MARINE TECHNOLOGY REPORTER

September/October 2024
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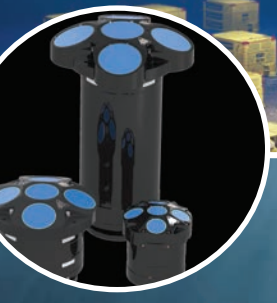
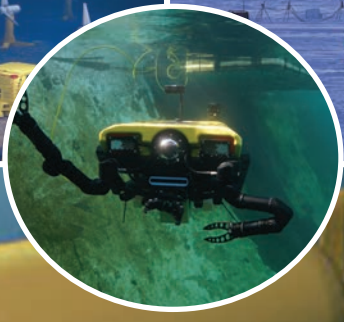
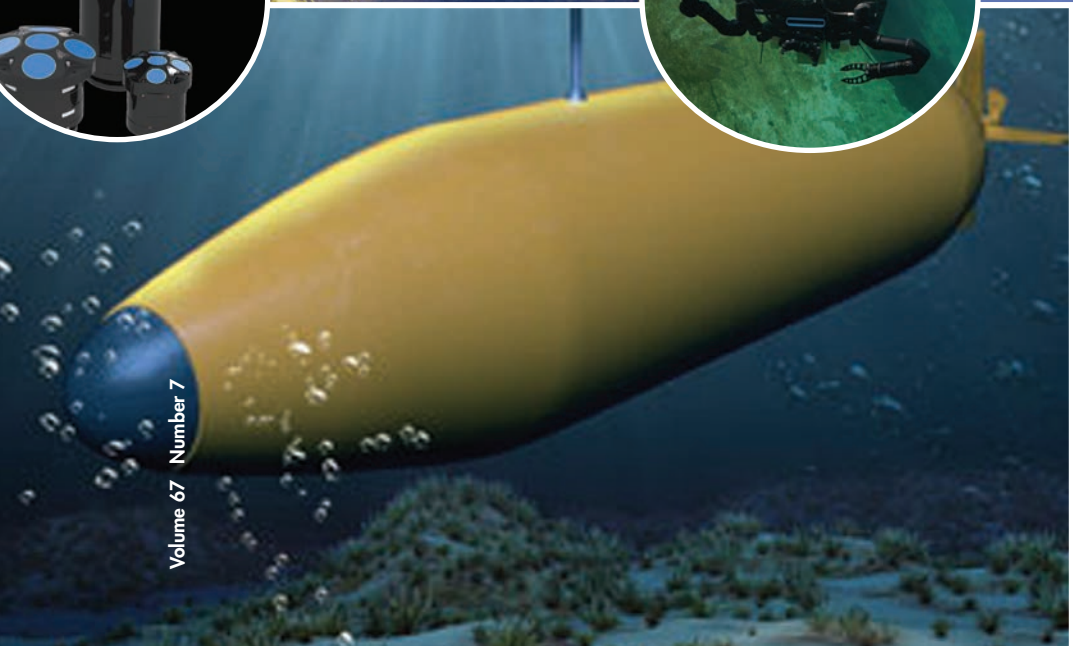
The 19th Annual

MTR100

The tech, the people, the companies leading the subsea sector







Volume 67 Number 7

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MTR 100
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Volume 67 • Number 7

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SAAB TECHNOLOGIES

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Editorial

Justin Zuure

I welcome you to the 19th Annual MTR100, our annual look at 100 technologies, people and companies driving the subsea market. As most regular readers of MTR know, the MTR100 is far from exact science, as there is no true common measuring stick that can used to accurately measure and rank 'subsea' companies globally.

Rather this is an overview of progress, and for the companies that historically have and continue to contribute to this annual showcase, I'd like to extend my personal 'thank you' for expending the time and effort.

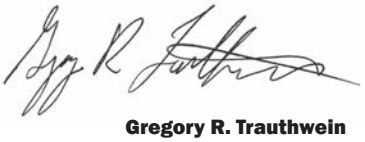
This year's '100' follows closely many of the trends that each of you walk, live and drive on a daily basis:

- The continued miniaturization – and energy efficiency – of sensors and systems
- The increased levels of effective autonomy
- The incorporation of next-generation technologies like AI

As you may know, we cover the maritime, offshore energy, subsea, ports and logistics markets across our various media brands, and while I am generally loathe to play favorites, I must admit that the subsea sector shines a bit brighter in my eyes, as there is a spirit of innovation combined with earnest feeling of community throughout the sector.

This can be seen in many corners of the world, but perhaps not as acutely as you'll find in Newfoundland & Labrador, Canada. We published last month an extensive, 70+ page eMagazine supplement to Marine Technology Reporter, Maritime Reporter & Engineering News and Offshore Engineer on the Newfoundland & Labrador cluster, premised on my visit to St. John's in the Spring of 2024 and solidified by multiple interviews with leadership in government, industry and academia in the ensuing months over the summer.

For those who might have missed it, check out the supplement in the "Magazines" section of MarineTechnologyNews.com or drop me a line and I'll send it over, but in the meantime I've condensed that 70+ pages into an 11-page showcase of everything Newfoundland & Labrador, starting on page 34.



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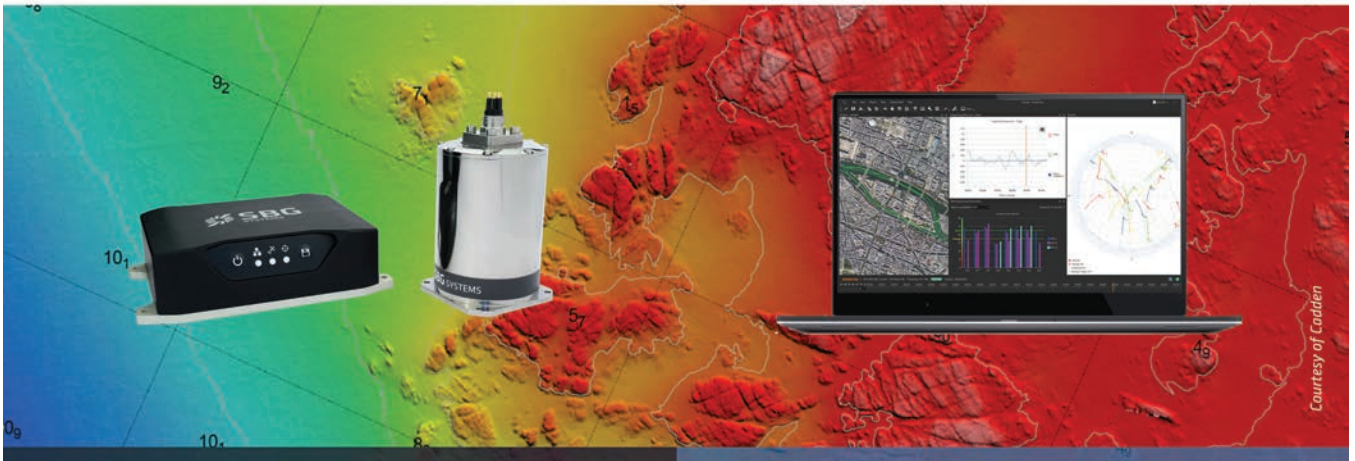

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ARGEO

https://argeo.no/

Argeo is a complete subsea service provider operating in three major verticals, oil & gas, marine minerals, and the renewables sector. The company offers a unique package combining robust vessels, AUV's, advanced sensors and digital imaging technology and an intuitive digital platform that collects complex data and brings this to life. With their own vessels and superior AUV's they provide fast and flexible full lifecycle services including survey, inspection, maintenance, and repair, increasing efficiency and reducing carbon footprint for their customers.

Argeo's current fleet consists of two vessels: the Argeo Searcher and the Argeo Venture. In addition to these vessels, the fleet includes four autonomous underwater vehicles (AUVs) whereof two Hugin Superior models, one Hugin 6000, and one Hugin 1000. A third Hugin Superior is planned for Q1 2025.

Efficiency with in-field decision making

Argeo's cutting-edge proprietary technology revolutionizes workflows, delivering superior efficiency across various operations. Their solutions empower teams with real-time, in-field decision-making capabilities, drastically reducing the time from data acquisition to deliver-

ing the final product to customers. The near-zero turnaround time allows stakeholders to make quicker, more informed decisions, optimizing project outcomes. The intuitive visualization of complex data helps decision-makers grasp essential insights quickly, ensuring better-informed choices and more effective project execution. This efficiency also translates into reduced CO2 emissions, and the advanced technology enhances safety by reducing Health, Safety, and Environment (HSE) risks.

Argeo has, so far, successfully secured six patents in the field of subsea electromagnetic and acoustic sensor technologies, demonstrating their commitment to innovation.

Argeo's clients include energy companies, government authorities, and others authorized to map the seabed including blue-chip companies like TotalEnergies, Shell, RWE, Equinor and Woodside Energy.

RWE Canopy floating wind is an example of a hallmark renewables project executed by Argeo. The Canopy Offshore Wind Farm project off the coast of Northern California is a key milestone in the development of RWE's first commercial scale floating offshore wind farm.

The TotalEnergies Namibia Venus project with Argeo Venture is another high-performance project where Argeo is delivering both geophysical and geotechnical services in ultra deep waters.

Solid performance, organic growth

Argeo has a track-record of solid operational performance and high utilization of its ships and AUV's. Its growth is steep and consistent. For the second quarter it reported that revenue had improved to $15.7 million, marking an increase of 1037% year-over-year. EBITDA rose to $4.2 million, alongside an improved EBIT of $1.6 million.

The company has grown to 100 employees in total, with headquarters located in Norway, in addition to offices in Edinburgh, Rio de Janeiro and Singapore to remain close to its customers. **Trond Crantz is the CEO and founder** of Argeo, and has 20 + years' experience from global technical, operational and commercial leadership roles in Schlumberger and PGS.

UK's National Oceanography Centre (NOC)

The UK's National Oceanography Centre (NOC) is driving innovation in marine robotics and remote sensing to help expand the possibilities of sustained ocean exploration and science. A major goal is multi-decadal ocean observations – physical, biological and chemical, as well as mapping, surveying and imaging – to help solve challenging, large scale, long-term marine science problems.

NOC's fleet of Autosub Long Range (ALR, also known as Boaty McBoatface) underwater vehicles is a major part of this solution, supporting the deployment of critical sensor payloads for multi-month deployments. ALR is pushing new boundaries, including, earlier this year, seeing the first country-to-country deployment of an ALR.

This saw ALR 4 spend two months beneath the waves, crossing from Iceland to the Isle of Harris in the Scottish Outer Hebrides, collecting critical ocean data from the Iceland Basin to support the BIO-Carbon programme. BIO-Carbon, funded by the Natural Environment Research Council (NERC), is exploring how marine life helps the ocean stores carbon by collecting novel datasets from research vessels and robotic platforms to inform the next generation of climate modeling.

The joint BIO-Carbon and Future Marine Research Infrastructure mission involving projects led by University of Southampton, Heriot-Watt University ad NOC, was also the first simultaneous deployment of two ALRs on one mission, further pushing the boundaries of robotic exploration. Both ALRs were equipped with a suite of cutting-edge sensors, many of which are developed at NOC, to analyze the biology and chemistry of the ocean.

Other projects ALRs have undertaken include a seafloor survey 140 km off Shetland. The ALR was shore-launched for this project, carrying a 3D seafloor imaging system to generate georeferenced, color corrected conventional still images, as well as texture maps and corresponding microbathymetry maps of the seafloor. The goal was to explore the potential of marine robots to help monitor decommissioned oil and gas infrastructure as well as helping the government meet monitoring ambitions around Marine Protected Areas.

Innovation in sensor and sampler technology is rapidly expanding the breadth of science applications NOC's robotic fleet can address. NOC has a strong pedigree in inventing, designing, building, deploying and commercializing sensors and instruments. These technologies include micro sensors, lab-on-chip sensors and eDNA samplers.

NOC's marine robotics fleet also include underwater gliders, some of which are playing a crucial role in gathering data for ingestion into the UK's Met Office for weather and ocean forecasting. Work is underway to see how digital twins can be used to optimize glider observations.

Annually NOC publish the National Marine Facilities (NMF) Technology Roadmap, which sets out a five-year vision for the services they provide to the UK science community across their robotic fleet, ship-fitted instrumentation and supporting infrastructure. Through NERC funding, these capabilities deliver large-scale research infrastructure and enable the UK to contribute to the Global Ocean Observing System.

