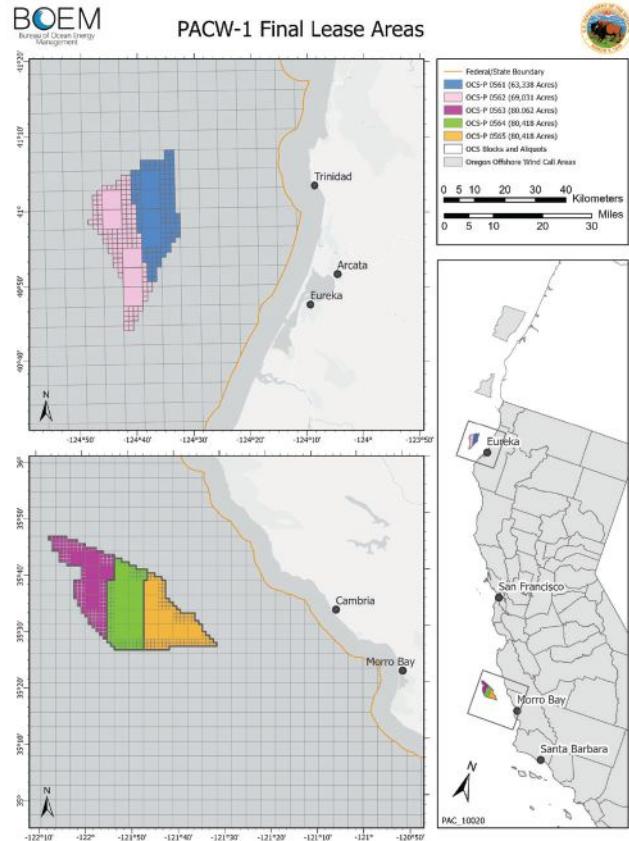
FIRST OFFSHORE WIND LEASE SALE IN THE PACIFIC TO BE HELD IN DECEMBER

In a new development in the pursuit of a clean energy future, the Department of the Interior has announced that the Bureau of Ocean Energy Management (BOEM) will hold an offshore wind energy lease sale on December 6, 2022, for areas on the Outer Continental Shelf (OCS) off central and northern California.

This will be the first-ever offshore wind lease sale on America's west coast and the first-ever U.S. sale to support potential commercial-scale floating offshore wind energy development. This sale will be critical to achieving the Biden-Harris administration's deployment goals of 30 GW of offshore wind energy by 2030 and 15 GW of floating offshore wind energy by 2035.

"The demand and momentum to build a clean energy future is undeniable. I am proud of the teams at the Interior Department that are moving forward at the pace and scale required to help achieve the President's goals to make offshore wind energy, including floating offshore wind energy, a reality for the United States," said Secretary Deb Haaland. "Today, we are taking another step toward unlocking the immense offshore wind energy potential off our nation's west coast to help combat the effects of climate change while lowering costs for American families and creating good-paying union jobs."

In May 2021, Secretary Haaland and California Governor Gavin Newsom joined Biden-Harris administration leaders to announce an agreement to advance areas for wind energy development offshore the northern and central coasts of California. The California sale reflects the leasing path announced last year by Secretary Haaland and last month's announcement of a new deployment goal of 15 GW of floating offshore wind energy by 2035.



BOEM will offer five California OCS lease areas that total approximately 373,268 acres with the potential to produce over 4.5 GW of offshore wind energy, power more than 1.5 million homes, and support thousands of new jobs.

"Today's announcement represents years of close coordination and engagement with the state of California, Tribes, ocean users, local communities and all interested parties to move us closer towards achieving the administration's vision to fight climate change and realizing California's clean energy future, while creating a domestic supply chain and good-paying union jobs," said BOEM Director Amanda Lefton.

SEAJACKS COMPLETES INSTALLATION OF 33 WIND TURBINES AT AKITA & NOSHIRO OWF



» Seajacks Zaratan, a self-propelled jack up vessel.

Seajacks International recently completed the installation of all 33 wind turbines at the Akita & Noshiro offshore wind farm situated off the Japanese Akita Prefecture coastline.

The self-propelled jack up vessel, Seajacks Zaratan, carried out the work in collaboration with main installation contractor Kajima

Corporation and turbine supplier Vestas Japan Co., Ltd. The project, which is owned by Akita Offshore Wind Corporation (AOW), is the first commercial-scale fixed-bottom wind farm to be constructed in Japan. The 140MW project will power approximately 150,000 homes and mitigate over two million tons of GHG emissions over its expected useful life.

Blair Ainslie, Seajacks CEO said: "The completion of the turbine installation at Akita and Noshiro is an achievement that all parties involved can be proud of. The project is a powerful demonstration of a successful collaboration between international partners to deliver a successful project outcome."

DNV PARTNERS WITH ENERGY COMPANIES IN THREE ENERGY TRANSITION SAFETY JIPS

The energy transition depends on several technologies with potential hazardous characteristics, such as carbon capture and storage, and utilization of hydrogen, and ammonia. When deploying these solutions at a larger scale, safety is essential. DNV is working with energy companies to address this in three research projects.

DNV is leading three parallel joint industry projects (JIPs) to develop the existing KFX software, which simulates gas dispersion, fire and explosions, to increase safety in the deployment of energy transition solutions. The KFX computational fluid dynamics (CFD) software simulates what actually happens to liquids, vapor clouds, and potential dry ice formation in the event of accidents. The simulations are used as the basis for design of installations and to mitigate consequences.

"DNV has in recent years been involved in CFD simulation software development projects. The joint industry projects for CCS, hydrogen and ammonia safety strengthen our commitment to the energy transition," said Kenneth Vareide, CEO of Digital Solutions at DNV.

In the event of an accidental release, there are widely varying scenarios depending on the properties of the gases or liquids involved. The first JIP is a partnership between Equinor, TotalEnergies and DNV, and focuses on CO₂. The research concentrates on the consequences of accidental release, depending on surrounding environmental conditions such as terrain and wind, combined with dry-ice formation and its impact on dispersion. The second JIP includes Equinor and DNV, focusing on hydrogen and the

consequences of low storage temperatures, dispersion, fires and explosivity. The third JIP, with Equinor, Vår Energi, Horisont Energi and DNV, is developing solutions for ammonia safety, analyzing alternative strategies to mitigate consequences of toxicity.

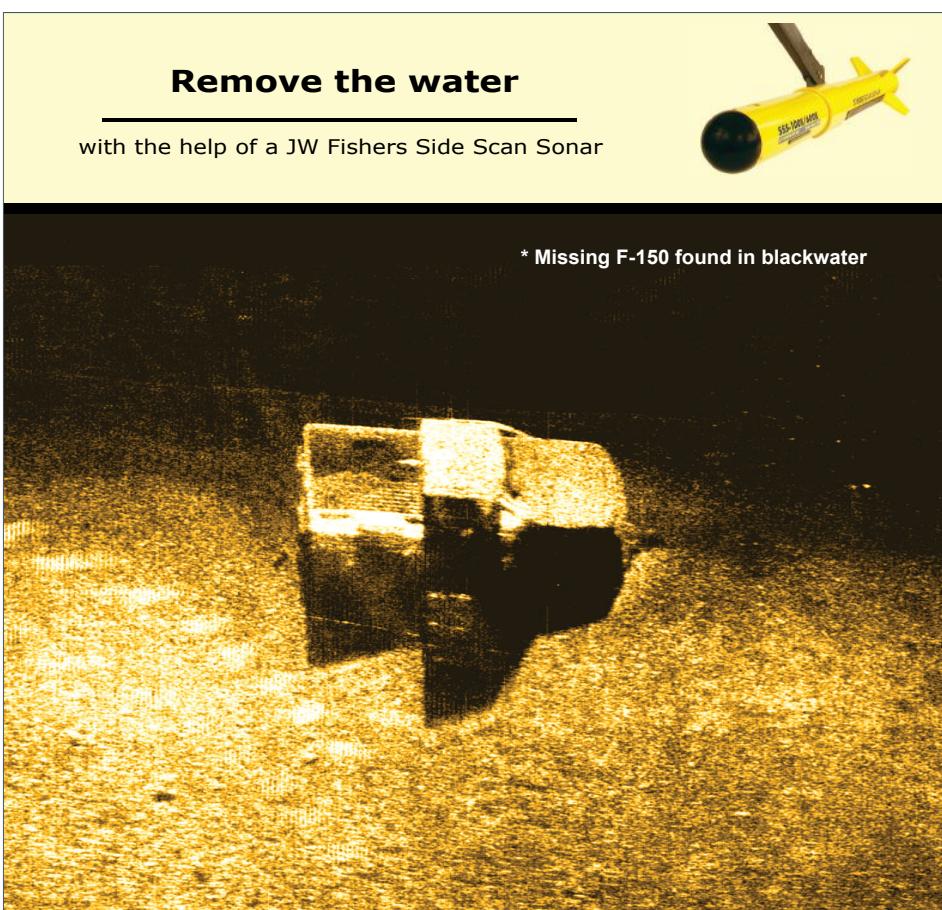
"DNV is committed to close collaboration with customers in the areas of hydrogen safety, CO₂, ammonia and liquefied natural gas, enabling the accelerated energy transition journey," added Trond Evanger, Head of Section of CFD Solutions at DNV.

KFX computational fluid dynamics software has been developed for more than 25 years by DNV in collaboration with Equinor, TotalEnergies, ConocoPhillips, Eni, Gassco, GRT GAZ and other energy companies, as well as the Research Council of Norway.

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COMMODITY HEADWINDS ABOUT TO BECOME TAILWINDS?



By G. Allen Brooks
*Expert Offshore Energy Analyst
 & ON&T Contributor*

CRUDE OIL:

This year is turning out to be the second most volatile year for oil prices since 1990, other than the pandemic year of 2020. Why are prices volatile? It has to do with geopolitics, a decline in liquidity in the oil trading market, but importantly strong headwinds buffeting commodity markets in general and particularly the oil market. Importantly, commodity headwinds may become tailwinds that could boost prices despite continuation of the other two factors.

Liquidity in oil trading has been reduced by regulators lifting cash margin requirements to 100-150 percent of the value of the trade to protect financial institutions. This has caused traders and hedge funds to exit the business, reducing liquidity, and contributing to increased price volatility.

Russia's invasion of Ukraine tops the geopolitical problems list, as Vladimir Putin weaponized his country's fossil fuels in prosecuting the war. Added to Russia/Ukraine are China/U.S. tensions over Taiwan, and the

bungled U.S. oil policies impact relations with Saudi Arabia and OPEC+. The last two geopolitical issues were manufactured by the Biden administration's energy and foreign policies.

Fearing a backlash in the upcoming midterm elections due to high gasoline prices, Biden seized on our Strategic Petroleum Reserve as a tool to reduce pump prices rather than maintain the supplies for emergencies. Attacking oil companies and hampering their operations has been a key aspect of the Biden administration's Green Energy agenda and it has now led to a 25-year low in diesel fuel inventories, risking the backbone of the nation's transportation sector.

Rather than helping Biden and his Democrat colleagues in the upcoming midterm elections, OPEC+ cut output by two million barrels-a-day. Since few OPEC+ members are producing at their quotas, oil supplies will only fall by 600 to 900 thousand-barrels-a-day. Thus, the global oil market will remain tight even with recessionary conditions emerging to weakening consumption.

The big supply unknown this winter is the impact of the ban on Russian oil sales starting December 5. That ban will be followed by a Russian refined product ban commencing in February. These bans restrict not only the sale but also the shipping, financing, and insuring of Russian oil cargos. How much supply will cease flowing, and in which geographic markets is uncertain.

These bans will disrupt existing supply chains and raise concerns about the health of the global oil market. Fewer ships, less working capital available, and extremely high insurance costs will help drive up oil prices. If 500,000 to one million barrels a day of Russian oil and/or refined product cannot access the market, global oil prices could soar. Rising oil prices would also be helped as the headwinds from a strong U.S. dollar shifts to a weakening dollar. The latter condition is associated with historical \$100+ oil price eras. About to happen again?

Help for higher oil prices may come from the reversal of the value of the U.S. dollar against other currencies. After years of strengthening, the dollar's



➤ China/U.S. tensions over Taiwan is just one of a series of geopolitical uncertainties bringing sustained volatility to global oil prices.



» Gas markets are on a knife's edge and poised to react to sudden weather and economic events.

value is suddenly falling. That will make oil less expensive for international buyers, boosting demand. Here comes another driver for high oil prices, which is not yet receiving attention.

NATURAL GAS:

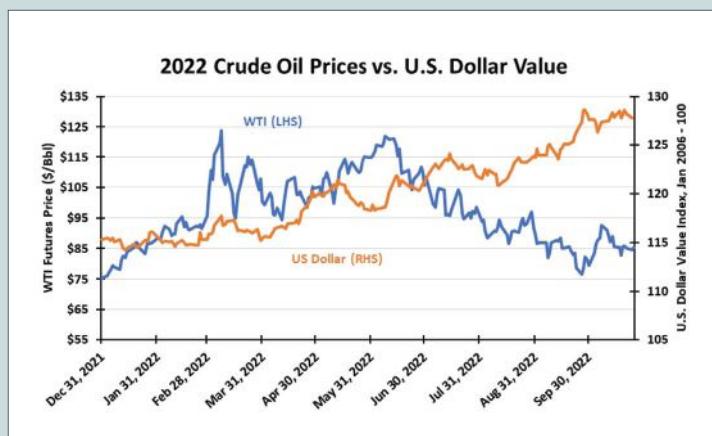
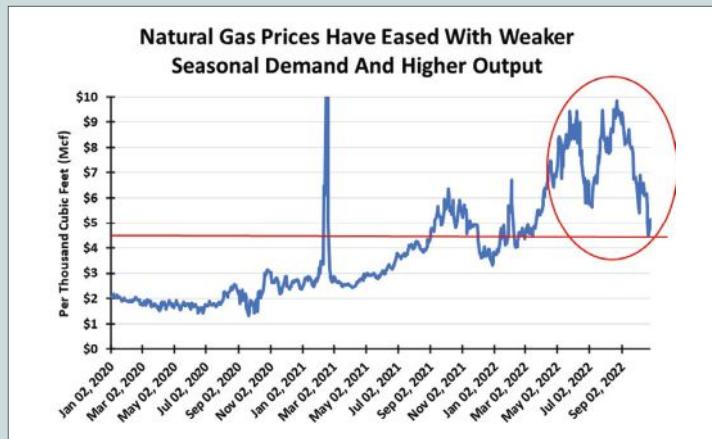
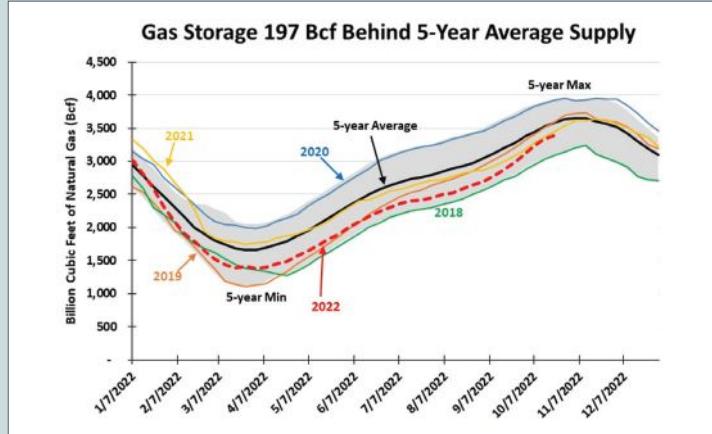
We are about to end the 2022 hurricane season with little impact on gas supplies or demand. Potential storms still lurk, but gas prices are awaiting winter weather and signals on LNG export demand.

Official U.S. government weather forecasts call for a moderate winter with few bouts of super-cold temperatures. In contrast, the Farmers' Almanac expects a "Shake! Shiver! Shovel!" winter. We will experience a La Niña Triple-Dip (three consecutive years) for the first time this century and only the third time since weather records began in 1950. Such a weather phenomenon has been known to produce periods of severe cold and heavy snows, but also spans of more moderate winter weather.

The slowdown in U.S. LNG exports has enabled domestic storage volumes to grow faster in recent weeks, helping ease the shortfall that was helping elevate gas prices. For September and early October, gas storage injections were higher and the gap between current storage and 5-year average volumes closed. The latest week saw storage injections underperform leading to the storage gap widening.

Natural gas prices were above \$9 per thousand cubic feet in both the spot and futures markets this summer. By the third week of October, prices were below \$5, the lowest level in seven months. That price dip reflected storage injections growing just as media stories highlighted LNG carriers idling offshore Spain waiting to unload their cargos. With current European gas storage at nearly 100 percent full, Europe gas prices were dropping sharply. Those tankers are awaiting better gas prices. As the ships wait, Gulf Coast LNG exports stall.

Halloween traditionally marks the end of the high storage injection months and the beginning of winter demand, so prepare for further gas price volatility. Volatility will be driven by uncertainty over European LNG demand, which will now depend on heating and electricity demand. The economic contraction underway in Europe is sapping some gas demand as industrial companies cut back as sky-high energy prices destroy their profitability. Any early cold weather in the U.S. could easily spike gas prices as they are only restrained by expectations for soft LNG export demand. All gas markets are on a knife's edge and poised to react to sudden weather and economic events. But winter will boost gas demand, so prices should strengthen in the weeks ahead.



CHECK THE TECH

NEW HOVERING AUV FOR WIND FARM UNDER-WATER INSPECTION

A colossal amount of new subsea infrastructure will be built in the North Sea to accommodate ambitious offshore wind energy capacity targets before 2030. While this is clearly needed to minimize Europe's dependence on fossil fuels, the successful expansion of renewable energy production could easily stretch the current offshore services sector in the region to near breaking point.

If fears that key services such as underwater inspection are not positioned to meet demand come true, there is potential for significant delays in wind farm development projects, while operational farms will lose productive time as turbines are shut down until a contractor can be found to carry out the work.

The industry is mobilizing and more work-class ROVs and divers will be available to conduct underwater inspections. But, to meet the enormity of the challenge—more than ten thousand new turbines will be needed just to meet the German government's latest growth targets—disruptive new methodology and technologies will be needed.

HOVERING AUV

One such initiative is A.IKANBILIS, an entirely new category of AUV from Singapore-based autonomous vehicle developer BeeX, and supported by European rental and service partner Subsea Europe Services from its North Sea gateway facilities in Hamburg and Rostock, Germany.



» HAUV A.IKANBILIS is a new category of AUV from Singapore-based autonomous vehicle developer, BeeX. (Photo credit: BeeX/Subsea Europe Services)



» Level 5 autonomy and ML algorithms help the HAUV recognize targets of interest and operate without a human in the loop. (Photo credit: BeeX/Subsea Europe Services)

"We call it a Hovering AUV (HAUV) because it can work completely tetherless and without a human in the loop," said Grace Chia, CEO, BeeX. "This autonomy combined with advanced machine learning capabilities and next generation duration and current fighting capabilities make it ideally suited to performing offshore underwater inspection tasks more efficiently than current processes."

Eschewing the standard AUV torpedo shape to unlock new levels of agility, the real showstopper with A.IKANBILIS is the level of AI-powered autonomy that BeeX has developed. Not content with delivering an AUV that requires expert oversight, BeeX has aimed for level 5 autonomy and in doing so, reduces the need for expert operators and support staff.

Further still, BeeX autonomy controller leverage machine learning algorithms to continuously approve its effectiveness, from better recognizing targets of interest through to planning faster and more energy saving routes around specific areas of a wind farm.

"The idea is to engender more cost-effective underwater inspection services, so that providers can leverage the business opportunities generated by offshore wind's planned growth," said Soren Themann, CEO, Subsea Europe Services. "We don't view A.IKANBILIS as a replacement for ROVs and divers, but its super powerful AI is a platform for contractors to easily expand their capacity and augment their capabilities with a highly capable autonomous solution."

LAUNCH & LEAVE

While on tour at various sites since 2021, the potential of such high-level autonomy was demonstrated in full for the first time on an operational wind farm in September this year. A team from BeeX and Subsea Europe Services, together with North Sea wind farm owner Nordsee One set A.IKANBILIS loose to approach an underwater inspection of operational wind turbine foundations and monopiles, in whichever way it saw best.

"It was a pure launch and leave mission with the goal to demonstrate how the efficient deployment and recovery, and true autonomous operation can unlock a step change in underwater inspection," said Soren Themann, CEO, Subsea Europe Services. "The system performed exactly as expected, carrying out all of its tasks without intervention from an operator, all from a very minimal initial instruction set."





NEW RESEARCH AIMS TO EXTEND OFFSHORE WIND MONOPILE WEIGHT AND DEPTH LIMITS

A new research project, launched on October 18, aims to extend the use of offshore wind monopile foundations, to support larger turbines in deeper waters.

Monopiles are the cheapest and most widespread offshore wind turbine foundation, however they experience structural issues as their length and the weight they bear increases. Currently, this creates weight and water depth limits. The Offshore Wind Accelerator (OWA), led by the Carbon Trust, is hoping to find a solution, through a new project called Support Structure Damping.

The project is seeking a contractor for the technical delivery of six work packages. The invitation to tender is out this week and open to submissions from prospective bidders. The accelerator is also open for new partners to participate in the project.

Carbon Trust Offshore Wind Manager, Robert Keast said: "Monopile research is particularly urgent as the number of shallow sites are limited. Cost effective expansion into deeper waters will be required for us to meet Net Zero targets and create more affordable energy for end consumers."

Currently, alternative foundation types, such as jackets, tripods, or floating structures, would need to be used past

a certain depth. If monopiles become available for deeper waters, it could drastically cut the costs and complexity of wind farm development.

"At present, most turbines installed are 10MW or less, with larger 15-20MW turbines expected to become standard by the late 2020s," Keast added. "We hope that this research will find improved damping solutions for wind turbine structures, to prevent the structural issues caused by increasing water depth and turbine weight."

The project will define new design guidelines, which incorporate improved damping technologies, for offshore wind structures. The guidelines will set best practice for developers and turbine manufacturers to collaborate in the structural design process.

The tender closes on December 1, 2022, with successful applicants expected to begin work later this year, running until early 2024.

The Carbon Trust will manage and lead the project, with the selected contractor delivering the technical studies, supported by project partners Equinor, RWE, Shell, SSE Renewables, TotalEnergies and GE.