EdgeTech

www.edgetech.com

EdgeTech is a manufacturer of underwater technology solutions. The company is known worldwide for its high-quality products which include: side scan sonars, sub-bottom profilers, bathymetry systems, deep sea acoustic releases, shallow water and long-life acoustic releases and on demand ("ropeless") fishing systems. EdgeTech continues to innovate and advance all aspects of their sonar systems and acoustic release based systems. The company continues to see a strong demand for off-shore, mid-to-deep water survey systems including the 4205 side scan sonar system and 3400 sub-bottom profiler. As more operations focus on unmanned surface vessels (USV) these tools will play a valuable roll. Importantly, the 4205 continues to be the side scan sonar of choice for offshore windfarm surveys. Additionally, the 2050 remains popular because of its unique ability to collect side scan and sub-bottom data from one towed platform. Closer to shore, EdgeTech's pole mount systems such as the 6205 combined side scan sonar and bathymetry system, and the 3400-OTS (over the side) sub-bottom profiler are playing an important role. A rising star this year is the **Buried Object Sonar System (eBOSS),** an advanced sub-bottom sonar system capable of penetrating the seabed to accurately detect, locate, classify, and identify buried and partially proud objects. This low-frequency acoustic imaging system can be operated in real-time for general survey purposes such as cable & pipe tracking and route surveys or have the data post processed utilizing synthetic aperture sonar (SAS) processing to render 3-dimensional images of buried objects.

In the AUV, ROV and ROTV market EdgeTech offers the 2205 OEM-based solution to provide tightly integrated side scan, sub-bottom, bathymetry and combined systems for manufactures.

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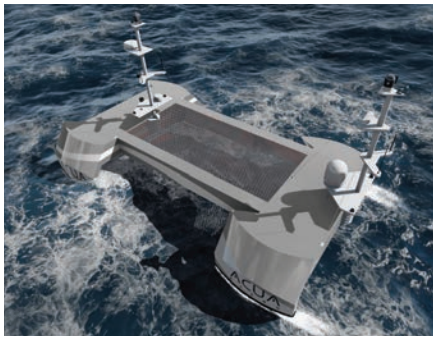

ACUA OCEAN

www.ocean.tech

Founded by brothers Neil and Mike Tinmouth in 2021, ACUA Ocean is a UK-based startup designing and developing uncrewed surface vessels (USVs) for ocean monitoring and data collection. ACUA's autonomous systems deliver enhanced open ocean platform-as-a-service capabilities for the launch and recovery of sensor and system payloads.

ACUA's Pioneer-class uncrewed surface vessel (USV) delivers a stable open ocean platform, enabling the deployment of system and sensor payloads in up to 4m wave heights and increasing operational availability. Acting as the platform or "mothership," the Pioneer provides the space, weight, power and communication for the launch and recovery of payloads including ROVs, AUVs and UAVs. This approach to "interchangeable nested robotics" will replace the need for larger and more costly crewed vessels for routine tasks such as subsurface surveys and monitoring of critical offshore infrastructure including data cables, pipelines and wind farms. The zero-emission, hydrogen-electric powertrain enables multi-week mission lengths and ensures sustainability of operations whilst minimizing signature and maximizing data quality.

ACUA Ocean's H-USV is currently in build at the AMC shipyard on the Isle of Wight. It is scheduled to undergo harbor and site acceptance testing in Q4 2024 ahead of demonstrations and pilot projects early next year.

CAMBRIDGE PIXEL

https://cambridgepixel.com/

Cambridge Pixel was founded in 2007 by Dr. David Johnson. The company's radar, camera and sensor processing technology are used around the world by the maritime, security and defense sectors, and Cambridge Pixel provides a wide range of radar interface hardware, modular COTS software and time-saving tools for software developers.

Some recent product releases include:

SPx Radar Trainer - a 3D simulation software for radar course instructions to aid in the practice of proper marine radar usage, supporting safer maritime practices. Combining a typical marine radar display with a 3D environment and custom course creation, the software enables a clearer understanding of what the display shows.

GPS Assist - an innovative way to navigate in GPS-denied areas using radar, especially useful for USVs and ASVs. The software compares the live radar image to a database for the same GPS coordinate, enabling accurate detection of spoofing or jamming. This allows the shipboard systems to continue safe navigating using the radar data instead, if needed.

SPx Video Simulator - Allows developers to simulate and test PTZ camera feeds on vessels and other moving platforms in a customizable 3D environment. It combines with SPx Radar Simulator to allow simulated vessels and targets in the scene to follow recorded radar tracks, or the user can define their own. Both simulators can be used to train maritime and coastal surveillance operators.

EIVA

https://www.eiva.com/

A containerized remotely operated towed vehicle (ROTV) solution, developed for the UK Ministry of Defense (MoD), has completed Factory Acceptance Tests (FAT) – six-months after the contract was awarded to EIVA. Through containerization, this new type of survey solution enables hydrographic surveys with multiple acoustic survey sensors and instruments to be performed from many different host platforms with very short deployment time.

The components of this survey solution include SH Group's 20-ft. Cube container module and launch and recovery system for EIVA's ScanFish L ROTV, which is equipped with Sonardyne's SPRINT-Nav Mini hybrid INS/DVL and Voyis' Observer Pro optical camera and Insight Pro laser scanner. Two dedicated computer workstations are built into the container and equipped with EIVA's NaviSuite software for efficiently processing and analyzing the collected data.

EIVA is working with Forcys, a global maritime defense company and EIVA's sister company in Covelya Group, to ensure the solution aligns with the current requirements of Navies for portability, flexibility, scalability and standardization.

SECO SEALS INC.

www.secoseals.com

Seco Seals, an aerospace manufacturer of high-pressure tube fitting gaskets, is ISO 9001:2015 and AS9100D certified, a family-owned American small manufacturer in business since 1969. Our industry standard product line, SECO7 "37 Degree Flared Tube Fitting Conical Seals," is renowned in the industry for its ability to prevent leaks in any environment. Our goal is to eliminate and prevent leaks caused by the failure of fittings in fluid and gas connections. These flare gaskets are designed to withstand vibration, temperature changes, full vacuum, and exceed the pressure ratings of fittings. This allows the fittings to be used repeatedly by replacing the gasket after each use, improving performance and avoiding the need to replace fittings. We also offer build-to-print sealing solutions for extreme pressure and temperature applications made of the highest quality metal foils. SECO SEALS CAGE (Commercial and Government Entity) Code is 33447, and the ECCN (Export Control Classification Number) is 9A991.d.

SECO SEALS' flare gaskets are designed for deep space to never fail and never wear out and to expand and contract with the systems. They withstand vibration, temperature changes and full vacuum. The SECO 37-degree Conical Seal has been pressure tested over 10,000 PSI on certain line sizes. Its newer cousin, the SECO45, 45-degree Conical Seal, is usually rated at over 500 PSI. These gaskets allow the unlimited use of fittings by replacing the gasket after each use. The SECO flare gasket is used to protect the surface of the fitting and the flare tube. These soft annealed crush washers improve performance of the connection by custom forming into the slight imperfections of the fitting or flare surface finish.

BIRNS

President/CEO: Eric Birns
www.birns.com

BIRNS is celebrating its 70th anniversary as a leader in the design and manufacture of connectors, penetrators and cable assemblies for deep ocean use. BIRNS solutions are found worldwide on submarines and submersibles, diving bells and decompression chambers; ROVs, AUVs and UUVs; and on everything from massive crewed systems to photonics masts and intricate towed arrays. BIRNS interconnect products deliver superior performance: faster data transfer for better telemetry and communications, and safer, more reliable power distribution in severely demanding environments. The company has invested in a new state-of-the-art extreme depth hydrostatic pressure testing facility. The new system includes a custom designed pressure vessel capable of tests to 20,000 psi (1380 bar) and which features angular positioning and can simulate sinusoidal motion. The facility also allows technicians to utilize more than one testing vessel concurrently, to provide greatly increased throughput. BIRNS technology includes:

Hi-amperage connector series

BIRNS answered the industry's call for enhanced current capabilities and launched the 225 Amp BIRNS Meridian series this year — a high performance, high current dry-mate interconnect range suitable for deep submergence applications. The series is available in straight or 90° configurations and offers standard and reverse-gender options, all withstanding reverse pressure. BIRNS Meridian connectors are open-face rated to 6,000 meters and select sizes are DNV Type-Approved for 6,000 meter rated crewed submersibles. Compact and extremely robust, they are ideal for battery packs and thrusters for crewed and uncrewed subsea vehicles that require high amperage power transfer.

6km open face RF cable assemblies

Recent stringent testing has led to 75Ω and 50Ω coax 1C configurations of the popular BIRNS Millennium connector series receiving certification to open face pressure to 6km. BIRNS had already been leading the industry in low insertion losses and high frequency capability matched with pressure resistance capabilities for years—with the latest 40 cycle testing at 8800 psi showing attenuation of only -0.35dB at 3.0 GHz with a VSWR of 1.2.

Advanced Penetrator Solutions

BIRNS introduced new 6,000m rated DNV type approved penetrators, and sophisticated new high density hull penetrators for military submarines this year.

HYDROMEA

https://hydromea.com

Hydromea is a Swiss-based company with core expertise in underwater robotics, through-water wireless communication networks and underwater navigation. Hydromea develops products and solutions that allow customers to have autonomous high-speed and high-volume subsea data access in real-time. Hydromea aims to render cables obsolete, make previously prohibitively expensive projects affordable and keep humans away from risky jobs by combining autonomous robotics and wireless communication network systems. This presents a shift in affordability and subsea data access and minimizes human risks.

Hydromea's line of free-space optical underwater modems allows for high-bandwidth wireless data harvesting and exchange, opening up new ways to collect and manage data flow from submerged sensors and instruments. Importantly, removing the barrier to wireless data offload, what was possible to do only with ROV previously now can be achieved with AUVs. Apart from that, Hydromea launched commercially its portable ROV EXRAY that has a wireless robot payload to perform inspection tasks around especially complex infrastructure.

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Falmouth Scientific Inc.

www.falmouth.com

Falmouth Scientific, Inc. (FSI), located in Pocasset, Mass., operates out of a purpose-built, 10,000-sq.-ft. facility that enables the company to design, develop, and manufacture sensors, systems, and transducer solutions for both saltwater and freshwater applications. This facility is equipped with an acoustic test tank, pressure chamber, environmental chamber and calibration lab.

FSI specializes in producing a wide range of marine sensors, systems, transducers, and other acoustic technologies. Its product offerings span various sectors, including seismic, sub-bottom, and combined sub-bottom and side scan sonar imaging systems, as well as current, wave, and tide meters. Among FSI's most notable products is the AquaPulse Acoustic System, previously "Bubble Gun." The AquaPulse system provides low-frequency acoustic pulses for sediment profiling and seismic surveys, delivering high-resolution data while being environmentally friendly. It generates a range of low-frequency pulses (70Hz – 1700Hz Plus or 20Hz – 1700Hz Plus) without the need for compressors, high-pressure air or water. The AquaPulse is suitable for water depths ranging from less than one meter to 2000 meters or more, making it highly effective for shallow surveys and sediment studies in various environments. The rebranding of the products to AquaPulse reflects the unique pulse generation characteristics and capabilities of this highly reliable and precision system. The AquaPulse reliability has been demonstrated to operate on a single project for over 10 million shots without maintenance.

FSI's other standard products include the ACM-PLUS series of current, wave, and tide measurement systems, and the HMS-621/2 chirp sub-bottom profilers in single or dual-channel towed and hull mounted configurations, as well as dual-frequency side-scan sonar systems with capabilities down to 2000 meters. FSI also offers a wide range of transducer products, with standard models covering frequencies from 1kHz to 500kHz.

GeoAcoustics Ltd

https://geoacoustics.com/

GeoAcoustics is a pioneer in interferometric sonar for bathymetry and a leading supplier of Sub-Bottom Profilers and Side Scan Sonars.

GeoAcoustics provides products under three core categories:

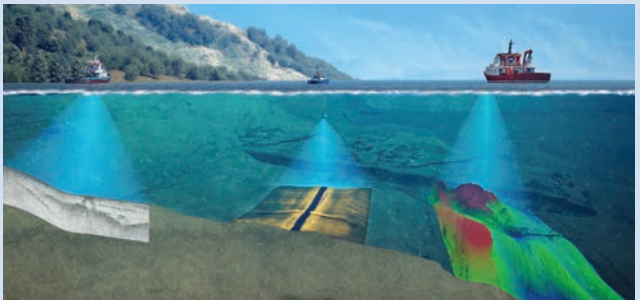
• **Bathymetric Sonar –** An interferometric system offering accurate, efficient simultaneous swath bathymetry and side scan sonar mapping for shallow water environments. With hull mounting options as well as USV integration, the AI-equipped GeoSwath 4 product line is suitable for a wide array of survey tasks and applications, including hydrographic surveys, environmental assessments, infrastructure inspection and inland waterway and seabed mapping.

• **Side Scan Sonar –** The Pulsar provides for simple deployment and intuitive operation, capturing high resolution images of the seabed using a rugged tow fish which can be easily operated with a water-protected deck unit and a portable cable hand reel. It operates within a 550KHz to 1MHz frequency with selectable FM and CW pulses, allowing the user to optimize the configuration to the survey task.

• **Sub-Bottom Profiling –** GeoPulse Sub-Bottom Profilers provide reliability and accuracy of data, producing repeatable, high-quality results time after time. Application specific, ruggedized and towed or over the side use make GeoPulse suitable for a wide range of applications.

The company's latest product is a new version of its industry standard shallow water Sub-Bottom Profiler, GeoPulse. GeoPulse 2 updates the system and gives the user the opportunity to experience the same operation in deeper water further offshore. Designed for diverse applications including pipeline detection, geological surveys, dredging surveys, environmental assessments, and buried object detection, GeoPulse 2 is designed for integration with existing GeoPulse transducers.

Continuing its focus on Sub-Bottom Profiles, GeoAcoustics also introduced compatibility for the first time with the popular Geo Marine Survey System developed Geo-Suite Acquisition software in March 2024. The pairing introduces a powerful GIS-based solution for the acquisition, processing, interpretation and 3D visualization of data acquired by GeoPulse Compact and GeoPulse 2.



COPENHAGEN SUBSEA

www.copenhagensubsea.com

Copenhagen Subsea A/S pioneers thruster technology, offering powerful and silent subsea thrusters. Our flagship product is the Gorilla ROV, which is powered by our electric thrusters.

The CS-thruster is designed with the end-customer in mind. Key issues include choosing a thruster that can achieve the necessary thrust force for demanding tasks, that performs uninterrupted for long periods, that has high compatibility with available power supplies, and that is customisable to the project at hand. The CS-thruster is designed with compatibility in mind. For example, the number of windings in the stator can be adjusted in the production stage, so that the thrusters can adapt to a supply voltage level between 24-800 VDC. This allows the system to be incorporated with a wide range of power sources. In addition, the motor controller is a commercially available shelf product, ensuring high compatibility with custom electronics. Lastly, thrusters can be incorporated as a propulsion system for both remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs), and manned submersible vehicles.

Secondly, the CS thrusters are engineered for reliability in harsh environments. Rim-driven thrusters have a built-in cooling mechanism, where the surrounding water is used as a cooling medium. However, in the case where high temperatures should arise, the CS -thrusters temperature measurement is incorporated in the design. Furthermore, the thrusters which integrate high torque and a robust stator contribute significantly to their stability and reliability, even under strenuous operational conditions.

All American Marine

All American Marine, located on the shores of Bellingham Bay, was founded in 1987 and specializes in the construction of custom-tailored aluminum vessels, including high-speed passenger boats, hybrid vessels, dinner cruise boats, patrol vessels and **research vessels.** All American Marine has recently become part of the Bryton Marine Group family of boat builders. Whether it's a high-speed catamaran passenger ferry, a monohull cruise boat, or a government research vessel, each operator's needs are unique. All American Marine works on every detail of the mission of each vessel before production, to ensure the most operator-friendly, fuel-efficient, and best performing vessel in its class.

All American Marine boasts North America's first hydrogen-fuel-cell-powered commercial vessel now in operation in San Francisco Bay.

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HydroComp, Inc.

www.hydrocompinc.com

HydroComp, Inc. provides engineering tools to develop marine vehicles and their propulsion systems more efficiently and responsibly. The Vehicle-Propulsor-Drive system model is the foundation of optimized performance when using HydroComp's tools for Speed/Power Prediction, Operational Energy Analysis, and Propulsion System Sizing. NavCad, and its companion for optimized propulsor design, PropElements, have become the suite-of-choice for surface ship and submersible designers and builders worldwide, with tools to investigate design space optimization, determine carbon footprints, identify energy-efficient systems, and assess and mitigate underwater radiated noise.

In response to recent requests from our growing UV user community, HydroComp has undertaken a focused development for NavCad of new UV submersible body design features for drag analysis and geometric design space optimization.

The parametric body geometry employed for UV resistance and power prediction – by segmented shape definition for forward (nose), mid-body cylinder, and aft (tail) volumes – has been augmented to generate offsets and 3D geometry for CAD export. New prediction models now support vehicles with higher speeds and operation at a pitch angle (with calculation of corresponding lift force), and a new 3D body force model provides higher-order prediction of hull form pressures and drag/lift forces. These new analysis models can now be used with the existing models in a "designer-guided" drag reduction optimization utility that indicates how changes in shape parameters (e.g., segment length and volume) will affect drag and power. These new features and enhancements provide UV designers with easy-to-use and effective tools not only for analysis of UV geometries, but also to aid in the design of body shapes for engineering of an optimized Vehicle-Propulsor-Drive system.

JW Fishers. Mfg., Inc.

www.jwfishers.com

JW Fishers Mfg. was founded by Jack Fisher in the 1960's. Handheld underwater metal detectors were the basis of the foundation for the brand but quickly advanced into a full array of underwater search equipment. Today, the line of products includes hand-held and boat-towed metal detectors, magnetometers, underwater HD video systems, ROVs, sonar systems, acoustic pingers & receivers, pipe & cable trackers, a sub-bottom profiler system and the Pulse 8X underwater metal detector.

The latest product, the SeaLion-3 ROV, has twice as many thrusters for horizontal movement and is twice as powerful as its predecessor. The four vectored thrusters allow horizontal motion in any direction and the ability to rotate in place. Vertical power is also increased, with three thrusters for diving and lifting. The unique vertical thruster placement provides the ability to adjust the pitch and trim of the ROV. The SeaLion-3 is depth rated to 1000-ft. with the option of up to 1500-ft. of tether. The SeaLion-3 has two full HD video cameras and recording capability. The new topside console has two monitors for viewing and controlling the ROV. The top viewing monitor is a large 15.1-in. screen that uses picture-in-picture functionality to view 1080p videos from either camera or both. The 12-in. touchscreen control monitor is a complete system dashboard. Sensor readings and navigation information can be displayed on either screen. The solid-state internal storage can record over 200 hours of HD video. The SeaLion-3 has a full complement of sensors and attachments: an inertial measurement unit (IMU), a depth and water temperature sensor, front and rear high-intensity LED lighting, an altitude sensor, an optional gripper attachment, and optional sonar. The advanced IMU and depth sensor on the SeaLion-3 allows for automated 'hold' modes of operation, during which the ROV can maintain its depth or altitude and magnetic compass heading without operator control. The operator can concentrate on driving and searching with the ROV without worrying about preserving depth, heading, or other navigational concerns.

BLUEPRINT SUBSEA

www.blueprintsubsea.com

Blueprint Subsea specializes in the design and manufacture of imaging sonars, underwater positioning beacons and diver navigation technology, providing solutions tailored to the unique challenges of underwater environments. Their product line-up includes the StarFish sidescan sonar, valued for its compact size, affordability, and high-resolution imaging capabilities. StarFish sidescan systems are used in hydrographic surveys, underwater inspection, and search and rescue operations. Another product range is the SeaTrac USBL acoustic tracking systems, which offer real-time tracking and positioning of underwater vehicles and divers, providing critical support for complex underwater applications. Blueprint also manufactures Oculus multibeam imaging sonar, designed to

deliver high-definition imaging for a variety of applications. Oculus' dual frequency capability enables operators to optimize performance by seamlessly switching between frequency modes to suit their task. Blueprint Subsea is set to launch several product developments in 2025, ensuring that their systems continuously meet the evolving needs of their customers.

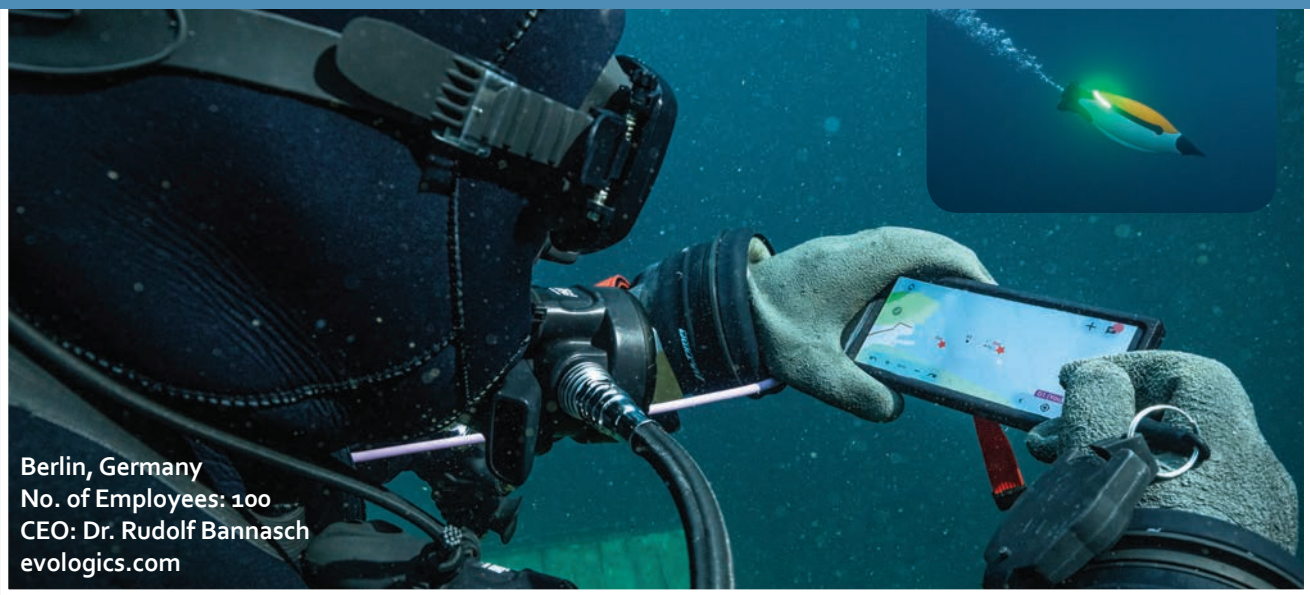
ENGINEERED FLUIDS

engineeredfluids.com

Engineered Fluids, Inc. was founded in 2017 to promote Single-phase Liquid Immersion Cooling technology for thermal management of electronics and electrical devices. Engineered Fluids develops thermal management solutions for Electrical Vehicles, data centers, underwater ROVs, LEDs and power electronics.

Development of new, higher voltage batteries have enabled higher powered propulsion and electronics systems in marine vehicles. Battery thermal management in confined spaces has become a key equipment design limitation. Engineered Fluids has introduced Single-phase Liquid Immersion Cooling (SLIC) technology with nontoxic, biodegradable AmpCool Dielectric Coolants that are 2000 times more efficient than air at removing heat. Immersion Cooling of batteries and motors in AmpCool Coolants enables smaller, faster, longer-range and higher powered marine vehicles. In 2017, Engineered Fluids developed the first synthetic Dielectric Coolants that were biodegradable, nontoxic and compatible with materials used in batteries and electric motors. AmpCool Coolants are 2000 times more efficient than air in absorbing and transferring heat energy.

EvoLogics GmbH



Berlin, Germany
No. of Employees: 100
CEO: Dr. Rudolf Bannasch
evologics.com

EvoLogics is a high-tech marine technology enterprise with headquarters in Berlin, Germany, and a US sales office in Yorktown, Va. The company was founded in 2000 with a group of scientists and R&D experts, aimed to develop innovative technologies for the maritime and offshore industries.

EvoLogics creates high-end underwater robotics, acoustic communication and positioning networks and sensor systems. These combine state-of-the-art engineering with bionic concepts.

Research and innovation are the cornerstones of EvoLogics, and an underwater "Internet of Things" that enables intelligent cooperation between various vehicles and sensors is the main vector of EvoLogics development strategy.

Smart underwater networks build on EvoLogics' S2C spread-spectrum communication technology that combines underwater acoustic data networks with integrated real-time positioning. With advanced sensor systems, autonomous underwater and surface vehicles for survey and support operations, AI-based object recognition and analytics, the EvoLogics ecosystem offers competent underwater solutions for complex mission scenarios.

Technology Profile

EvoLogics provides reliable, flexible, and cost-effective solutions for underwater communication, positioning, navigation, and monitoring applications. At the core is the patented S2C technology, which delivers bidirectional data links with integrated positioning, broadcasting, and networking functions, forming the IT backbone of complex underwater operations.

One of EvoLogics' flagship products is the **Sonobot 5 uncrewed surface vehicle (USV)**, a compact and robust platform designed for bathymetric and side-scan sonar surveys. The SONOBOT 5 delivers high-precision, geo-referenced bathymetry and high-resolution sonar imagery with minimal logistical effort. Its AI-based object recognition system enables real-time detection of objects within the side-scan-sonar stream during the missions.

A major innovation for 2024 is the **EvoLogics Diver Navigation System**, designed to streamline complex underwater tasks like search and rescue, recovery, and environmental cleanup. The system utilizes compact, battery-powered acoustic modems worn by divers to track their positions in real time. Divers can coordinate through a wrist tablet that displays a live map with the positions of team members, along with a messaging tool for efficient communication. Mission waypoints and discovered objects can be marked in real time for enhanced coordination and situational awareness.