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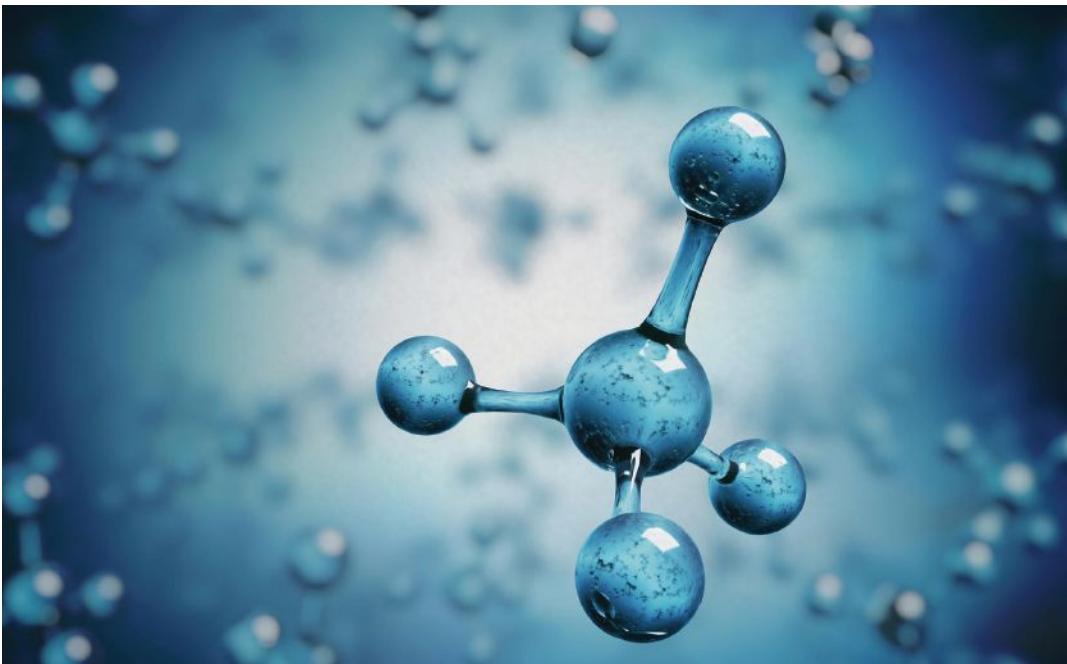


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AIR LIQUIDE, CHEVRON, LYONDELLBASELL, AND UNIPER TO PURSUE LOWER CARBON HYDROGEN AND AMMONIA PROJECT

Air Liquide, Chevron Corporation, LyondellBasell, and Uniper SE have announced their intent to collaborate on a joint study that will evaluate and potentially advance the development of a hydrogen and ammonia production facility along the U.S. Gulf Coast. The facility could support industrial decarbonization and mobility applications in the region and expand clean ammonia exports, helping to increase the supply of lower carbon power internationally.

The potential project to be studied is intended to cover the end-to-end energy value chain, utilizing each participant's technical expertise in production, operational experience, storage, distribution, and export logistics. Collectively, the consortium will bring capabilities and expertise in air separation technology, hydrogen technologies, lower carbon intensity and renewable natural gas, carbon capture and storage (CCS), electrolysis-based technologies, and petrochemicals.

Specifically, the consortium will assess the potential for producing hydrogen

using natural gas with CCS and renewable hydrogen via electrolysis to supply end-use markets, including the ammonia, petrochemicals, power, and mobility markets.

If development proceeds, the project could leverage existing advantages along the Gulf Coast, including pipeline infrastructure, to supply lower carbon and renewable hydrogen to local industrial clusters. Likewise, ammonia infrastructure could support exports to both Europe and the Asia Pacific region.

Adam Peters, CEO of Air Liquide North America, said: The Gulf Coast is the ideal location to model hydrogen and carbon capture technologies as immediate pathways to decarbonizing hard-to-abate sectors. This project exemplifies Air Liquide's commitment to decarbonizing industrial basins around the world."

Austin Knight, Vice President of Hydrogen, Chevron New Energies, added: "Across the value chain, collaborations are critical to developing a hydrogen ecosystem, and this is an example of bringing together

leaders in the space to explore lower carbon hydrogen opportunities and to contribute complementary expertise."

Aaron Ledet, Senior Vice President, Olefins and Polyolefins Americas of LyondellBasell, said: "While our products play an important role in helping to enable greenhouse gas emissions reductions through their use in renewable energy technologies, such as wind turbines, solar panels and electric batteries, we are also taking concrete steps to reduce the greenhouse gas emissions from our operations."

Marc Merrill, President and CEO of Uniper in North America, concluded: "We look forward to bringing the best of our U.S. business and global technical and commercial platforms to support this effort. Uniper is committed to the green expansion of our Wilhelmshaven LNG receiving terminal in Germany and expects to receive and store roughly 1 MTPA of clean ammonia at the port by the end of the decade. U.S. Gulf Coast supply from this initiative can be critical to meeting that goal."

PENTLAND FLOATING WIND PROJECT SELECTS FLOATING TECHNOLOGY PROVIDER

Pentland Floating Offshore Wind Farm (PFOWF), a 100 MW development key to advancing the global deployment of large-scale floating offshore wind, has selected Stiesdal Offshore's TetraSub as the floating structure technology for the project.

Developed by wind energy pioneer Henrik Stiesdal, the project's chosen technology is the innovative Tetra concept by Stiesdal Offshore.

This Tetra concept is the world's first fully industrialized floating offshore technology offering a lightweight and cost-effective floating foundation made up of factory-made modules. No manufacturing takes place at the quayside, instead these ready-made modules are assembled in ports using existing infrastructure to form a complete foundation. The process significantly reduces both manufacturing hours and transportation costs and enables assembly

to take place domestically within local ports.

Richard Copeland, PFOWF Project Director, said: "The objectives of Pentland are to demonstrate new floating wind technologies which will enable industrialization, develop local supply chains and reduce costs, allowing deployment of floating offshore wind in the UK and globally at scale. For us, the Stiesdal Offshore Tetrasub concept ticks all of these boxes."

Peder Riis Nickelsen, CEO at Stiesdal Offshore said: "We are delighted that the TetraSub technology has been selected by PFOWF. This project will support us to meet market demands for low-cost and fast deployment of floating wind technology, advancing the next generation of floating offshore wind turbines with capacity of 14 MW and more. We look forward to working with the Pentland team to deliver this exciting world-leading development."

Once constructed the PFOWF is estimated to provide enough green energy for almost 70,000 homes per year, approximately 65% of those in the Highland Council area.

The project expects to install the first unit ahead of the wider array and be fully operational by 2026. PFOWF recently submitted its offshore consent application to Marine Scotland.



» TetraSub in testing. (Photo credit: Stiesdal Offshore)

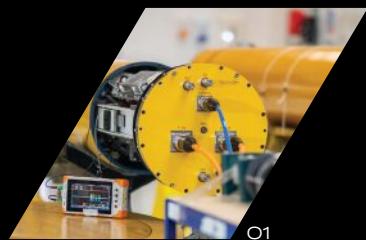
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ROVCO AWARDED CONTRACT AT GALLOPER OFFSHORE WIND FARM

Rovco, a leading global provider of subsea robotic and hydrographic survey solutions, has been awarded a contract for the provision of offshore rock bag deployment and installation at the Galloper Offshore Wind Farm in the Outer Thames Estuary, UK.

The project scope covers the application of an operator engineered solution for the installation of rock bags, which need to be placed at precise locations on and around the Cable Protection Systems (CPS) on the wind farm, located 27 km off the Suffolk coast.

Following previous subsea surveys, rock bag placement was selected from a number of options considered by the operator as the most suitable solution to eliminate or vastly reduce excess cable movement of the CPS, stabilizing and prolonging the life of the array cables which carry the generated electricity from the wind turbines.

Rovco will deploy the DII subsea support vessel VOS Star, on charter from Vroon Offshore Services, during the project. The vessel will be pre-installed with cutting-edge survey equipment and Rovco's powerful Seaeye Leopard WROV which will be fully calibrated, and system tested for swift commencement.

The project is led by personnel from Rovco's experienced offshore team and a dedicated onshore project manager who will be assigned to the project throughout, to ensure safe and efficient operations.

The 353 MW Galloper Offshore Wind Farm has a site area of 180 km² with wind turbine generators located in depths between 26.5 m – 39.5 m (LAT). Galloper's 56 turbines will generate enough green electricity every year to power the equivalent of more than 380,000 average homes in the UK.

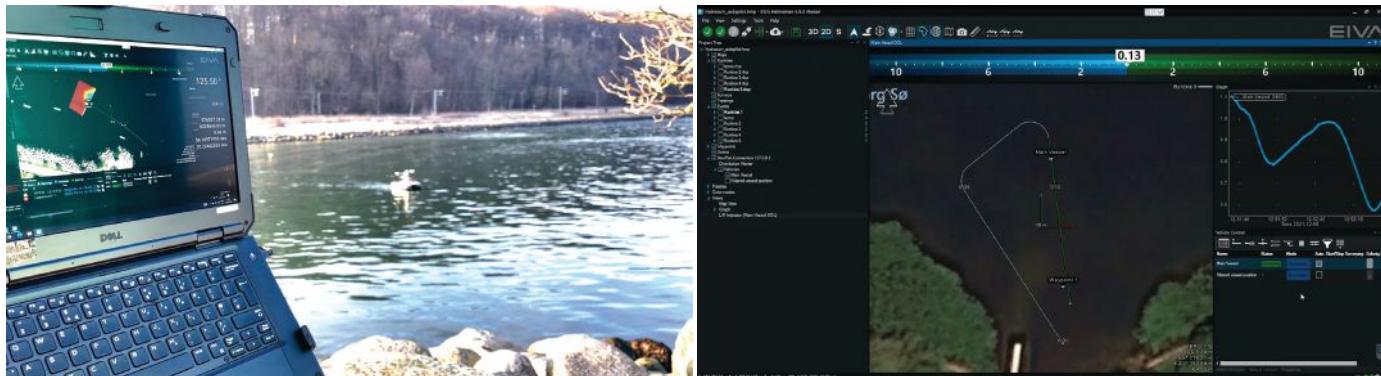
Sean Chenery, General Manager at Galloper Offshore Wind Farm said: "We selected Rovco to install the rock bag solution due to their knowledge, experience and competitiveness in subsea operations. Placing rock bags on live cables at water depths of 26 m – 39 m with tight tolerances is where Rovco's equipment excels."

Simon Miller, Chief Revenue Officer of Rovco, and its sister company Vaarst, added: "Engineering solutions to extend the life of critical subsea infrastructure and ensuring uptime of these offshore assets and installations is crucial. This award by Galloper Offshore Wind Farm, to help them detect issues and implement their designed solution post engineering analysis, is testament to our team's efforts across the company and real recognition of our growing presence in this market. We are thankful to Galloper for placing their trust in us to deliver an efficient, safe, cost-effective solution."

"Rovco's highly experienced team and our expertise in developing and providing subsea solutions for the offshore wind sector can help operators, detect, report, consult, design and implement mitigation programs to limit the effects of existing issues, whilst minimizing the risk of problems arising in the future and most importantly prolonging the life of major subsea components to extend operations."



» Rock bag deployment at Galloper Offshore Wind Farm.
(Photo credits: Rovco)



» NaviSuite Kuda in action. (Photo credits: EIVA)

HYDROSURV PARTNERS WITH EIVA TO SUPPLY AUTOPILOTS FOR USV LEASE FLEET

HydroSurv, a UK innovator in the Uncrewed Surface Vessel (USV) sector, has announced its partnership with Danish engineering company, EIVA, to supply autopilots for a lease fleet of USVs.

The integration of EIVA's hydrographic survey software bundle, NaviSuite Kuda, with the innovative autopilot technology installed on HydroSurv's REAV-28 USV design offers operators adaptive line planning and automated area coverage optimization tools to analyze MBES data in real time. The software can automatically calculate optimal runlines based on collected data and position. Through streamlined integration with the autopilot, this results in precise line keeping typically with an accuracy of +/- 15 cm, even in sharp turns.