Also new in 2024 is the latest version of the **Quadroin, an autonomous underwater vehicle inspired by the streamlined movement of penguins.** Equipped with side-scan sonar, cameras, and environmental sensors, the Quadroin is capable of performing underwater surveys with real-time data analysis, including object recognition and metallic object detection. The Quadroin operates at high speeds and can coordinate with other vehicles in a swarm configuration, transmitting data to surface operators and interacting with other subsea assets.

IMPACT SUBSEA LTD

www.impactsubsea.com

Impact Subsea was founded by Ben Grant and Alastair Mclennan-Murray. With experience in the design and manufacturing of underwater sensors and systems, they were keen to create a new standard of ROV & AUV sensor.

The company specializes in a range of high-performance sensor solutions for underwater vehicles and associated applications used in the Oil & Gas, Renewables, Underwater Research and Defence sectors. They offer a portfolio of underwater technology encompassing sonars, altimeters, depth sensors, attitude and heading reference systems, flooded member detection systems and bespoke pressure housings.

Since the last MTR100 edition, **Impact Subsea has introduced an open source SDK** to provide users of Impact Subsea sensors with a powerful kit to develop applications. The company has strengthened its support offerings through the appointment of a service center within Guangzhou, China. By leveraging Oceasian Technology's established presence and expertise in China, Impact Subsea will be able to better serve users of their sensors in the region. At Oceanology International in London, **the company launched its Profiling Sonar**, which will be available in the market later this year.

Inyanga Marine Energy Group

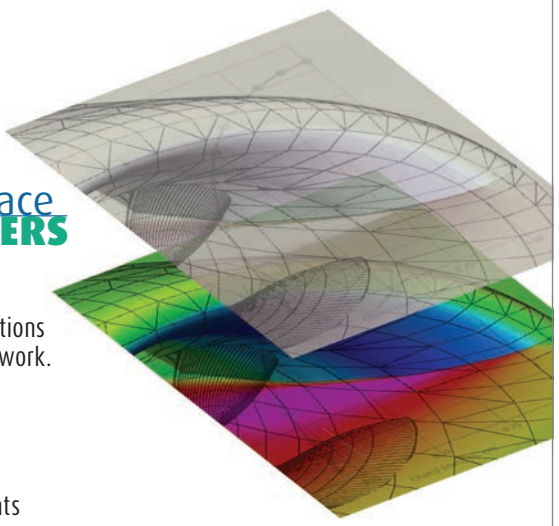
Inyanga Marine Energy Group completed hydrodynamic testing of its Passive Pitch Unit for its patented HydroWing technology, which was recently awarded the largest tidal energy project in the UK in Allocation Round 6 of the UK government's Contracts for Difference scheme and the company is now on course for deploying a 20MW tidal energy project at Morlais in Wales, in addition to other projects around the world.

The hydrodynamic testing was conducted at the Kelvin Hydrodynamics Laboratory at the University of Strathclyde in Scotland. "The tests on the passive pitch technology have behaved exactly as calculated, validating the 'proof of concept'," said George Dadd, Lead Turbine Engineer at HydroWing. "We will now continue the validation process with a full scale test rig."

The test results reportedly confirm that the blade rotor on HydroWing's tidal energy device can automatically regulate its own pitch using its self-adjusting system.

Richard Parkinson, CEO of Inyanga Marine Energy Group explains: "With this new pitch regulation system, the blade rotors can now scale to twice the swept area, while ensuring safety and efficiency, even in the harshest ocean conditions." The project has been supported by the IDCORE Program through which HydroWing have engaged two engineers as part of their EngD thesis.

Below The Surface
IS WHAT MATTERS



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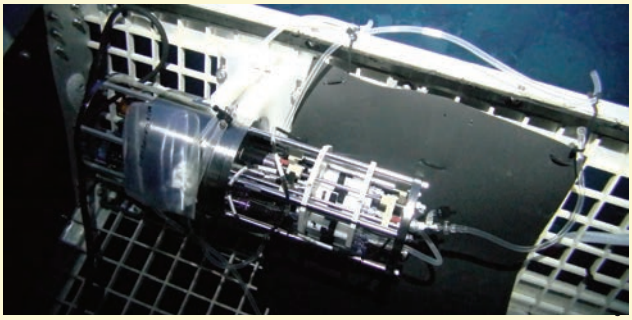


McLane Research Laboratories

Founded in 1983, McLane manufactures and develops time-series instrumentation. Its instruments are central to many long-term global projects and cruises including such initiatives as OOI, GEOTRACES and the RAPID array. It produces three main product lines: **Profilers, Samplers** and **eDNA**. The McLane Profiler line include the Prawler, the Ice Tethered Profiler (ITP) and the McLane Moored Profiler (MMP). Samplers include Sediment Traps, the Remote Access Sampler (RAS), Particle and Phytoplankton Sampler (PPS) and Large Volume Pumps. It also has aSignal Activated Bottom Lander (SABL) Sediment Trap, a low-profile sediment sampler ideal for studies in stormwater discharge, dredging, sediment disturbance and HAB events. Two of its newest instruments, the **RoCSI and the SuPR**, are ideal for eDNA collection. Robotic Cartridge Sampling Instrument (RoCSI), a field-proven in situ autonomous oceanographic sampler that collects and preserves water samples into industry standard 0.22 and 0.45 micron Sterivex filter cartridges for later eDNA analysis. A 2023 technology transfer from the National Oceanography Centre (NOC), RoCSI provides high sample count capability in a compact instrument. Water samples are collected and then biologically preserved with a user-specified fixative. The Suspended Particulate Rosette Sampler (SuPR) is a high volume time-series sampler that autonomously collects 14 water samples onto 142 mm membrane filters. The SuPR provides high volume capacity of 1000-2000 Liters per sample and flow rates between 2000-6000 mL/min. Dynamic pump speed algorithm adjusts to protect the sample as material accumulates on the filter In addition, McLane's in-situ laboratory platforms, Environmental Sample Processor (ESP) and Imaging FlowCytobot (IFCB), support emerging genomic and optical research methods for automated time-series oceanography and limnology.

McLane Research Laboratories is positioned to support the June 2024 announcement of the US National Aquatic Environmental DNA Strategy by the National Science and Technology Council. The integration of environmental DNA (eDNA) in aquatic research and management offers a transformative approach to biodiversity assessment, conservation, and ecological monitoring. Key eDNA Products: RAS: 48 samples, Volume per sample of 500 mL or 100 mL (model dependent) at 75 mL/min, max depth 5,500m RoCSI: Up to 48 samples, Volume per sample of up to 2 Liters at 60 mL/min, max depth 6,000m PPS: 24 samples, two models, Up to 10 Liters at 125 mL/min or up to 20 Liters at 250 mL/min, max depth 5,500m SUPR: 14 samples, 1000 – 2000 L at 6000 mL/min, max depth 5,000m

Massa Products Corporation

https://www.massa.com/

Massa Products Corporation is a sonar and ultrasonic product manufacturer with unmatched expertise and experience in the advancement of electroacoustic technology. Founded in 1945 by **Frank Massa, the man who pioneered the electroacoustic industry** through his career at Victor talking Machine/RCA and Brush Development as the Industry POC for Sonar Advancement and Production for the US Navy during WWII. Massa remains an industry leader and under family ownership, currently run by 3rd generation Dawn Stancavish. With a presence in both government and commercial markets, Massa offers a full line of solutions for both underwater and in-air applications such as Sub-bottom profiling, underwater communication, UUV/AUV sensors, connectors, level measurement, and proximity detection to name a few. Massa also develops custom solutions for uniquely challenging applications, environments, and use cases where sound has not previously been considered.

Massa is working on several new to the world and new to the market products soon to be released. They are currently collaborating with different partners in the Oceanographic Arena as well as Government Programs. They are involved with creating solutions that can help clean-up and protect our shorelines, oceans, and marine life.

MARKEY MACHINE LLC

www.markeymachine.com

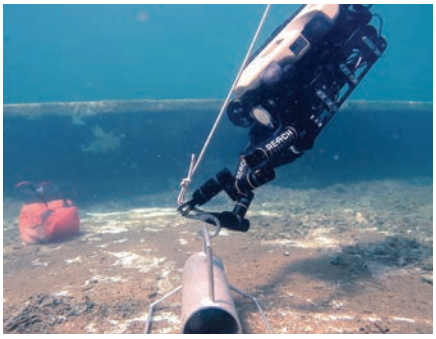
Founded in 1907, Markey Machine is the oldest privately-held winch manufacturer in the United States. Markey began as a general industrial manufacturer, but in WWI turned exclusively to deck machinery as the U.S. Navy began ordering anchor windlasses in quantity. During WW II, Markey reached its peak employment with 400 employees and 24/7 operations, again for the U.S. Navy, building winches especially for jeep tugs and liberty ships. In the post-war period, Markey moved into the workboat industry while working with vessels in deep-sea operations, with provision of oceanographic, traction, and other winches. Markey became heavily involved in the Alaskan north-slope operations, providing winches for tugs towing barges from Seattle northward to Alaska, and provided workboat winches for varied coast-wise towing and other operations in other parts of the U.S. During the last 20 years, Markey's customer base has expanded into Australia, Mexico, and other foreign markets. In 2023, the company announced a standard 3-year warranty, which is unique in the field. Markey is among the pioneers in electric winching, embracing winches working aboard Active-Front End (AFE) configured boats. Markey has also led the field in constant-tension winch control, coining the term "render/recover" as part of the first prototypes developed in the mid-1990s. Markey further developed render/recover and trademarked its most advanced form, the Markey Asymmetric Render/Recover in 2004.

MISSION ROBOTICS INC.

https://www.missionrobotics.us/

Mission Robotics was founded in 2020 with the goal of increasing the speed of innovation in the marine robotics industry. The founders have backgrounds in marine robotics as well as self-driving cars, aerial drones, NASA, and aerospace engineering. It took a clean sheet of paper approach to vehicle software and have built and deployed our software to control ROVs ranging in size from 10kg to 500kg+. Our operating system, sensor fusion, control loops, and intuitive pilot user interface solve the challenges our customers face today and lays the foundation to tackle their future needs.

Mission Robotics has recently released the latest major version of its software. It takes the company's framework, which our customers use to run 24/7 operations, and overhauls the state estimation and control loops. Its sensor fusion architecture and algorithms enable a wider range of navigation sensors to be used, even if they are from different vendors. This allows our customers to use the exact sensors they need and swap sensors easily. The state estimation provides our customers with precise station keeping during manually piloted modes and enables higher level mission planning. Its electronics and software platform, coupled with our simulation capabilities, has dramatically decreased the time to market for our customers designing and building new vehicles, reducing the time from months to days.



REACH ROBOTICS

reachrobotics.com

Reach Robotics is extending human reach into harsh environments by creating advanced manipulation and perception systems. Its systems enable clients in mission-critical Defense and Commercial sectors to remotely inspect their infrastructure and intervene in their environment. Its dexterous manipulator systems multiply the capability of industry-leading ROV and AUVs and feature intuitive control options that can be piloted by a single operator. Reach Robotics was founded in 2016 and is headquartered in Sydney, Australia.

Its latest manipulator technology, the Reach X Advanced Intervention System, is supported by eight years of research, in-field testing, and collaboration with military end-users. Reach X is designed for critical commercial and military operations requiring hard-wearing, reliable technology. The design prioritizes durability, dexterity, speed and portability in response to industry-specific operational needs. The system is distinguished by its power to weight ratio among manipulators in its size-class, packing unparalleled force into a compact form. The Reach X underwater manipulator offers continuous rotate joints and interchangeable end-effector tooling.

DETYENS SHIPYARDS

Charleston, SC-based Detyens Shipyards has a long history of repairing ships and boats of nearly every shape and size. The shipyard is massive, with three dry docks and one floating dock to handle a volume of work. The shipyard also sports an impressive list of new and upcoming ship repair talent, such as **Max Braddock,** Ship Superintendent, Detyens Shipyards, a 2019 graduate from the United States Merchant Marine Academy.

Recently Braddock worked on a McDermott cable layer, the North Ocean 102 which was contracted by McDermott and came into the shipyard in early 2024 for an aggressive, 30-day dry docking package.

"It was five main propulsion units that needed to be swapped, so it involved two main thrusters and two tunnel thrusters, as well as one drop-down thruster, as well as a 100% blast of the underwater hull freeboard. [With the work package and aggressive timeline] it was a big coordination effort between paint and the Kongsberg [thruster] reps [to line-up the work]. It was tough, especially in that aggressive 30-day window," said Braddock.

Following that, Braddock was involved in work on a pair of NOAA ships, specifically the Pisces and Oregon Two

"The Oregon Two came in a couple of days after the RBN ship left, and Pisces came in about four hours after Bahrain left. So, I went from a year and 10-month job straight to NOAA. Both ships went in the Dry Dock One, where the Oregon had a complete a 100% blast on the freeboard and underwater hull. The Pisces had a 100% blast on the freeboard and spot on the underwater hull," said Braddock.