For hydrographic surveyors, this novel solution extends the capability of HydroSurv USVs to intelligently and reliably complete shallow water missions whilst offering the operator a familiar front-end control interface. The USV is controlled straight out of NaviSuite Kuda, enabling efficient, dependable, safe, low carbon remote data collection, as well as yielding immediately deliverable data.

Martin Kristensen, EIVA VP Hardware Development, commented: "Working together with HydroSurv, EIVA has optimized our full hardware and software autopilot solution. As a result, HydroSurv's USVs can now leverage the powerful survey capabilities of NaviSuite Kuda, such as advanced data acquisition and navigation-aiding, to sail towards complete autonomy."

David Hull, HydroSurv CEO, added: "EIVA has been a valued partner to HydroSurv since our entry into the USV space and we look forward to extending our collaboration further through mutual product development. Working symbiotically on the development of high-quality, small equipment sized USV products has seen EIVA develop a new core technology for commercial deployment onto HydroSurv's 2.8 to 6 m vessels."



EMPOWERING

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SAAB SEAEDGE





» EdgeDVR Mobile Workstation's three screens can display sonar, ROV topside, and DVR data simultaneously. (Photo credit: Digital Edge Subsea)

LAUNCHED: THE EDGEDVR MOBILE WORKSTATION

Digital Edge Subsea is a UK-based pioneer of offshore digital video recording and inspection systems. Founded in 2010, the company launched the EdgeDVR, an easy-to-use and reliable underwater inspection solution that has become the tool of choice among offshore oil and gas, renewables, and decommissioning operators worldwide. With over 500 systems in the field, Digital Edge Subsea continues to innovate, develop, and manufacture products for widespread application across the ocean industry.

Late in 2021, Digital Edge Subsea announced that the team was intending to introduce another industry-first product in 2022 to add to their expanding range of digital video inspection solutions: the EdgeDVR Mobile Workstation, which is now commercially available worldwide.

PORTABLE OFFSHORE INSPECTION

Designed with portability in mind and for deployment on projects short of space, the EdgeDVR Mobile Workstation features 17" integrated triple monitor display units in a small form factor for quick and reliable access. The three screens fold out from the main unit to create a compact system capable of presenting sonar, ROV topside, and DVR data simultaneously.

It has all the capability of a 4U rack mounted unit and a total storage capacity of 30TB, and is available in SD, HD and 4K configurations, with composite SD, HD-SDI, HDMI and IP camera inputs. Users can also create

a command-and-control field computing solution by adding a further mobile display unit of another three 17" screens.

Furthermore, the system has three removable hard drives which store the survey video and photos. The Windows 10 Pro operating system is stored on a solid-state hard drive for increased speed and reliability, with a second solid state hard drive for redundancy. The system is supplied in a custom pelican case and is only available to rent.

AT A GLANCE

- » 4 Channel Recording
- » Online Video Clips & Photos
- » 3 Hardware Models – SD, HD & 4K
- » Automatic Dive, Photo, Video & Anomaly Logs
- » User Configurable Eventing
- » 4 Serial Inputs
- » 4 Channel Digital Overlay
- » Multibeam Sonar Recording and Control
- » Offline Editor – Offline Video clips and Photos
- » Offline Eventing
- » Import/Export Workpack
- » Task Based Inspection Workpack
- » Report Generation
- » Built-in Blackbox Recording
- » Network Video Streaming
- » Network Viewer
- » Client Viewer

SOFTWARE OPTIONS

As with all Digital Edge Subsea hardware, there are three levels of software available:

- EdgeLite: an entry level unit, suitable for surveys and inspections, where there is no requirement for eventing.
- EdgeDVR can record 4 channels of HD simultaneously. It continues to offer the creation of Workpacks and offline editing.
- The EdgePro has an extended database that allows tasks to be assigned to components under inspection. This allows customers to either create their own Workpacks, or they can be created in-house at Digital Edge. It also provides an automatically generated report to capture inspection results.

Whichever unit best suits your need, customers are assured of two things: reliable quality and unparalleled customer service. Digital Edge Subsea also supplies excellent technical support where all systems can be remotely accessed. All units have been designed to be simple to use by personnel of all levels of ability and training is offered for increased peace of mind.

For more information, a quote, or a demonstration of the system, contact: info@digitaledgesubsea.com or visit www.digitaledgesubsea.com.



BLUEFIELD GEOSERVICES PERFORMS DEEPEST-EVER SEABED CPT

Bluefield Geoservices (Bluefield), an international subsea geotechnical services provider, has released details of what the company believes to be the deepest-ever successful offshore Cone Penetration Test (CPT), carried out in ultra-deep-water depths of more than 4,000 meters in the Pacific Ocean. Bluefield operators successfully completed 23 seafloor CPTs to a push depth of 2 meters as part of an ongoing geotechnical site investigation campaign to assess the ocean floor conditions that characterize this vast abyssal plain.

Instrumental to this "industry first" was the deployment of Bluefield's ROVcone, a

proprietary CPT system that can be paired with any work class ROV, trenching machine, or similar subsea asset. The CPTs were carried out in conjunction with Bluefield's BOXcone—a custom-built *in situ* testing tool designed to interface with a box core sample box—to enable the survey team to correlate the acquired seafloor data.

"This is an exciting milestone for the entire Bluefield team, both the skilled operators in the field and the subsea engineers that have worked so diligently in recent years to develop our exclusive toolkit of deep-sea geotechnologies, including the ROVcone CPT system," said Bluefield Managing Director Jim Edmunds.

"Most CPT systems, like the heavy duty 100 kN ROSON, are depth rated for 3,000 meters, so to see the ROVcone perform as designed at these unprecedented depths is hugely rewarding. And while we believe this to be the deepest offshore CPT on record, the ROVcone is in fact depth rated for operations to 6,000 meters below the surface, so the application of this equipment extends beyond these waters."



» Bluefield's ROVcone was used to achieve the ultra-deep-water CPT. (Photo credit: Bluefield)

Bluefield was founded in late 2018 by a team of offshore geotechnical experts seeking to disrupt the long-established order of subsea geotechnical services by fusing highly specialized geotechnical data collection services with the deployment of custom-engineered tooling. Since opening an office in Newport, Rhode Island in 2019, the firm has made a series of significant capital investments to ensure that the latest geotechnical solutions are available to the burgeoning US offshore wind industry and the broader offshore energy sector.

Two New ROS Innovations

One Brighter SEASTAR™



- LED array produces 10K+ Lumens
- All components field serviceable using standard hand tools
- 120VAC or 24VDC full range, flicker free dimming
- Depth rated to 6000 meters

One Smarter accu-positioner™

- Highly reliable design
- Controlled with COTS controllers, devices and ROS GUI
- High accuracy feedback / servo mode: +/- .1 degree
- Zero backlash
- Lightweight and compact
- Depth rated to 6000 meters



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AQUAMAPPER: UAV-BASED SOLUTION FOR BATHYMETRIC SURVEYING AND MARINE CONSTRUCTION

TOPODRONE, a Swiss based designer and manufacturer of high-precision LiDAR equipment for installation on drones, vehicles, and backpacks, has launched AQUAMAPPER, a UAV-based solution for bathymetric surveying and marine construction. The new multitasking data collecting device and TOPODRONE LiDAR ULTRA equipment have been successfully used together for airborne surveying at a highway construction project in Romania, EU to deliver a full digital twin of a studied area.

AQUAMAPPER is a brand-new hardware developed in-house by TOPODRONE and contributes to a complete set of photogrammetry, LiDAR, and bathymetry surveying solutions. This new product mounted



» AQUAMAPPER delivers a complete set of photogrammetry, LiDAR, and bathymetry solutions. (Photo credit: TOPODRONE)

SHEARWATER GEOSERVICES AWARDED LARGE US GULF OF MEXICO OBN PROJECT WITH WESTERNGECO

Shearwater GeoServices recently announced the award of a large US Gulf of Mexico Ocean Bottom program, Engagement 3, the second project award under the recently announced Global Agreement with WesternGeco. The contract secures WesternGeco access for follow-on projects, providing certainty for continued acquisition using this technology in the Gulf of Mexico to accelerate and de-risk new development projects.

The three-month survey is expected to cover a nodal area of approximately 2,400 km². The project builds on Shearwater's experience from similar OBN geophysical data acquisition executed in the Gulf of Mexico in 2020. Sparse node projects use ultralong-offset OBN data to resolve subsurface imaging challenges by integrating new data with existing wide and full azimuth data to provide new geological insight.

Shearwater will deploy the high-end seismic vessels SW Gallien and SW Mikkelsen as

source vessels for the project, working in combination with ROV node deployment. Both vessels are expected to continue to execute projects in the fast-growing OBN market.

"Shearwater has the flexibility to reassign our assets towards relevant markets, and by doing this support our clients' strategies in the growing ocean bottom seismic market," said Irene Waage Basili, CEO of Shearwater. "Our large high-end fleet of seismic vessels give us a significant competitive advantage, enabling us to evolve rapidly to answer our clients' needs."

Andrea Lovatini, Director WesternGeco, commented: "With this new strategic partnership and first project due to kick off in early November 2022, WesternGeco will continue to build on its industry leading data portfolio in the Gulf of Mexico."

WesternGeco will combine new OBN data with existing Wide Azimuth and Revolution

on a UAV provides a combination of high-speed efficiency (up to 14 km/h) and accuracy. It is a PPK ready solution, compatible with DJI Matrice 300 RTK. The application areas include but are not limited to an open sea bathymetric survey up to 100 m depth, quantity survey and calculation of sediments, periodic maintenance survey of storage pools.

TOPODRONE AQUAMAPPER and LIDAR ULTRA have been used for airborne surveying at Autostrada Sibiu – Pitești, Secțiunea 2: Bojă - Cornetu, a European road construction project. It aims at building a highway in one of the toughest terrains in Romania and includes 7 tunnels, 24 bridges and 18 viaducts. The drone LiDAR corridor and bathymetric survey was performed by Romanian GRAPHEIN TOPO SA.

TOPODRONE LIDAR ULTRA on board DJI M300 drone was used to capture laser scanning data from 100 – 120 m altitude over rugged terrain forest area to cover a 32 km long and 400 m width corridor within 14 flights while AQUAMAPPER connected to the same DJI M300 drone performed a bathymetry survey over 6 river crossings.

"The key advantage of the new bathymetric equipment from TOPODRONE is the ability to capture a riverbed with centimeters level accuracy with high speed in fully automatic mode and without using any boat. It allows us to work in hard to access and shallow water areas. The same drone carrier can be used for both LiDAR and bathymetry surveys. The combination of an echosounder, GNSS and Inertial measurement system helps to get accurate results after data post processing," explained Andrei Sueran of GRAPHEIN TOPO SA.

data, through the use of proprietary Enhanced Template Matching Full Waveform Inversion (ETM FWI). This has proven to deliver a step change in subsurface imaging resolution accelerating near field development with reduced uncertainty.



» SW Gallien. (Photo credit: Shearwater GeoServices)

FUGRO COMPLETES OFFSHORE SURVEYS FOR RWE'S DOGGER BANK SOUTH WIND FARM

Fugro has successfully completed fieldwork on a geophysical, geotechnical, and environmental site investigation contract for RWE Renewables' Dogger Bank South (DBS) offshore wind farm and export cable routes.

DBS is located more than 110 km off the east coast of Yorkshire, England in the North Sea and has the potential to generate renewable electricity for up to 3.4 million UK homes per year. The array area covers approximately 1,000 km² with over 100 km of proposed export cable routes, resulting in a total survey scope exceeding 20,000 km of survey lines.