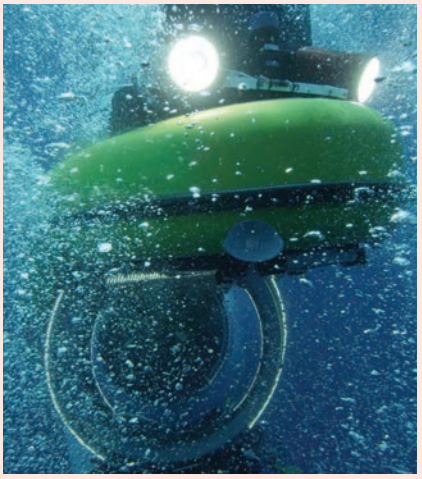
The Pisces was interesting because they have a centerboard – pretty much a 30-foot paddle – with a bunch of sensors and equipment on the end of it. It retracts into the ship while they're underway, [and when deployed] it sticks about 10 to 15 feet down into the water. We had to pull that centerboard out through the O3 level, through the bridge. They actually had a soft patch on the bridge, and then on the flying bridge we had to pull both of those out with our large crane. We had to pull it all the way out, blast and paint it, do some work on the transducers and sensors on there, and then reinstall that thing. That was a job in and of itself.

They both had main engine room work. They had diesel overhauls on the Pisces. And on the Oregon, they had MRG work. That engine room was packed, and you could tell that the ship was built around that engine room. So, in order to pull the generators out, we had to basically cut the entire upper level of the engine room out and rig those things out to fit them, which was a job.

NOAA has a great crew of port engineers, and they were here for about two months each, so I worked them simultaneously.

www.detyens.com

NOVACAVI



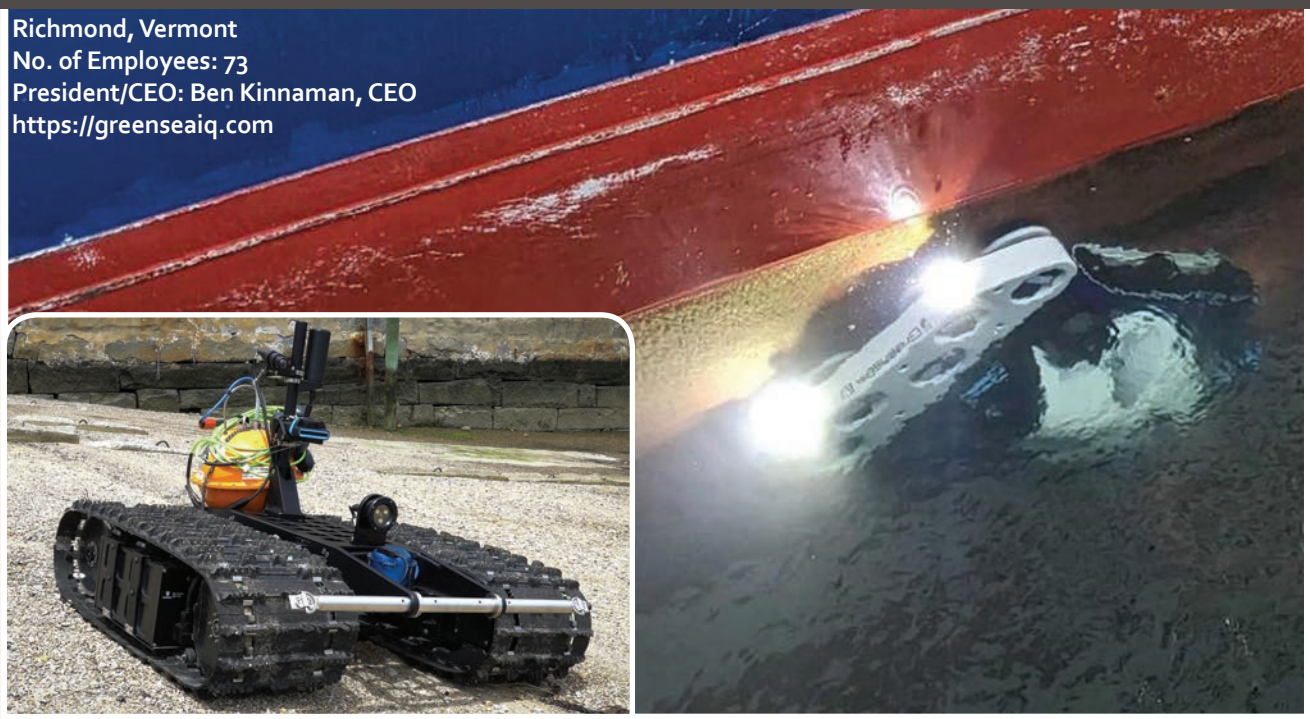
https://www.novacavi.it

Specialist in custom electrical cables design and manufacturing for the most varied and challenging applications since 1975, NOVACAVI develops specific solutions as reliable high-quality accessories to any form of innovative equipment and evolving system.

NOVACAVI, with experience in the development of underwater cable solutions, has designed a special configuration and manufactured a tailor-made strategic component for the Rebikoff-Niggeler Foundation (FRN) and its unique underwater research system. During the development of their new remotely operated camera system, which will be used for documentary filming and research in the pelagic zone down to depths of 1000-1200m, the non-profit organization, whose mission is to facilitate marine research and in-situ observation and documentation of the deep sea environment, asked NOVACAVI to design a custom-made, neutral, buoyant fiber optic cable with high tensile strength, perfectly suited to their specific requirements.

GREENSEA IQ

Richmond, Vermont
No. of Employees: 73
President/CEO: Ben Kinnaman, CEO
https://greenseaiq.com



Greensea IQ was established in 2023 through the merger of Greensea Systems, Armach Robotics, and Bayonet Ocean Vehicles. This consolidation unites Greensea Systems' advanced OPENSEA platform—known for its robotics software and navigation technology—with the robust hardware capabilities of Armach and Bayonet, creating a formidable presence in ocean robotics. Specializing in dual-use robotics, Greensea IQ transitions mature solutions developed for the defense industry into commercial markets where they can have a significant impact on science and industry. Greensea's position allows it to capitalize on the expanding Blue Economy, driven by the increasing need for scalable and persistent ocean protection, net-zero emissions in shipping, alternative ocean-based energy sources, and a deeper understanding of the ocean's response to climate change.

Most recently, Greensea IQ and Woods Hole Oceanographic Institution (WHOI) entered a strategic partnership to help access and accelerate scientific innovation and discovery in the ocean. This collaboration with WHOI's Deep Submergence Laboratory (DSL) and the National Deep Submergence Facility (NDSF), hosted at WHOI, combines Greensea IQ's experience in navigation, robotics, remote operations and user interface systems with WHOI's outstanding reputation as a leader in deep-sea exploration capabilities and expertise in the design and construction of underwater systems for scientific research.

The partnership's primary objective is to create an environment of open collaboration that will facilitate the integration of existing as well as new subsea platforms, with Greensea IQ's open architecture platform providing the backbone for these developments. "Two technology leaders, WHOI and Greensea IQ, are collaborating to break down barriers that often hinder innovation, leveraging their combined strengths to advance ocean research," said Ben Kinnaman, Greensea IQ CEO, in a press notice announcing the partnership. "By extending OPENSEA, our open architecture platform, further into the science community via NDSF, Greensea IQ will make a higher impact that will support a more diverse community of scientists and researchers."

"Our experience at the forefront of ocean science and exploration pairs well with Greensea IQ's mission to expand a common set of foundational tools that enable broader and more flexible access," said Andy Bowen, Director of the NDSF and a Principal Engineer at WHOI. "For more than half a century, WHOI has pioneered deep submergence technology. Forging this collaboration with Greensea IQ is a natural continuation of that legacy, one that will power greater reach and impact for the tools that form the basis of our current and future understanding of the ocean that serves as our planet's life-support system."

SBG Systems

https://www.sbg-systems.com/

SBG Systems designs and manufactures miniature, high performance and cost-effective inertial motion sensing solutions. Its Motion Sensors and Inertial Navigation Systems are ideal for ship motion monitoring, SoNAR, LiDAR and Buoy orientation & position, ROV & AUV control. Qinertia, our post-processing software, completes the offer.

Combining high-performance MEMS tactical inertial sensor with a quad-constellation, dual-antenna GNSS receiver, Ekinox Micro is the logical choice for mission-critical applications. It includes pre-configured motion profiles for marine applications (as well as land and air), allowing the sensor and algorithms to be tuned for maximum performance in any condition. It meets the MIL-STD-461, MIL-STD-1275, and MIL-STD-810 standards, ensuring reliable and accurate performance even in the harshest environments. One of the features of Ekinox Micro is its dual-antenna GNSS receiver for heading. However, field-proven algorithms also allow maximum performance even in single-antenna mode for all but lowest dynamics applications. Ekinox Micro is designed for ease of use and integration, with simple connectors, a web configuration interface, a data logger, Ethernet connectivity, a PTP server, and a REST API for configuration and multiple input and output formats. Ekinox Micro is RTK compatible and based on a tactical 0.8°/h class IMU calibrated across the entire operating temperature range, with a roll/pitch accuracy of 0.015° and heading accuracy of 0.035° and accuracy position of 1.2 m in without any corrections or 1cm in RTK. Additionally, aiding such as odometer, DVL, and airdata are included to ensure navigation even without GNSS. Ekinox Micro also embeds several technologies to fight against GNSS jamming and spoofing. Its dual-band, full-constellation GNSS significantly reduces the chance of an attack being successful, and its mitigation algorithms filter jamming and spoofing.

Seatools

Seatools debuted its patented seabed pre-cutting and clearance technology, **Iron Bull**, a tool designed to mitigate risks posed by adverse soil conditions and subsurface obstacles, offering Offshore Wind Farm (OWF) developers and contractors significant reductions in both risks and costs during offshore cable installation operations. The technology removes all subsurface objects, such as boulders and obsolete cables, that could obstruct cable laying and burial operations. Additionally, it loosens the soil through pre-cutting with unique drum cutting technology. By fully clearing and loosening the cable trajectory over a 4-meter width, productivity, predictability, and accuracy in achieving required burial depths for subsequent cable operations are significantly enhanced. These improvements can lead to substantial cost reductions due to shorter cable burial times and higher success rates in meeting required burial depths, reducing the need for extra unplanned protection work like subsea rock installations. Beyond cost benefits, seabed preconditioning and comprehensive soil data collection during initial offshore wind farm construction ensure a more reliable construction schedule. Moreover, achieving required burial depths directly minimizes cable manipulation during installation, reducing the risk of cable damage, which is critical since mechanical loads cause about 50% of subsea power cable failures.

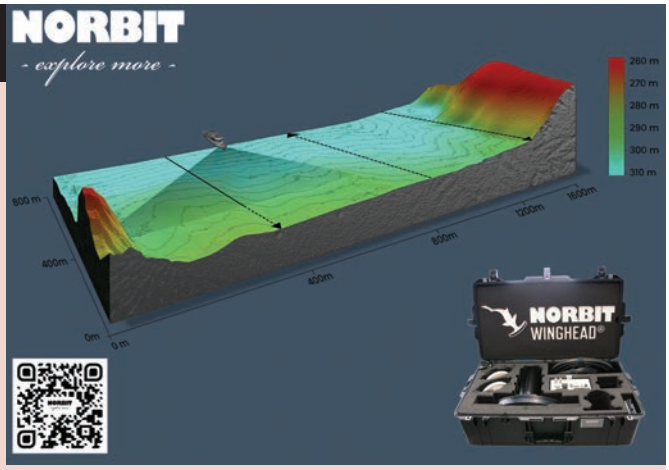
The technology features a 2 MW towed sledge, comparable in size and weight to a typical cable plough, incorporating robust and proven dredging technologies. Jet-assisted rippers at the front remove large obstructions like boulders. The hydraulically tiltable rippers can exert immense breakout forces on objects stuck in the seabed, eliminating the need for costly vessels with high bollard pull capacities that would otherwise be required by conventional tools relying solely on towing forces to remove obstructions.

The technology is developed in partnership with Bruno Tack, founder of Innovate2dredge.

NORBIT Subsea

www.norbit.com/subsea

NORBIT Subsea is part of NORBIT Oceans and offers tailored technology solutions to international maritime markets. Through Oceans, NORBIT specializes in designing and developing a range of sonars, including wideband multibeam sonars, 3D side-scan sonars; sub bottom profilers and long-range surveillance sonars, for exploring the ocean space. NORBIT bathymetric sonars are used for seabed mapping, construction support, inspection, and subsurface navigation with multiple other applications. NORBIT is also a provider of security and monitoring solutions for detecting and monitoring activity at sea. Using forward-looking sonars allows detection of threats below the surface, and NORBIT technology can be used for obstacle avoidance on underwater vehicles such as AUVs, mine countermeasures, and threat target detection and tracking of divers or other moving objects to critical infrastructure. Additionally, monitoring solutions above the water surface are provided through an integrated offering, where NORBIT delivers sensors, control systems and surveillance solutions, providing the customers with a single common operational picture for decision support and operational risk management.