Trevor Baker, RWE Project's Lead for Dogger Bank South, said: "The offshore surveys are a very important aspect of the project's development and the data collected will help inform the environmental impact assessment process and help in the engineering design

of the wind farms. Fugro have demonstrated technical competence in previous projects, and we are pleased to have them on board."

Fugro mobilized multiple vessels from its industry-leading fleet to complete full coverage surveys. This included seabed cone penetration tests (CPTs), sampling boreholes, multibeam echosounder surveys and the largest 2D ultra high-resolution seismic (UHRS) survey to be completed on a single project. In addition to this, Fugro's environmental surveys comprised of grab sampling, epibenthic trawling and drop-down videos. The acquired Geo-data will be used to understand the site's subsurface conditions, advise on geohazard risk mitigation and identify a safe route for export cables.

The processed data will be shared on Fugro's centralized cloud-hosted platform allowing



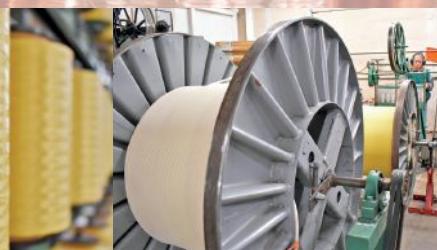
» Multipurpose survey vessel Fugro Frontier.
(Photo credit: Fugro)

internal and external teams access to authoritative project Geo-data, facilitating faster decision-making and accelerated timelines on critical project milestones.

Peter Aarts, Fugro's Marine Geophysical Director Europe and Africa, said: "When considering a project of this scale, early access to Geo-data that provides actionable insights is key. With an understanding of the seafloor and sub-surface conditions, geohazards and environmental constraints, RWE will be able to make informed decisions on their wind farm foundation designs, whilst also reducing installation risks and ensuring the most efficient cable routes. We're proud to support the future developmental phases of the Dogger Bank South wind farm project and the UK's ongoing energy transition."



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» Mobile and internet connectivity is important for socioeconomic growth and development and is crucial for island nations like Maldives. (Photo credit: Dhiraagu)

ADB, DHIRAAGU TO EXPAND INTERNET ACCESS IN MALDIVES

The Asian Development Bank (ADB) and Dhivehi Raajjege Gulhun Public Limited Company (Dhiraagu) have agreed on a \$20 million debt financing facility to expand mobile and internet coverage in Maldives by supporting the company's capital expenditure requirements and helping to finance the SEA-ME-WE 6 Submarine Cable System (SMW6) that will connect the country to the global digital superhighway.

The debt financing includes a recently signed \$9.1 million facility as the first tranche to support Dhiraagu's general capital expenditure and working capital requirements such as network capacity upgrades, expansion of data centers, and mobile service enhancements in and outside the capital Malé. A second \$10.9 million will finance further general capital expenditure and funding requirements for SMW6—an undersea cable system that will connect Maldives to Europe and Asia via the Middle East which will be approximately 15,000-kilometer long.

"Mobile and internet connectivity is important for socioeconomic growth and development," said ADB Private Sector Operations Department Director General Suzanne Gaboury. "It's crucial for island nations like Maldives, where public services are difficult to provide as the population is spread across numerous islands. This is ADB's first private sector infrastructure financing transaction in Maldives, which will help to deliver faster and more affordable internet connectivity and be a crucial enabler of private sector investments and regional connectivity."

The internet and mobile phone penetration rate in Maldives is higher than in most of its South Asian neighbors. However, due to the high cost of providing services to almost 200 inhabited islands across the country, fixed broadband has not yet been rolled out to communities on many of the smaller islands.

"This loan from ADB will help finance some of our critical projects that require foreign currency financing," stated Dhiraagu Chief Executive Officer and Managing Director Ismail Rasheed. "We are focused on expanding our fiber-to-the-home reach and strengthening our digital infrastructure to ensure that high-speed broadband and high-quality digital services can be enjoyed even at remote islands across the country. Our recent initiative to connect the Maldives to the SMW6 submarine cable system will add further resilience and diversify our global connectivity, bringing Maldives a step closer to becoming a global digital hub."

Expanded telecom coverage on remote islands of Maldives will provide communities with enhanced access to online services such as education and health care, reduce development gaps between urban and rural areas.

Dhiraagu is the leading digital service provider in Maldives, enriching the lives of the people living in the island nation. The company has enabled 100% mobile coverage across the country and fixed internet coverage available to 85% of Maldives households. A comprehensive range of mobile, internet, data, IPTV, mobile money, and fixed services are offered to their customers.

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region.

DEVELOPMENT CORPORATION FORMED FOR TRANS-ARCTIC FIBER CABLE CONNECTING EUROPE TO ASIA

An international consortium of companies has formed a joint corporation to work towards development of a submarine fiber optic system connecting Asia and Europe through the Arctic. Far North Fiber, Inc., brings together Finland's Cinia Oy, Alaska's Far North Digital and Japan's ARTERIA Networks Corporation. The team will promote a system that aims to realize a faster and more secure route directly connecting Japan, North America, and Ireland and Scandinavia.

Far North Fiber estimates that the nearly 17,000 km system will be ready for service by the end of 2026. Global submarine cable leader Alcatel Submarine Networks (ASN) has been selected to build and install the submarine cable and equipment required for this project.

"Far North Fiber will be the first multicontinental cable system through the Arctic. It provides a backbone that offers enhanced opportunities for economic development, international security, and a greener footprint for the buildup of global digital infrastructure," said Ari-Jussi Knaapila, CEO of Cinia.

Koji Kabumoto, Representative Director, President & CEO of ARTERIA, commented: "The FNF is to build a network that directly connects Europe and Asia with low latency through the Northwest Passage, and Japan will serve as the gateway to Asia. It is our pleasure to be involved in this journey, as the project is expected to contribute the development of digital societies in Japan and Asia in a wide range of fields, including industry, academia, and culture."

Guy Houser, FND's Chief Operating Officer, added: "Far North Fiber represents a unique partnership, which is going to improve Arctic infrastructure, lead to greater scientific understanding of the environment along the route, and build closer relationships for the connected regions and communities."



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VAN OORD ANNOUNCES NEXT PHASE FOR NEW CABLE-LAYING VESSEL CALYPSO

Van Oord's new cable-laying vessel *Calypso* is on its way to the Vard Brattvaag yard in Norway for construction finishing, after a successful and safe launch at the Vard Tulcea shipyard in Romania, last week. This next-generation, custom-built vessel will be a key strategic addition to Van Oord's offshore wind fleet, being equipped with the latest sustainable technologies. Construction is progressing well on schedule and the vessel is expected to be operational from the end of 2023 on.



» Launch of cable-laying vessel *Calypso*. (Photo credit: Van Oord)

NEW ELLALINK PETABIT CABLE OLISIPO

EllaLink, the high-capacity and low latency fiber-optic submarine cable directly connecting Europe to Latin America, recently announced the development of a direct connection between Sines and the Lisbon Metro Area—the Olisipo system.

The Olisipo system is designed to connect all the international submarine landings in Portugal with the major data centers in the region with a secure multi-petabit future-proof infrastructure.

This new fiber optic submarine cable will land in Carcavelos and Sines and will be ready to branch into Seixal and Sesimbra cable landing stations and connect the Setubal area.

Incorporating 288 fibers, the unrepeatered 110 km fully buried cable will have an impressive total design capacity of 4.3 Petabits.

Additionally, the cable robustness will be enforced by particular care given to route engineering with special attention to cable crossing, full subsea and terrestrial burial strategy, full cable armoring, and extra shore-end protection with bore pipe in Sines.

The Olisipo system will provide direct POP to POP connectivity at fiber pair level between the main data centers located in Sines and Lisbon Metro Area, connecting at day one the data centres of Start© Campus NEST in Sines and Altice LDV in Lisbon.

The *Calypso* is Van Oord's second cable-laying vessel in addition to the *Nexus*. It measures 131 meters in length and 28 meters across the beam and will be Dutch flagged. The new DP2 vessel will not only be fitted with a carousel on deck but also with a second, below-deck cable carousel, with a total cable-carrying capacity of 8,000 tonnes.

Offshore wind is a key contributor to achieving climate change targets around the world. By investing in state-of-the-art sustainable technology, Van Oord contributes to the energy transition, making offshore wind more competitive. The *Calypso* will mainly be deployed to install inter-array grid and export cables for offshore wind projects, including high-voltage direct current (HVDC) cables. Van Oord's highly innovative cable trenchers can also be operated from the vessel.

The *Calypso* has been designed with the latest sustainable technologies in order to reduce its carbon footprint during operations and when on port standby. Apart from the ability to run on biofuel, this hybrid vessel has future-ready engines with built-in flexibility to anticipate e-fuels. It will have a large battery pack, a shore supply connection, and a state-of-the-art energy management system. This sustainable set-up will result in a more energy-efficient vessel, with significantly reduced CO₂, NO_x, and SO_x (carbon, nitrogen and sulphur oxides) emissions.

With this new cable development, EllaLink underlines its openness to integrate additional anchor customers aiming to partner for the expansion and construction of a very important connection.

The Olisipo sustains EllaLink's vision in having Sines as one of the most important interconnection Hubs in Iberia, extending our cable from EllaLink Vasco da Gama CLS in Sines to the Lisbon Metro Area. The symbiotic relationship between submarine cable systems and data centres is at the heart of how these businesses thrive and survive. Connecting and transporting traffic between Brazil and Portugal, onwards across Europe and ultimately across the globe is the primary role of the EllaLink cable system and the data centres it connects to! Sines and Lisbon together will be able to compete with major European Hubs as both cities are being seen as a preferable gateway to Europe already.

Olisipo is projected to be ready for service in 2024.



NEC SIGNS LONG-TERM CHARTER CONTRACT WITH GLOBAL MARINE SYSTEMS

NEC Corporation has signed a charter contract with U.K.-based Global Marine Systems Limited for an optical submarine cable-laying ship for approximately four years. Through this contract, NEC will strengthen its provision of submarine cable systems and respond to expanding demand for submarine cables due to the increase in global data traffic.

NEC has been a leading global vendor in the submarine cable system business for over 50 years, manufacturing submarine cables, submarine repeaters, and terminal station equipment, in addition to coordinating marine surveys and route design, equipment installation work, cable laying, training and delivery testing.

Until now, NEC has procured submarine cable-laying ships for each project separately. In order to respond to the growing demand for new submarine cables due to the recent spread of 5G and the increase in data traffic between data centers in various countries, NEC has chartered a long-term dedicated cable-laying ship for the first time. As a result, NEC will provide submarine cable systems more quickly and flexibly than ever before to meet customer demand.



» Submarine cable-laying ship Normand Clipper.
(Photo credit: Global Marine)

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» Inexpensive and versatile, Seasats' X3 micro-ASV is well positioned to enhance L3Harris' existing maritime capabilities. (Photo credit: Seasats)

L3HARRIS INVESTS IN SEASATS TO ACCELERATE DELIVERY OF AUTONOMOUS MARITIME CAPABILITIES

L3Harris Technologies has made a strategic investment in Seasats, a privately-owned company involved in the design and production of low-cost, solar-powered maritime autonomous surface vehicles (ASVs) for military and commercial use.

L3Harris is making its investment to fuel collaborative development and accelerate production of Seasats' X3 micro-ASV, whose unique design and low-signature waterline makes it difficult to detect by sight and radar. The X3 features stealthy performance and reliable six-month endurance in all weather conditions for a fraction of the price of current small maritime ASVs and provides a complement to L3Harris' large and medium-sized ASV offerings.