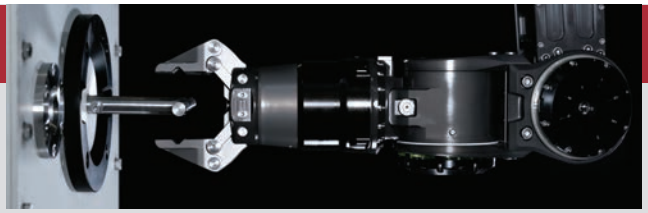
In the world of underwater surveying, the introduction of the **NORBIT WINGHEAD i80S Long Range multibeam sonar** marks a milestone, as a high-performance, high-resolution integrated 3D & 4D motion-stabilized bathymetric system. The WINGHEAD i80S Long Range has full motion stabilization capabilities. Surveyors further benefit from NORBIT multiple imagery and backscatter outputs as standard, enhancing high data quality throughout the wide swath coverage for deliverables. The WINGHEAD i80S Long Range stands out with its compact curved array design, with a small form factor combined with low power consumption and tight integration. With a depth range of up to 650 meters and a resolution of 0.5 x 0.5 degrees at 400kHz the WINGHEAD i80S Long Range has a level of precision and capability proven to deliver for various applications, including: offshore operations, harbor and bridge inspections; maintenance tasks; wreck and seabed searches; coastal surveys and renewable energy projects.

Saab Seaeye

https://www.saabseaeye.com/

Seaeye is a wholly owned subsidiary of Saab UK and has facilities in the UK and Sweden, along with substantial water tank and lake test facilities. With a portfolio of remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs), Saab's Seaeye is at the forefront of marine technology, addressing the needs of subsea exploration, research, and commercial operations.

An example of its innovation is the Seaeye eM1-7 Electric Manipulator. This technology exemplifies Saab's commitment to advancing subsea operations through enhanced efficiency, precision, and sustainability. The eM1-7 is a tool designed to perform complex underwater tasks with precision and dexterity. At its core, eM1-7 incorporates compact modular electric joints, revolutionizing arm control with lifting capacities. It can handle up to 122 kg at a full 2-meter extension and 454 kg at minimum extension. Constructed from sturdy yet lightweight aluminum, this manipulator is built to last without sacrificing agility. Weighing 116 kg in air and 84 kg underwater, it operates at depths up to 4,000 meters, with options extending to 7,000 meters. One of the eM1-7's features



is its intelligent power management system, which efficiently regulates power consumption and handles regenerative power during free-fall loads. Its versatile functionality, including six degrees of freedom and adaptable jaws, provides dexterity. Research institutions can leverage the eM1-7 for deep-sea exploration and data collection. The manipulator's ability to handle delicate specimens and equipment makes it ideal for scientific missions that require meticulous handling and precise movements. In underwater construction, the eM1-7 can be used for tasks such as pipeline installation and subsea module assembly. Its dexterity and precise control enable construction teams to perform complex assembly tasks with high accuracy. Furthermore, the eM1-7 will play a crucial role in environmental monitoring and protection efforts. It enables the assessment and mitigation of human impact on marine habitats by allowing operators to interact with underwater environments in a controlled and precise manner.

ROS
REMOTE OCEAN SYSTEMS An ISO-9001 Company
SYSTEMS SOLUTIONS SERVICE

www.rosys.com

For nearly 50 years Remote Ocean Systems has been an industry leader in the development and manufacture of reliable technology camera, lighting and positioning systems for extreme oceanographic, industrial, commercial and military applications and environments. ROS headquarters and manufacturing facility is located in San Diego, CA. Its product line includes underwater video cameras, lights, rugged pan and tilt positioning systems, video inspection systems and control systems manufactured primarily for the oceanographic, nuclear and defense industries.

Our 10,000 square-foot manufacturing headquarters consists of hydrostatic pressure tanks, electronic labs, advanced computer modeling and prototyping. ROS has developed two new technology products designed for deep ocean applications. The **SeaStar** is a high-powered, compact LED light that delivers 10,000 lumens output with a full-range dimming capability and is depth rated to 6,000 meters. The **Accu-positioner is a new ROS technology Pan & Tilt Positioner** that features a reliable and rugged deep ocean design and computer-controlled accuracy to +/- 0.1 degree (6 arc minutes). The Accu-positioner is controlled with COTS controllers, devices and ROS GUI. It operates with zero backlash and is depth rated top 6,000 meters. ROS has the broadest and most complete line of positioners in the industry and the Accu-positioner is a leader in ROS technology.

R. M. Young Company

https://www.youngusa.com/

Founded in 1964, R.M. Young Company specializes in the development and manufacture of professional meteorological instruments. Its product range includes the acclaimed mechanical Wind Monitor, advanced ultrasonic wind monitors, temperature and humidity sensors, precipitation and pressure sensors, visibility sensors, and comprehensive all-in-one weather stations.

KRAKEN ROBOTICS

Mount Pearl, Newfoundland and Labrador , Canada
No. of Employees: 266 Worldwide
President/CEO: Greg Reid, President and CEO
CTO: David Shea
www.krakenrobotics.com

From its inception in 2012, Kraken has championed innovation, driving advancements in sonar systems and underwater robotics. Today, Kraken Robotics employs 266 globally, involved in the development of new and enhanced underwater technologies (complex subsea sensors, batteries, and robotic systems) and undertakes subsea survey services. Headquartered in Canada, Kraken has offices in North and South America and Europe. Its high-resolution 3D acoustic imaging systems, battery solutions, and services enable its clients to overcome the challenges in our oceans – safely, efficiently, and sustainably.

The Technology

• **KATFISH** Towed SAS Vehicle is Kraken's intelligent, high-speed, high-resolution and actively stabilized Synthetic Aperture Sonar (SAS) towed subsea survey system that operates at speeds up to 10 kts. KATFISH provides high-resolution ACR of 4 km^/hr with 3.3 cm x 3.0 cm constant resolution (1.9 cm x 2.1 cm post-processed) across ranges up to 200 m per side with simultaneous 3D bathymetry. KATFISH incorporates Kraken's latest generation real-time SAS processor. RTSAS enables real-time processing of SAS imagery and bathymetry. On-board Automatic Target Detection survey data and contacts can be viewed directly on the ship as it is collected, or remotely from a mothership or shore-based command station.

• **MINSAS** is Kraken's off-the-shelf Miniature Interferometric Synthetic Aperture Sonar, billed as a replacement for sidescan systems. It offers 3.3 cm x 3.0 cm (2.1 cm x 1.9 cm with post-processing) ultra high definition constant resolution up to 200 meters per side, with simultaneous 6 cm x 6 cm bathymetry. Its unique features make it suitable for various underwater platforms and UUVs, based on a modular array system adjustable from 60 cm to 180 cm lengths, fitting different vehicle sizes.

• **Kraken's Man-Portable SAS** payload utilizes its new MINSAS 60 Light Weight arrays and is designed to retrofit existing Man-Portable UUVs with diameters from 7.5 to 9 inches. This modular payload section can be added and removed quickly in the field without recalibration; retaining the ability to use the vehicle's existing OEM shipping containers. The MINSAS 60 LW provides detailed images with a resolution of 3.3 cm x 3.0 cm out to a range of 100 m from each side of a UUV (200 m swath). The MINSAS 60 LW also produces real-time bathymetric data with a resolution of 25 cm out to full range while delivering high depth accuracy.

• **Kraken's SeaPower Battery** enables commercially offered UUVs to more than double their previous survey endurance while using the same battery payload volume. Each SeaPower battery block is equipped with an advanced battery management system which continually monitors the status and health of the battery. SeaPower batteries can be used singularly or connected in modular banks, depending on your requirement for capacity and voltage.

• **Sub-Bottom Imager (SBI) Surveys:** The Sub-Bottom Imager uses beamforming SAS arrays, providing a real-time 3D view of the sub-seabed. The SBI identifies buried objects, anomalies, geohazards, and stratigraphy, acquiring data in a continuous 3D acoustic swath at a minimum of 5 meters wide (at the seabed) and penetrating to 5 meters below the seabed. Applications include depth of burial, out of straightness, debris locations, unexploded ordnance, and decommissioning surveys.

• **SeaKite** is its SBI deployment method, utilizing a remotely operated towed vehicle incorporated into the SBI. The high-speed depth of burial platform that operates in water depths from 7-250 meters and is six times faster than ROV surveys by travelling at speeds up to 4 knots. Having the same benefits as the ROV mounted SBI, the SeaKite images both ferrous and nonferrous anomalies.

• **The Acoustic Corer** is a subsea surveying technology that interrogates the sub-seabed to optimize offshore installation programs. Its capabilities include buried boulder identification and support for foundation location selections and foundation engineering design.

Silicon Sensing

www.siliconsensing.com

Silicon Sensing Systems is a supplier of MEMS-based gyroscopes, accelerometers and inertial measurement systems. Its latest generation of compact, rugged, high-performance, low power consumption gyro's, inertial measurement units, accelerometers and combi-sensors, has potential for operations in the severe ocean surface and subsurface environments.

Several Silicon Sensing's products are suited to the requirements of the extreme marine environment. These combine low size, weight and power consumption with sustained performance over time. The DMU41 is a market-disrupting, 9 degrees of freedom (DoF) inertial measurement unit (IMU) delivering inertial sensing performance that competes directly with far heavier, larger and more costly, fiber-optic gyro-based IMUs. This 50 x 50 x 50 mm unit operates in extreme temperatures, delivering exceptional low noise performance with class-leading bias instability and excellent angle random walk:

- -40°C to +85°C operating temp
- +/- 490°/sec dynamic range
- 0.02°/√hr angle random walk
- 0.1° /hr, 0.015mg bias instability

The CRH03 is a single axis gyro offering FOG-comparable performance. It is highly tolerant to external vibration, delivers excellent bias instability and angle random walk, is available in five rate ranges, including an option of 10 degrees per second, and can be delivered as a packaged unit or an OEM item:

- -40°C - +85° C op. Temp.
- rate ranges ±10°/s to 400°/s
- 0.03 to 0.1°/hr bias instability
- angle random walk from 0.005°/√hr.

For applications such as subsea downhole surveying, precision platform stabilization, guidance and control and high-end AHRS, the company's CRS39A gyro offers ultra-high-stability performance.

Strategic Robotic Systems, Inc

www.srsfusion.com

SRS has developed and is manufacturing the FUSION vehicle, a next-generation underwater system. The FUSION hybrid ROV is an approach to underwater vehicles that exemplifies design, capability, and intuitiveness. SRS understands operators are always looking for force multipliers, and FUSION meets this requirement with advanced sensor integration. Built mission-ready, FUSION is designed for rapid deployment during challenging missions and is trusted by navies around the world. Key technical points include:

- Highly capable portable hybrid ROV
- Deployable as an ROV with a tether or as an AUV
- Fully integrated imaging and navigation sensors
- Side scan sonar, imaging sonar, HD video, DVL, AHRS, GNSS, and USBL
- The only ROV of its class with an integrated side scan sonar AND gap filler technology
- Deploys out of the box within minutes
- Intuitive software with fully integrated data management, which requires no third-party software.
- Designed for easy operation and features hot-swappable batteries (available in Li or NiMH configurations) and quick-release thrusters that are field-swappable in less than 60 seconds
- No generator is required, allowing operations from a broad range of crafts of opportunity.

FUSION is a unique system in many ways, one of which is the ability to operate in different modes. Out of the box, FUSION is a highly capable tethered ROV system providing real-time feedback and interaction. With a simple software update (in non-restricted countries), FUSION can be turned into an untethered autonomous underwater vehicle (AUV) to conduct traditional or complex missions without the use of a tether. The third function that sets FUSION apart is the optional diver module that turns FUSION into a diver propulsion and navigation device. FUSION is a singular asset that can quickly transform between desired applications utilizing the same intuitive user interface. Conduct a larger area mission in AUV mode, download and analyze the data, hot swap the batteries, and plug in the tether or connect the diver module to follow up with real-time acquisition.

TRITECH INTERNATIONAL LTD

www.tritech.co.uk

Tritech International Limited [Tritech] is a high-technology business dedicated to providing imaging and ancillary equipment for use in underwater applications. Its product portfolio consists of a suite of Mechanically Scanning and Multibeam Imaging sonar, profiling solutions and oceanographic bathymetric and depth sensing products. Tritech also sells navigation and tracking solutions for small subsea vehicles.

Designed with ROV/WROV/AUV usage in mind, our latest offering builds upon the success of the previous generation. Launched in March 2024, the Precision Altimeter MKII sensor is one of the first products to utilize our newly derived 'text based' programmable command interface for simple reconfiguration, whilst retaining full backwards compatibility with the previous generation of Precision Altimeter sensors. Tritech offers a wide range of input voltage and continue to maintain our significant range of connector options. The Precision Altimeter MKII offers a series of additional features whilst building upon the legacy of our previous generation of altimeter ranging sensors. Utilizing our proprietary signal processing techniques to give an industry leading SNR, measurement is possible over a wide range of material densities from the seafloor to areas of high silt deposits or sedimentary layers. With features such as full software configuration using our new 'human readable' command interface, optional slant range correction, millimeter accuracy and full backwards compatibility, it provides users with a significant upgrade at no extra cost.