"Our U.S. Navy customers are pursuing innovative solutions to reliably and efficiently patrol the waters from the Red Sea into the Persian Gulf and we understand their urgent need for proliferated maritime ASV architectures," said Daniel Gittsovich, Vice President, Corporate Strategy and

Development, L3Harris. "Our investment and collaboration with Seasats provides a proven, multi-capability solution for global maritime security challenges."

Inexpensive, versatile, and ideally suited to host a variety of maritime payloads, the X3 is well positioned to enhance the counter-piracy, mine clearing, intelligence, surveillance and reconnaissance, and electronic warfare solutions L3Harris already provides its customers.

Seasats can also serve commercial clients by pairing platforms and sensors to enable advanced hydrographic surveys, infrastructure monitoring, and scientific discovery. Future collaboration and technology sharing between L3Harris and Seasats has the potential to increase the autonomous capabilities, artificial intelligence, and endurance of the X3 while cutting production time up to 75 percent.

"The L3Harris team recognized the value in pairing their payloads and sensors with our versatile platform because together

they create an operations-ready solution for a wide range of critical military and commercial uses," said Mike Flanigan, CEO of Seasats. "Our previous tests and demonstrations with the Navy were enthusiastically received and we are looking forward to making collaborative improvements with L3Harris as we prepare for operational capabilities testing with Task Force 59 in the Arabian Peninsula next year."

The U.S. Navy 5th Fleet commander, Vice Admiral Brad Cooper, recently announced a goal to have at least 100 unmanned surface vessels patrolling the Arabian Peninsula by mid-2023. Earlier this year the Navy invited Seasats to participate in its "Digital Horizon 2022" exercise designed to develop maritime domain awareness and accelerate the Navy's robotic and artificial intelligence maritime capabilities.

CNO, COMMANDANT, AND FIRST SEA LORD MEET FOR STRATEGIC DIALOGUE ON DELIVERING COMBINED SEAPOWER

Chief of Naval Operations Adm. Mike Gilday and Commandant of the Marine Corps Gen. David Berger met with the Royal Navy First Sea Lord and Chief of Naval Staff Adm. Sir Ben Key for a Strategic Dialogue at the Pentagon, October 20, 2022.

The Strategic Dialogue takes place every other year between the U.S. and U.K. navies. Known as "Delivering Combined Seapower," the dialogue was first introduced in 2016 to build and sustain interoperability between the U.S. and U.K. fleets.

"Our relationship with the Royal Navy is the bedrock of enduring maritime security, and a key enabler of integrated all-domain naval power," said Gilday. "Nothing our armed forces accomplish day-in and day-out happens without working alongside close allies, and the U.S. Navy has no closer ally than Adm. Key."

Gen. Berger's presence marks the first time the Commandant of the Marine Corps (CMC) has participated in the Strategic Dialogue. Moving forward, a key objective for both CNO and CMC is to increase integration and interoperability of U.S. and U.K. Navy and Marine forces.

"The Marine Corps always welcomes opportunities to partner with our allies in the naval forces," Berger said. "I look forward to continued dialogue and collaboration with the Royal Navy and the Royal Marines as we explore the full potential of Delivering Combined Seapower."

"It is a matter of enormous pride for me to visit the U.S. and talk to my great friends and colleagues Adm. Mike Gilday and Gen. David Berger. Once again, we have reaffirmed the very special relationship between our two Nations and two Navies and our Marines," said Key.

"We have refreshed our longstanding commitment for us to work collaboratively across the world, from the Euro-Atlantic to the Indo-Pacific Regions, and to stand together to safeguard the use of the global maritime commons upon which our combined security and prosperity depend," he added.

During the dialogue the leaders discussed maritime strategies, warfighting concepts, and future force design. Berger released his latest 2022 Force Design 2030 annual report this past May, Gilday updated his Navigation Plan 2022 in July, and Key recently circulated his own Royal Navy strategy.

The U.S. and U.K. naval forces regularly operate together around the globe. In addition to annual, named exercises like Joint Warrior, Pacific Partnership, Rim of the Pacific, and Baltic Operations, the U.S. Navy, Marine Corps, and Royal Navy have



» Chief of Naval Operations Adm. Mike Gilday (left), Royal Navy First Sea Lord and Chief of Naval Staff Adm. Sir Ben Key (center), and Commandant of the Marine Corps Gen. David Berger (right). (Photo credit: U.S. Navy/Mass Communication Specialist 1st Class Michael Zingaro)

teamed up this year for real-world contingency operations and joint deployments—to include the current deployment of the USS Gerald R. Ford (CVN 78).

Gilday last met with Key earlier this month at the Trans-Regional Seapower Symposium in Venice, Italy. The two navy chiefs are expected to next meet in November at the Western Pacific Naval Symposium in Yokohama, Japan.

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KONGSBERG TO SUPPLY HUGIN AUVs PLUS HIPAP EQUIPMENT TO POLISH NAVY

Kongsberg Maritime has announced a contract award with Polish shipbuilder Remontowa Shipbuilding SA (RSB) to supply three shipsets of KONGSBERG HUGIN AUV systems and related HiPAP positioning and communication systems for three newbuild warships for the Polish Navy.

The total contract value is in excess of €10 million, with the KONGSBERG equipment destined for the next three vessels (#4, #5 and #6) in the Kormoran II Mine-Countermeasures (MCM) vessel program. These three ships will be commissioned from 2026 to 2027. The three HUGIN/HiPAP shipsets will be delivered to the yard over the next four years to match with the new vessel delivery schedule. This new contract follows on from previous contracts for the successful integration of HUGIN and HiPAP systems on the first three vessels in the Kormoran II program by Kongsberg Maritime and RSB.

KONGSBERG HUGIN AUVs are marine robots offering the ultimate in autonomous remote subsea search and survey capability. These free-swimming autonomous underwater vehicles are characterized by great maneuverability and excellent stability for high-quality data collection. Hydrodynamic shape, accurate instruments and excellent battery capacity make these AUVs a

popular choice for governments and militaries worldwide.

One of the many benefits of the HUGIN systems is their modular platform and wide range of options. The HUGINS aboard the Kormoran II vessels will benefit from:

- KONGSBERG HISAS 1032 Synthetic Aperture Sonar for long range, high-resolution imagery and bathymetry
- KONGSBERG EM2040 Multibeam Echosounder, an industry standard bathymetric mapping sonar
- UHD Color Camera with LED Lighting Panel for high-resolution optical imagery
- Forward-looking Sonar and altimeters for obstacle avoidance and trajectory planning
- Low magnetic-signature stinger launch & recovery system (LARS)
- KONGSBERG Sunstone advanced Inertial Navigation System (INS) for industry leading autonomous position accuracy

Capable of fully autonomous operations without surface vessel support, HUGIN is also designed to work in conjunction with the HiPAP (High Precision Acoustic Positioning) family of underwater

positioning and navigation systems. This allows for high-accuracy position updates for the vehicle, as well as real-time communications for status, sensor quality assurance and on-the-fly mission replanning.

The Kormoran II class minehunters have a full load displacement of 850 tonnes, an overall length of 58.5 m and can carry a crew complement of 45, with accommodation for seven additional personnel. The RSB's own in-house design is a multi-toolbox concept, hybrid solution, minehunter where HUGIN AUV is one of underwater systems for stand-off mine countermeasure operations.

Commenting on the contract award, Kongsberg Maritime SVP Stene Førsund said: "These latest contracts are a true acknowledgment of a team effort over many years, and it shows that Kongsberg Maritime offers the right technology and solutions for the growing AUV market. We see that customers put AUVs into operation in many applications, and we believe that Autonomous Underwater Vehicles will be used in even more applications in the future. We have some big-name clients, but when the navy of a sovereign nation and fellow NATO member continues to put its trust in our technologies, it's an inspiring moment for us."

Dariusz Jaguszewski, CCO at Remontowa Shipbuilding said: "These mine countermeasure vessels represent an important contract for Remontowa Shipbuilding as well as an important statement and reinforcement of Poland's national security in a fast-changing world. Kongsberg Maritime has already successfully delivered and commissioned HUGIN and HiPAP systems to us for the first three vessels in the Kormoran II program. The experience of nine years work with Kongsberg through these deliveries has been highly professional throughout and we are confident that the technologies to be delivered represent the state-of-the-art in underwater autonomy and mine countermeasure systems."



» Kongsberg Maritime will provide HUGIN AUV systems for three new vessels in the Kormoran II Mine-Countermeasures program. (Image credit: Kongsberg)

HII UNVEILS REMUS 620 MEDIUM-CLASS UUV

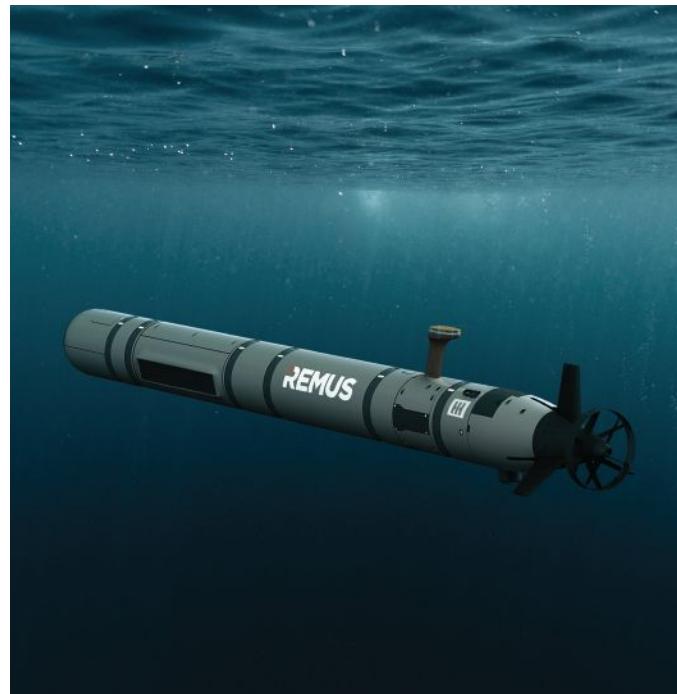
HII's Mission Technologies division has revealed a new medium-class unmanned underwater vehicle (UUV): REMUS 620. Building on the design philosophy of the highly successful REMUS 300—recently selected by the U.S. Navy as the program of record for the Lionfish Small UUV—the REMUS 620 has a battery life of up to 110 hours and a range of 275 nautical miles, providing unmatched mission capabilities for mine countermeasures, hydrographic surveys, intelligence collection, surveillance and electronic warfare.

"The REMUS 620 is the first medium UUV designed to accurately deliver this range of advanced above-and-below water effects at long range," said Duane Fotheringham, president of Mission Technologies' Unmanned Systems at HII.

Built to support current and next-generation naval and special operations forces operations, REMUS 620 features a modular, open architecture design to facilitate seamless payload integration and HII's Odyssey™ suite of advanced autonomy solutions for intelligent, robotic platforms.

REMUS 620 is the same size and weight of the first and only full-rate production medium UUVs: the MK 18 Mod 2, Littoral Battleship Sensing-Autonomous Undersea Vehicle (LBS-AUV) and LBS-Razorback systems operated by the U.S. Navy's Mine Countermeasure Squadrons, U.S. Naval Oceanographic Office and Submarine Forces, respectively.

Multiple REMUS 620s operating collaboratively can be deployed from submarines, small manned or unmanned boats, amphibious ships, surface combatants and helicopters. REMUS 620 can also be used as a platform to launch and operate other unmanned vehicles or payloads from beneath the sea.



» REMUS 620 is equipped with multiple batteries capable of 110 hours and a range of 275 nautical miles. (Image credit: HII)

The increased REMUS battery life enables the UUV to execute a significantly longer route to and from a mission area than previously afforded by medium-class vehicles, with swappable energy modules for quick turnaround.