SUBSEA INNOVATION

www.subsea.co.uk

Subsea Innovation, a division of Unique Group, has expertise in Launch & Recovery Systems (LARS). The company has successfully delivered over 150 LARS tailored for a wide range of subsea vehicles including ROVs and trenchers, deployed across various critical sectors such as oil & gas, navy, tidal, renewables, and subsea mining. Beyond LARS, the company has a range of deployment and handling systems, including deck equipment, mattress handling systems, skidding systems, lay equipment, and trencher launch and recovery systems. Each system is designed with precision and built to withstand the most challenging conditions. Subsea Innovation's Engineering Pipeline Repair System (EPRS) further exemplifies the company's commitment to excellence. Designed to accommodate pipelines ranging from 2" NS to 48" NS, with pressure capabilities up to 600 bar/g and temperature tolerances from 0°C to +150°C, these systems are built for durability and adaptability. Whether installed by divers or ROVs in shallow or deep water, the EPRS solutions are engineered to meet specific client requirements, ensuring long-term operational integrity with a design life of 25-40 years.

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SubCtech GmbH

www.subctech.com

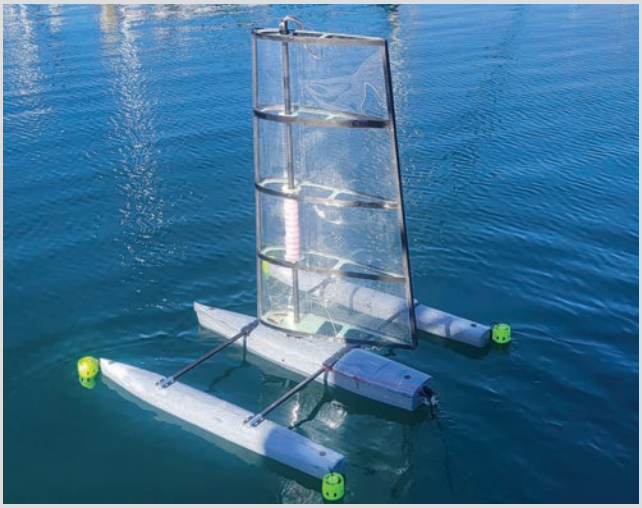
SubCtech offers underwater power solutions and ocean monitoring systems. It provides solutions in close collaboration with our clients in science and in industries such as offshore Oil+Gas. Li-ion batteries PowerPacks, pCO2 analyzers OceanPack and system solutions are our core products and a one-stop service. SubCtech is certificated as "proved vendor" in the offshore industry according to ISO 13628-6 and API17f for design and operation of subsea production systems and is also certified by ISO 9001:2015. Our qualified engineers are educated and certified for highest-quality IPC-A-600/610 class 3 production and functional safety according IEC 61508 up to SIL-3.

SubCtech GmbH "Subsea Technologies for the Marine Environment" is the producer of Li-Ion PowerPacks and OceanPack measurement systems used for scientific research and industrial monitoring of water quality and oceanographic parameters. In particular, the Oil & Gas Offshore industry requires increasingly autonomous systems for greater depths, like large Energy Storage Systems with 2 MWh of energy. Complete systems are projected together with data loggers and the implementation of sensors. Projects in depths of up to 6000m are realized in the division of "Ocean Monitoring" with the adaptation of sensors for pCO2. The pCO2 analyzers are used for maritime surveillance and research on buoys and ships. The exclusive production of LI-COR pCO2 analyzers enables us to offer internationally competitive "state-of-the-art" solutions.

SubSeaSail, Inc

www.subseasail.com

San Diego-based SubSeaSail (SSS) is a seven-year-old BlueTech company developing disruptively affordable Autonomous Undersea & Surface Vehicles (AUSVs) that will be able to function above and below water down to 100 meters for extended periods of time. The semi-submersible, monohull OBSERVATION vessel called HORUS (TRL 7) is an ultra-quiet vehicle ideal for Passive Acoustic Monitoring and ISR (Intelligence, Surveillance, and Reconnaissance) sensors. The HERMES multi-hull, trimaran cargo vessel (TRL 5-6) will be able to deliver cargo and/or energy to the beach or harbor and represent secure, offshore, underwater storage, as needed. Depending on its size and wind conditions, HERMES will represent a fast ISR platform sailing at 5-15 kts. Both will be ultra-low-signature (negligible sound, heat, radar, visual and wake), edge-computing vehicles that will represent distributed AI-nodes across the ocean. The vehicles have been developed partially with funding from US Government agencies (including Dept. of Energy and National Science Foundation) and additional USG funding is pending. As of September 2024, the vehicles are protected by 11 issued Patents, 7 Patents Pending with more patents to be filed. The current HERMES prototype trimaran represents the first-ever self-righting, autonomous multihull vehicle by submerging and righting itself underwater (patented). Effective Oct. 1, 2024, SSS will be in a much bigger facility as it adds to its team preparing the HORUS vehicle for contract manufacturing to answer market demand including strong DoD interest and to further develop the HERMES line. SSS is looking for well-connected channel partners globally and for manufacturers of ultra-low SWaP (Size, Weight, and Power) sensors that can submerge to 100 meters for long periods and work again at the surface.



RTsys

CAUDAN, France
No. of Employees: 60
President/CEO: François-Xavier de Cointet
https://rtsys.eu/

RTsys is a French company specializing in underwater acoustics (passive and active) and autonomous underwater vehicles. The company is part of the SEA VORIAN group, which has more than 15 years of experience in supplying equipment for maritime and naval industries. A decade of research and development, combined with a close cooperation with the French Navy, enabled RTsys to develop Anti-Submarine Warfare innovative systems (ASW), portable equipment for EOD divers and complete environment in Mine Countermeasures Operations (MCM), Autonomous Underwater Vehicles (AUV) and Passive Acoustic Monitoring Systems (PAM) such as acoustic recorders, buoys, datalogger and stations.

RTsys RUBHY rugged buoy is a powerful tool for monitoring underwater noise. The challenge is to autonomously detect sounds from different sources (human activity, underwater species, etc.), without the need of a 24/7 analysis. This led to a collaboration between RTsys and SenseaFR. BioSound, an algorithm, was developed and embedded within RUBHY. ResNet, an architecture known for image recognition, has been trained to recognize the time-frequency representation of various mammals calls and vocalizations. The network had been trained on several thousand of examples recorded at various locations and conditions around the world since 2018. Used as a detection algorithm based on machine learning principles, RUBHY-AI improves as more variance is introduced into the database. This deep neural architecture also proved that the network could be trained to identify very specific species like North Atlantic Right Whales upcalls under diverse and variable conditions. The automatic detection by RUBHY-AI includes ambient noise study, assessing the noise level in the relevant frequency bands and identifying the sources responsible for the noise (anthropogenic, meteorological, biological), the detection, classification and enumeration of animal sounds for cetaceans like odontocetes or mysticetes, and the assessment of the effects of noise on wildlife. The algorithm can detect the presence of cetacean sounds in the hydrophone capture radius (~ 20 km for mysticetes, ~ 1.5 km for delphinid clicks, ~ 1 km for delphinid whistles). Four detectors can be applied: vocalization, upcall, whistles, and delphinid clicks. In parallel to these detections, RUBHY-AI evaluates the detection range. The annotation of detections is very useful for the classification of biological sounds which can address two specific points of view: the sound functionality (transit, nutrition, socialization, reproduction, etc.) and the emitting species. To date, the artificial intelligence tools applied to cetacean sound detection are in full incrementation on a database of over 24,000 diverse biological signals and 50,000 diverse noise samples. The level of certainty of detection is:

For vocalizations: - 93% probability of detection, - 0.6% probability of false alarm

For clicks: - 95.6% probability of detection, - 0.6% probability of false alarm

SEASPAN SHIPYARDS

https://www.seaspan.com/seaspan-shipyards/

Seaspan Shipyards (Seaspan) launched the Canadian Coast Guard's flagship science vessel, **CCGS Naalak Nappaaluk**. The fourth ship designed, built and launched by Seaspan under the National Shipbuilding Strategy, the Offshore Oceanographic Science Vessel (OOSV) is a floating laboratory that will serve as the primary oceanographic science platform for Fisheries and Oceans Canada. As a Polar Class 6 vessel, it will be a highly advanced ice capable ship equipped with the latest scientific research systems. The new ship will provide increased capability and capacity to support marine surveys and scientific research on ocean currents and the seabed in Atlantic Canada. It will also contribute directly to increasing our overall understanding of the impact that climate change has on the oceans.

"The launch of Canada's largest and most modern science vessel is a historic day for our country and the crucial work underway to support ocean research," said John McCarthy, CEO, Seaspan Shipyards. "Seaspan is delivering on the promise of the National Shipbuilding Strategy - ships built in Canada by Canadians for Canada. I am so proud of the innovation and dedication that went into building this important ship that will help deepen our understanding of the oceans that Canadians depend on for food, our livelihoods and the health of our country."

The future CCGS Naalak Nappaaluk is named after a well-respected elder from Nunavik, who was a renowned promoter of the Inuit language and culture. The vessel will be stationed in Dartmouth, Nova Scotia and will accommodate up to 34 crew and 26 scientists. The data and samples collected aboard this vessel will support Canada's domestic and international commitments to ensure that our oceans are sustainably managed.

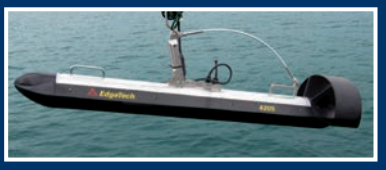
The 88-metre-long vessel is outfitted with a modular working deck, a marine mammal observation station, an ocean sampling room, an oceanographic winch, as well as permanent and portable labs. The ship can also perform search and rescue operations and environmental response when needed.

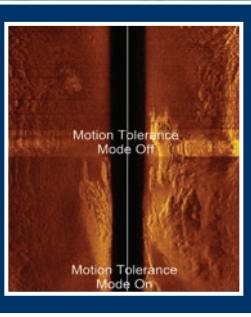
The new OOSV is replacing the CCGS Hudson, which entered service in 1964 and was the longest serving ship in the Canadian Coast Guard fleet. CCGS Hudson was decommissioned in 2022 following 59 years of service supporting ocean science work in Canada and around the world.

EdgeTech
The Leader in Underwater Technology

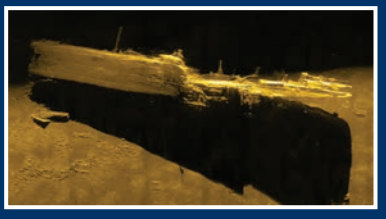
4205

MULTIPURPOSE SIDE SCAN SONAR SURVEY SYSTEM





- Dual & Tri-Frequency Options
- Motion Tolerant
- Increased Power
- New Low Noise Electronics
- Superior Resolution



EdgeTech.COM

info@edgetech.com
USA 1.508.291.0057

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ROCK SOI

Aerial view from Signal Hill across Gibbet Hill with the Queen's Battery Barracks and the Narrows into St John's Harbor.

LID

The spaces and places of Newfoundland and Labrador's maritime, offshore and subsea industries.

By Celia Konowe

The maritime industry in **Newfoundland and Labrador (NL)** is unique—versatile, adaptable, collaborative and community-focused. This is not only due to the North Atlantic's proximity, providing some of the most challenging and harsh ocean conditions, but also to centuries of sea living by determined and innovative people who created spaces that encourage synergy and minimize barriers. As a result, the province is home to state-of-the-art facilities supporting research, simulation and training, and innovation. Together, they are the spaces and places that help NL maritime science and technology evolve and thrive.

Atop the Rock

Known colloquially as The Rock, NL has rugged geology and sticks out into the North Atlantic, which offers dynamic and unpredictable weather system thanks to the Gulf Stream and the Labrador current colliding offshore. Water depths range from 80 to more than 3,800 meters at the infamous Titanic wreck. With a population of just over 500,000, NL has centuries of living by and depending on the sea, explained the **Hon. Andrew Parsons**, Minister of Industry, Energy and Technology. Fishery was the original backbone of the economy, although that has shifted to reflect the blue economy and a diverse array of maritime challenges.

The reason that NL developed a unique array of maritime expertise is simple: they had to.

"There were opportunities to grow it here because a lot of technology that was available—or not available—didn't reflect, or couldn't deal with [our unique] operational challenges, the reality of our conditions: this mixture of weather, ice, sea state and isolation, as well as the variability and quick change in the weather patterns here," explained **Chris Hearn, director of the Centre for Marine Simulation at Memorial University of Newfoundland (MUN)**. "When you live in a harsh environment, you have limited resources and you're isolated, you have to be really good at coming up with solutions and problem solving on demand," added **Meagan Kay-Fowlow, president of the Co. Innovation Centre.** "You don't have a choice."