REMUS 620 is built with modern core electronics, navigation and communication systems, and the vehicle's open architecture can now be enhanced with HII Odyssey™, a suite of advanced autonomy solutions for intelligent, robotic platforms.



KRAKEN RECEIVES \$1.1 MILLION SONAR ORDER FOR NATO NAVY CUSTOMERS

Kraken Robotics Inc. announces a \$1.1 million purchase order from an unnamed customer for several of its AquaPix® synthetic aperture sonars (SAS). These systems will be integrated to Autonomous Underwater Vehicles (AUVs) for delivery to two distinct NATO navies. Delivery is expected in the first half of 2023.

Kraken's AquaPix® is an off-the-shelf, configurable SAS that replaces high end sidescan

systems at an affordable price, while delivering higher resolution, range, and area coverage rates (ACR). The increased range, resolution, and therefore higher useable ACR of SAS over traditional side scan sonar systems significantly expand the capabilities of naval, scientific, and commercial applications.

Kraken's AquaPix is capable of 2 cm x 2 cm Ultra High-Definition SAS imaging at long ranges. AquaPix is uniquely

positioned within the industry to bring this capability to the increasingly popular small, man-portable vehicle class. AquaPix is modular and has been integrated and deployed on over 20 different underwater vehicle platforms from shallow water to full ocean depth.

Kraken's SAS is modular and versatile, demonstrated by being one of only two companies in the world that has sold and integrated SAS

into small, man portable vehicles, towed systems, and deep-water vehicles. This ability to cross several platforms enables military customers to streamline their Post Mission Analysis by having the same sonar resolution and ATR performance across their entire fleet of vehicles and mission requirements.





AMERICAS

Conf on Historical and Underwater Archaeology

Lisbon, Portugal ➤ January 4-7, 2023
<https://sha.org/2023-conference-lisbon/>

Trinidad & Tobago Energy Conference

Trinidad & Tobago ➤ January 23, 2023
<https://energynow.tt/events/tamt-energy-conference-2023>

Blue Innovation Symposium

Newport, RI ➤ January 24-26, 2023
www.blueinnovationsymposium.com

Floating Wind Solutions

Houston, TX ➤ Jan 30 – Feb 1, 2023
www.floatingwindsolutions.com

Oceanology Int'l Americas

San Diego, CA ➤ February 14-16, 2023
www.oceanologyinternationalamericas.com

Subsea Tieback

Galveston, TX ➤ Feb. 28 - Mar. 2, 2023
www.subseatiebackforum.com

US Hydro

Mobile, AL ➤ March 12-16, 2023
www.thsoa.org/us-hydro

Canadian Underwater Conference & Exhibition (CUCE)

Halifax, Nova Scotia ➤ March 26-28, 2023
www.underwaterconference.ca

Int'l Partnering Forum (IPF)

Baltimore, MD ➤ March 28-30, 2023
www.offshorewindus.org/2023ipf

Sea-Air-Space

National Harbor, MD ➤ April 3-5, 2023
[https://seaairspace.org](http://seaairspace.org)

EUROPE

EERA DeepWind

Trondheim, Norway
 ➤ January 18-20, 2023
<https://www.deepwind.no>

Subsea Expo

Aberdeen, UK
 ➤ February 21-23, 2023
www.subseaexpo.com

Offshore Wind Operations & Maintenance Forum

Berlin, Germany ➤ March 9, 2023
<https://www.leadventgrp.com/events/2nd-annual-offshore-wind-operations-and-maintenance-forum/details>

Seabed Mapping & Inspection

Geilo, Norway ➤ March 8-10, 2023
<https://www.tekna.no/en/events/seabed-mapping-and-inspection-2023-4384>

Reuters: Hydrogen Europe

Amsterdam, The Netherlands
 ➤ March 28-29, 2023
<https://events.reutersevents.com/renewable-energy/hydrogen-europe>

MCE Deepwater Development

London, UK ➤ March 28-30, 2023
<https://mcedd.com>

Ocean Business

Southampton, UK
 ➤ April 18-20, 2023
www.oceanbusiness.com

OTHER REGIONS

Int'l Conference on Coastal Engineering

Sydney, Australia ➤ December 4-9
www.icce2022.com

Asia-Pacific Deep Sea Mining Summit

Singapore ➤ December 12-13
www.asia.deepsea-mining-summit.com

SubOptic

Bangkok, Thailand
 ➤ March 13-16, 2023
www.terrapijn.com/exhibition/suboptic

DSEI Japan

Tokyo, Japan
 ➤ March 15-17, 2023
www.dsei-japan.com/welcome

Gastech

Singapore ➤ September 11-14, 2023
www.gastechevent.com

Mozambique Gas & Energy Summit

Maputo, Mozambique
 ➤ September 13-14, 2023
www.mozambiqueenergysummit.com

Eastern Mediterranean Conference

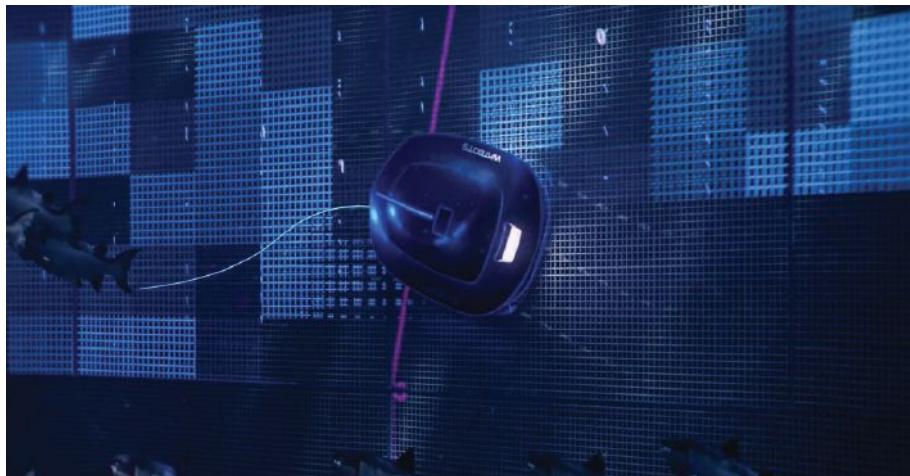
Cyprus ➤ November 28-30, 2023
www.emc-cyprus.com

2022

MONTH & DEADLINES	EDITORIAL FOCUS & SHOW DISTRIBUTION	CONTENT FOCUS & PRODUCT/SERVICE
NOVEMBER Editorial: Oct. 17 Ad: Nov. 03	» UNDERWATER IMAGING	Editorial Topics: Bathymetric Mapping, IMR, Habitat Characterization, Acoustic Sensing Product Focus: Observation ROVs, AUVs, cameras, lights, diving innovation, tracking & positioning systems, optical and acoustic sensors
DECEMBER Editorial: Nov. 14 Ad: Nov. 18	» THE FUTURE OF OCEAN TECHNOLOGY Oceanology Int'l Americas / February 14-16 Subsea Expo / February 21-23 Floating Wind Solutions / January 30 - February 1	Editorial Topics: Special Edition

2023

JAN/FEB Editorial: Jan. 20 Ad: Feb. 10	» OFFSHORE EXPLORATION US Hydro / March 12-16 Int'l Partnering Forum / March 28-30 CUCE / March 26-28	Editorial Topics: Offshore Infrastructure Development, Exploration of Deep-Sea Resources, ESG, Geotechnical Services Product Focus: Submersibles, AUVs, Lights, Cameras, Deck Handling Equipment, Research Vessels, Samplers
MARCH Editorial: Feb. 20 Ad: Mar. 10	» UNCREWED VEHICLES Ocean Business / April 18-20	Editorial Topics: Remote Marine Survey, Seafloor Mapping, Harbor Security, Long-Range Ocean Research, Coastal Monitoring Product Focus: USVs, AUVs, LARS, UAVs, Sonars, Propulsion and Positioning Systems
APRIL Editorial: Mar. 20 Ad: Apr. 7	» MARITIME DEFENSE & SECURITY UDT / May 9-11	Editorial Topics: Coastal Surveillance, Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW), Search & Rescue, Submarine Cable Infrastructure & Protection Product Focus: USVs, XLUUVs, AUVs, ROVs, Amphibious Vehicles, MCM, ASW
MAY Editorial: Apr. 14 Ad: May 5	» GREEN ENERGY TRANSITION	Editorial Topics: Offshore Wind Infrastructure & Supply Chain, Subsea Batteries, Wave Energy Systems, At-Sea Automation, CCS Systems, Hydrogen Product Focus: Offshore Turbines, Supply Vessels, Underwater Batteries, Subsea Connectors, Submarine Cables, Renewable Energy Systems
JUNE Editorial: May 22 Ad: June 9	» UNDERWATER SENSOR TECHNOLOGY & IMAGING	Editorial Topics: Underwater Navigation, Marine Archaeology, Environmental Coastal Monitoring Product Focus: ROVs, Lights, Cameras, Manipulators, Towed Arrays
JULY Spotlights: June 27 Ad: July 7	» UNCREWED VEHICLES BUYERS' GUIDE □	Editorial Topics: Special Edition
AUGUST Editorial: July 24 Ad: Aug. 11	» OCEAN OBSERVATION, DATA, & COMMUNICATIONS	Editorial Topics: Oceanography, Meteorology, Remote Sensing, Telemetry, Data Processing, Seafloor Mapping, Cloud-Based Data Storage Product Focus: Marine Observation Systems, Buoys, Drifters, Marine Research Vessels, Subsea Nodes, CTD, Acoustics, Biosensors
SEPTEMBER Editorial: Aug. 21 Ad: Sept. 8	» REMOTE MARINE OPERATIONS	Editorial Topics: Subsea Inspection, Maintenance, Repair (IMR), Seabed Residency, Subsea Intervention, Oil Spill Response, Remote Operations Centers, Professional Development & Training Product Focus: Inspection AUVs, ROVs, USVs, Work-Class ROVs, Pipeline Pigs, Ultrasonic Imaging



» The Watbots innovative solution for aquaculture cage cleaning. (Image credit: Water Linked)

OCEANOLOGY INTERNATIONAL AMERICAS GATHERS MOMENTUM

Oceanology International Americas (OiA), which will take place from February 14-16, 2023, in San Diego, recently announced the conference theme: The New Blue Economy: Unlocking the Potential.

The opening plenary will set the scene for the future development of the New Blue Economy, with senior representatives from federal and state government and from ocean technology and ocean services businesses describing their visions of the future.

Daily Ocean Futures panel discussions will feature discussion concerning the role of new blue economy products and services in delivery of energy transition and will explore the foundational science, effective innovation, and workforce development needed to ensure meaningful progress.

San Diego lies at the heart of the blue economy representing a focal point for technologists and tech accelerators to showcase new to market solutions to an interested worldwide audience. The accessibility of San Diego from Canada, Mexico, Australia, South America, and the wider APAC countries means that attendees are from diverse, economically, and strategically significant regions.

OCEAN TECH ON SHOW

One example of this wide reach is Norwegian OiA exhibitor Water Linked, which recently shared the good news that it is set to provide a key component in the Watbots innovative solution for aquaculture cage cleaning.

"OiA is the best opportunity for us to meet existing and new customers based in North America, all in one location," said Scott McLay, Chief Commercial Officer of Water Linked. "We continue to grow our market share and North America is a key market for us hence it is important for us to maintain a visual presence."

While Water Linked has only hinted at the possibility of a new product launch at OiA, Australian-based exhibitor Advanced

Navigation confirmed that its Hydrus underwater drone is set to make its US West coast debut at OiA 2023.

Hydrus is a highly capable AUV that fits into a standard airline carry-on bag yet packs in industry leading technology, including connector-less design, inductive charging, an AI enhanced INS (Inertial Navigation System) and DVL transducers.



» Hydrus AUV will be on display at OiA. (Photo credit: Advanced Navigation)

Advanced Navigation's Subsea Product manager Peter Baker commented: "This is a commercial grade fully autonomous free swimming subsea robot, not to be confused with other similarly sized consumer or pro-sume underwater drones which are usually tethered vehicles and remotely operated rather than fully autonomous. OiA is our opportunity to put this game changing technology in front of one of the largest concentrations of subsea professionals anywhere and we expect to develop a real buzz around it."

MATCHMAKING

New to OiA for 2023 is a B2B matchmaking event on February 15. Delivered in partnership with Innovate UK EDGE, the b2match event will give OiA attendees the opportunity to meet potential collaborators and business partners during pre-arranged one-to-one meetings between exhibitors and visitors, active in the blue economy.

Visitor registration for OiA 2023 opens on November 8. To find out more, visit: www.oceanologyinternationalamericas.com.

BSEE APPOINTS PAUL HUANG NEW DEPUTY DIRECTOR

The Bureau of Safety and Environmental Enforcement (BSEE) announces that Paul Huang joined the Bureau as the new Deputy Director. Paul will support BSEE's efforts to promote safety, protect the environment, and conserve offshore resources through vigorous regulatory oversight and enforcement.

"BSEE plays a critical role in regulating offshore energy production and assisting the Department in tackling the climate crisis through the advancement of renewable energy," said Director Kevin Sligh. "Paul's commitment to public service and his years of experience at the Federal Emergency Management Agency will be invaluable for BSEE as we expand to cover renewable energy production on the Outer Continental Shelf. Paul will be a tremendous asset for BSEE and our continued mission of safe and environmentally sustainable energy production."

"I'm excited to work with a fantastic team at BSEE to continue fostering safety and environmental compliance while making advancements to combat climate change," said Deputy Director Huang. "I look to bring a focus on diversity, equity, inclusion, and accessibility in all we do, through a collaborative, people-focused, and intellectually-curious approach."

Prior to BSEE, Paul served as the Assistant Administrator of Federal Insurance for the National Flood Insurance Program at the Federal Emergency Management Agency (FEMA). He also served as the Acting Associate Administrator for Resilience and helped stand up the Climate Adaptation and Equity Enterprise Steering Committees for the Agency. In that role he helped to establish FEMA's new Strategic Plan, and worked to improve program management, collaboration, and integration across the Resilience portfolio.



» Paul Huang, Deputy Director, BSEE

Paul previously served as the Director of the Risk Analysis Division within the Federal Insurance and Mitigation Administration. Paul also founded and served as the Executive Sponsor for FEMA's Asian American and Pacific Islander Employee Resource Group. He holds a Bachelor's in Management Science and Information Systems as well as a Master's in Business Administration.

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ECA AND IXBLUE REBRAND AS EXAIL

Following the acquisition of iXblue by Group Gorgé end of September, ECA Group and iXblue announces that both companies will be operating under a new joint brand: Exail.

With this alliance, Exail becomes a global high-tech industrial champion specializing in cutting-edge robotics, maritime, navigation, aerospace and photonics technologies. Combining complementary technological expertise and geographical footprint with a strong legacy of innovation, Exail provides its global base of customers with cutting-edge in-house manufactured technologies ranging from components and sensors to products and complex systems.

Finalizing this alliance between ECA Group and iXblue around a shared brand is strategic for Fabien Napolitano, CEO of iXblue: "Joining forces under a joint brand allows us to become a major global player capable of addressing new and larger markets, but also to federate our 1,500 employees around the same banner. Together, we will keep pushing back the frontiers of science to take our technological excellence to new heights. The new synergies created with Exail opens up unlimited prospects for the development of new products and systems that will continue to push back technological limits and expand our customers capabilities."

For Dominique Giannone, CEO of ECA Group, this new joint brand will help respond to the major challenges of our time: "Our world is facing many challenges, whether they are security, environmental or societal. At Exail, we are convinced that the development of disruptive technologies will enable us to rise to these new challenges.

"By mastering cutting-edge technologies, we are at the heart of our clients' most complex missions. Whatever the environment, our robust components, products and systems will provide them with the utmost performance, reliability and safety, while our global team will support them as they face the most complex challenges, from the deep sea to outer space. Together, we will continue to create innovative solutions that help explore new territories, and we look forward to continuing to serve our customers and partners with our new enlarged offer."



» Collaboration between the DriX USV and A18D AUV.
(Image credit: Exail)



KONGSBERG DIGITAL AND KEYSTONE JOIN FORCES FOR INDUSTRY-FIRST DATA OPTIMIZATION PARTNERSHIP

Kongsberg Digital and Keystone have combined their software expertise to form an industry-first technology partnership, enabling real time wells and planning data to be combined and contextualized to power more valuable workflows leading to optimized drilling operations.

By combining both companies' well application portfolios, Kongsberg Digital and Keystone's partnership represents an important step change in industry standards. Well data is combined and contextualized to provide well plans using Keystone's SmartHUB. Utilizing its Industrial Work Surface, Kongsberg Digital provides a detailed picture of the real time well operation through an interoperable platform.

This increased accuracy and consistency of available data in a single open platform helps teams to leverage real-time data, the latest and most consistent information, and embedded analytics tools for well operations.

Shane McArdle, CEO at Kongsberg Digital, said: "Kongsberg Digital's partnership with Keystone will enable customers to develop more effective planning, execution and learnings in well operations. Together we will make data and insights easily available in real time for end users to use to make better decisions.

"In the past, planning data and real time data for wells was stored in different silos and not combined. Our strategic partnership with Keystone will bring the context and verified actions from planning data to the real time data harnessed by Kongsberg Digital's applications. The real time data will bring actual numbers to the planning and execution phases of digital operation procedures, bringing value to our clients by providing a holistic overview of well operations, as well as verification of adherence to procedure."

Jan Isaachsen, CEO of Keystone, said: "Our collaboration with Kongsberg Digital is a perfect match between technologies already proven in the industry. Drilling engineers will finally be able to have a full picture of actual vs planned data, enabling dynamic use of all available data for real time operations optimization, and the continuous improvement of the planning of new wells."

SURVITEC APPOINTS NEW CEO



Strengthening the company's position as the world's leading Survival Technology solutions partner, Survitec recently announced the appointment of Robert Steen Kledal as the company's new Chief Executive Officer.

As CEO, Robert will be responsible for setting Survitec's strategic direction. He will lead the Survitec Executive team and sit on the Survitec Board.

At the start of the year, Survitec launched a new organizational structure designed to make Survitec an even better partner—increased levels of customer centricity and agility were the main focus.

Robert will continue the transformation work, positioning Survitec customers at the heart of every decision while achieving profitable growth.

A key focus for Robert will be Survitec's workforce of over 3,000 professionals, ensuring they feel connected to the Survitec purpose, which is "We Exist to Protect Lives."

Robert has over 30 years of experience in executive level roles on a global scale. He was CEO at Wrist Ship Supply, the world's leading ship and offshore supplier of provisions and stores, for over nine years. He led the organization and its 1,600 colleagues, through digital transformation, enabling substantial improvement to how the business engaged its customers.

"Coming from the shipping industry, I was instantly attracted to the inspiring purpose of Survitec," said Robert Steen



» Survitec CEO Robert Steen Kledal

Kledal. "I look forward to building on this great legacy and the achievements made to position Survitec as the global leader in Survival Technology for our customers worldwide. Not least to service our customers' requirements effectively."

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DeepWater Buoyancy Inc. is the world's largest producer of subsea buoyancy products for the oceanographic community and has a vast product line of buoyancy solutions for offshore oil & gas, energy and technology companies. This product portfolio has been built over the course of 40 years serving these industries. Though products are offered for shallow water applications, the company specializes in deepwater, providing solutions to depths of 6000 meters and beyond.



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Cathx Ocean design and manufacture advanced subsea imaging and precision measurement systems for subsea operations. Designed to meet stringent technical, operational and integration requirements associated with various subsea applications and vehicle types. Cathx Ocean's systems offer precision, reliability and peace of mind. Products include advanced still imaging, colour laser point cloud and video systems, designed to deliver precision subsea data in a way that allows automation for subsea vehicle operations. The range includes the Hunter system (AUV Imaging and Laser), the Scout system (Observation Class ROV Imaging and Laser Profiling), the Pathfinder system (Work Class ROV Imaging and Laser Profiling) and the Prowler I & II systems (Towed Vehicle Imaging Range and Scale Measurement).



REMOTE OCEAN SYSTEMS

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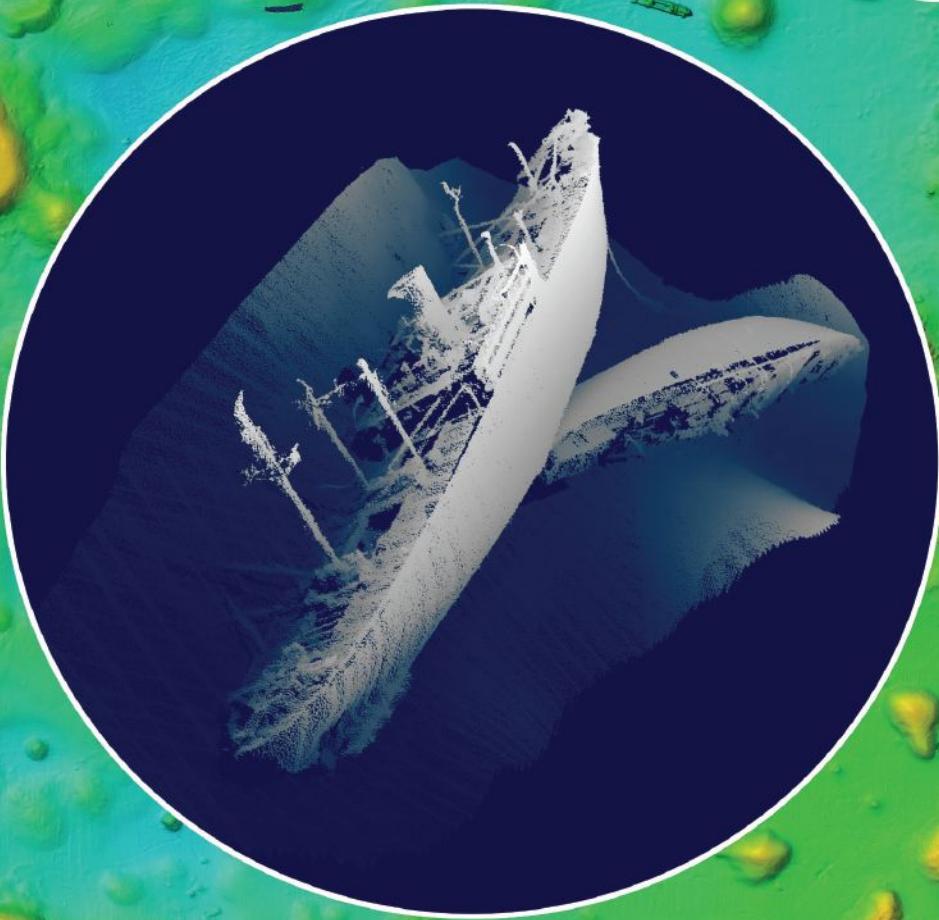
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