The provincial government, Hearn said, recognized the need for and benefit of innovation early on. "We are truly nimble, we are adaptive, and we want people to come here," Parsons emphasized. "[We're] surrounded by an amazing team of people that are interested and committed to economic development and opportunity. We're very proud of our responsive-

Image courtesy Memorial University Maritime Simulation Center

Centre for Marine Simulation at Memorial University of Newfoundland (MUN).

ness; it's very easy to sit down with decision makers in our province in order to get things done."

MUN Grounds Provincial Research

MUN, located in the capital of St. John's, serves as home base for NL's maritime sector, providing academic programs, testing and research facilities, plus opportunities for collaboration. The **Ocean Engineering Research Centre (OERC)** in the Faculty of Engineering and Applied Science boasts state-of-the-art technology, influential partnerships and researchers asking crucial questions for marine activity.

Its oldest asset is a tow tank with a wavemaker that has been used for hydrodynamic studies into ships and offshore structures, explained **David Molyneux, OERC's director**. The Structures Lab features large equipment that can test almost full-scale ship panels with ice. "There's a related piece, which instead of looking at crashing loads, we look at sliding loads where a piece of glacial ice comes into contact with the side of a ship and is pushed into the side, because that actually changes the maximum load," he added. There's always been a level of risk with going to sea to earn a living, but "in order to make that environment as safe as possible, [we have] a long history of research into ship safety and offshore structures."

The **Centre for Cold Oceans Resource Engineering** (C-CORE) is one of the OERC's partners, originating as a university offshoot with extensive ice research history, particularly in the oil and gas industry. The National Research Council (NRC) of Canada also has facilities in St. John's, allowing students and professors to utilize its technologies for research.

Lately, OERC's focus has been on the Artic and related environments, which are sensitive and carry a unique set of hazards. With anticipated shipping growth in the North, it's crucial to ensure that seafarers have lifesaving knowledge and technical capacity. "In the naval architecture world," Molyneux explained, "classification societies have been the go-to organization for certifying our ships and making sure that they meet the best standards." As vessels enter new environments, classification societies must be ready to answer the question of returning safely. "We are used to icebreakers being strongly and heavily built, but with climate change, do they need so much reinforcement? [All that] extra weight could be cargo," he pondered.

MUN is also home to **The Launch**, a cutting-edge living lab operated by the university's Marine Institute. Located in Holyrood, a bay where the North Atlantic collides with the rugged coast, The Launch serves as the ideal setting for technology testing, training and ocean research in a safe, near-Arctic environment. "It's an amazing facility and community," said Parsons. "It's bringing the world's harshest cold-ocean environment to the client. [They deal] with ocean tech through R&D, testing and demonstration—taking ev-

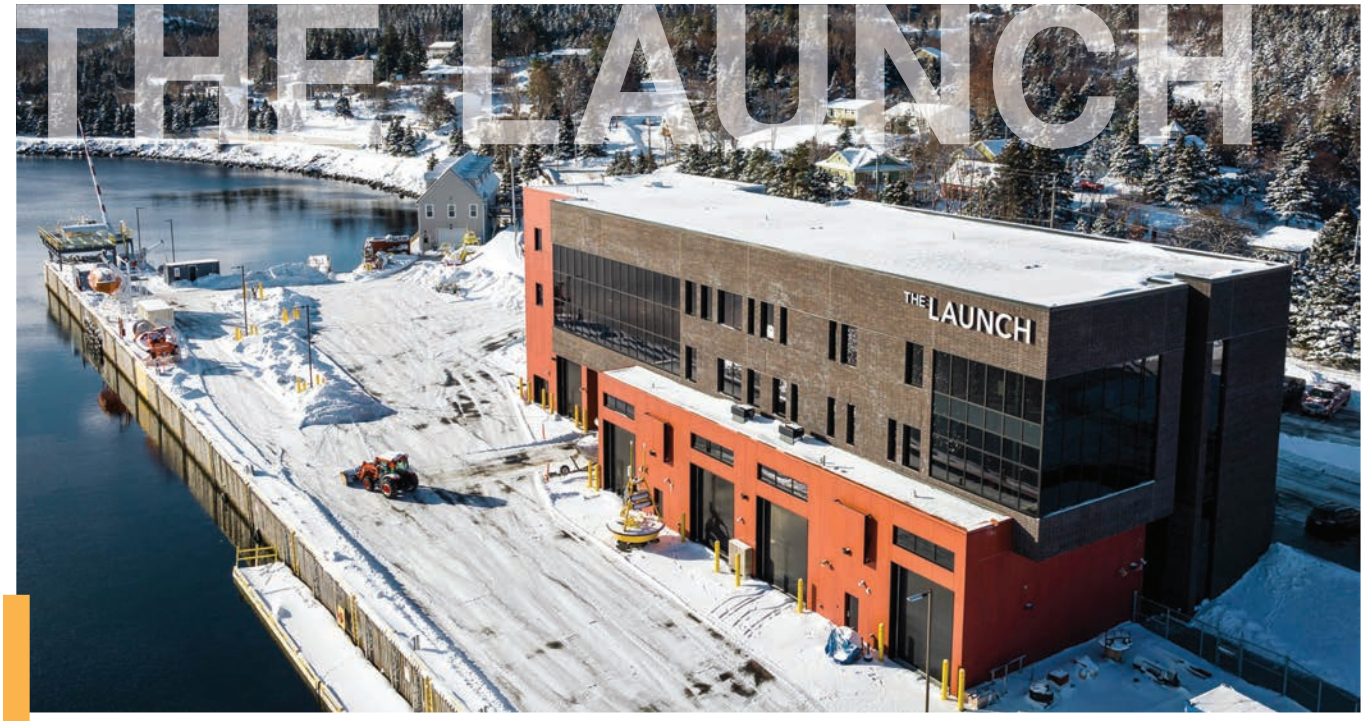


Photo courtesy the office of Minister Andrew Parsons

The Launch *is a cutting-edge living lab operated by the university's* **Marine Institute**. *Located in Holyrood, a bay where the North Atlantic collides with the rugged coast, The Launch serves as the ideal setting for technology testing, training and ocean research in a safe, near-Arctic environment.*

erything together and putting it to the test."

Research focuses on ocean mapping, habitat delineation, forecasting, modelling, management, and operational decisions, while long-standing partnerships with industry, government agencies, and Indigenous communities offer a truly collaborative and inclusive environment. Facilities include an autonomous testbed, a subsea observatory, remote operations center and workshop, training and meeting spaces. The Launch offers a toolkit that provides shared access to an extensive range of autonomous surface vehicles (ASVs) for training or marine applications and is home to NATO's Defence Innovation Accelerator for the North Atlantic network (DIANA) and SmartAtlantic, the largest applied ocean-observatory system in Canada, and data provider to the Canadian Integrated Ocean Observation System (CIOOS).

Government Contributions

St. John's is also home to the **NRC's** Ocean, Coastal and River Engineering Research Centre, which specializes in understanding the safety and performance of systems and infrastructure in harsh aquatic environments. "We have the world's largest ice tank," proudly said **David Murrin, General Director** of the site. It measures 90 meters long with temperatures that range down to -25 °C that helps to stimulate Arctic conditions. It's been used to study a variety of challenges, including navigation and model tests of ice structure interactions. "We also have a 200-meter towing tank that's fast enough to test high speed vessels and evaluate the performance of various marine systems like bulk carriers and patrol vessels, icebreakers, and submarines," he added.

In addition to physical modeling, the NRC provides numerical modeling and full-scale field testing to optimize ship design and offshore and coastal structures. "We're now at a point where we're looking to leverage these large data sets to train AI models to help with decision support technologies and make ships safer and more efficient," said Murrin. There are gaps, of course, like ship operations in the most extreme conditions. "We identified an opportunity to leverage our decades of data sets, and most importantly, our rich network of academic and industry researchers to kind of solve this limitation and try to fill in these gaps." The solution is a collaborative approach between MUN and Virtual Marine, a company that specializes in maritime training simulations.

Collaboration and innovation are not a singular experience for the NRC. "We're uniquely positioned in the intersection of industry, academia and government. Each year, our scientists, engineers and business experts work closely with thousands of Canadian firms tackling these important problems and bringing these technologies to market," explained Murrin. "We're also a steward of very important and unique scientific facilities and equipment, and that really helps us align science and innovation."

Oceans Advance Bridges Industry

Collaboration in the NL maritime industry is facilitated by organizations to connect and unify the industry. **Oceans Advance**, born out of the concept for an ocean technology cluster in NL, has a network of partners, collaborators and buyers across Canada and around the world. It leads national and international export trade initiatives and offers support to bring technology solutions to a global audience. "We facilitate collaboration through targeted events, and we advocate for support from our provincial and federal funding partners for our members," noted **Executive Director Shelly Petten**.

Member companies benefit from the vast network of partners and collaborations, trade opportunities for export growth, and continuous improvement initiatives like sales training and direct access to funding. Moreover, anyone outside of the province can benefit from Oceans Advance as an associate member. "We routinely connect folks from outside NL with our local community players," added Petten. "We have the most amazing infrastructure here for R&D in the ocean space, too."

The group is looking forward to this fall's ABCMI Business Conference in Vancouver, marketing the initiative as a gateway to the Asia market. "We are also supporting the Atlantic Canadian trade show space at Ocean Business in Southampton in April 2025—a major export activity for our NL companies," said Petten.

Co. Innovation Centre Removes Barriers

A new player in the NL maritime sector is the **Co. Innovation Centre**, a multi-sectoral space for established and growing companies to converge, collaborate and co-create. The facility was created to ameliorate silos between industries, missed partnerships, a lack of infrastructure or warehouse space for bigger projects and low visibility of new, local technologies. "And the companies had a really interesting desire that I haven't seen in other places, to collaborate," explained Kay-Fowlow. "Businesses here want to work together and they didn't have a place to do that." A group of core partners helped the Centre reach its current stage, including techNL,

© JAC Marketing Agency

The Co. Innovation Centre *came to life earlier this year. It's a multi-sectoral space for established and growing companies to converge, collaborate and co-create. The total space is about 54,000 square feet, split into different sections, including office and collaboration space, a light-industrial space, as well as a café, public space and meeting rooms.*

Energy NL, Canada's Ocean Supercluster, Energy Research and Innovation Newfoundland and Labrador (ERINL), and Econext, she cited.

The total space is about 54,000 square feet, split into different sections. About 20,000 square feet is office and collaboration space, while another 20,000 is light-industrial space that provides businesses with the technology and equipment they need for prototyping and testing. "We're trying to make sure we have a really unique combination based on the conversations we've been having around needs and removing the barriers to access for these businesses," said Kay-Fowlow.

The rest of the facility houses a café, public space and meeting rooms. "And then we're also in the planning stage for—and this is my favorite piece right now—a large-scale demonstration showcase space in the light industrial area, giving businesses or industry the option to rotate through and set up unique exhibits, whether it's for upcoming installations or new projects."

New Horizons

Common themes across the conversations above—climate change, green marine transportation, maritime cybersecurity, automation and autonomy, digitalization, and the growing use of AI. The Rock may not be alone in facing challenges in these opportunities, but Newfoundland and Labrador should be poised for success. "If it works here, it will work anywhere. So that's why you need to come to this province," said Parsons. "The technology we use here can be adapted to anywhere else in the world. And this is just a little corner of the world that can supply some of the strategies and solutions that will help us on a global basis."

"I heard a great quote one time about Newfoundland and Labrador," Hearn added. "'It has a landscape that makes you want to live up to it, but it doesn't provide you the resources to do it.' We've had more than 500 years of living here. It's in our DNA; it's part of what we are."

Images courtesy National Research Council of Canada / Conseil national de recherches du Canada

The World's Largest Ice Tank: *The world's largest ice tank is 90m (295 ft.) long, and has been used to study dozens of challenges, including navigation and Arctic conditions and model tests of ice structure with temperatures that range to -25°C (-13° F).*

TECHNOLOGY TIME

Collaboration at the Co. Innovation Centre.

© JAC Marketing Agency

In the market for innovative maritime, offshore and subsea technology? If so, it's a good bet that your colleagues in Newfoundland and Labrador already have it … or will create it!

By Celia Konowe

Newfoundland and Labrador (NL), Canada's easternmost province, is a hub of maritime activity, befitting its 29,000 km (about 18,000 mi) of coastline and rich history of seafaring and fishing. Your reporter, MTR's Halifax bureau chief, made the quick trip to St. John's, NL's capital, to explore the diversity and innovation of maritime companies that call the province home. techNL is a not-for-profit membership association that enables a thriving innovation-driven economy in NL, providing visibility, business growth services and a collective influential voice. The maritime sector offers immense potential for technological advancement and innovation, supported by the Marine Institute, Canada's Ocean Supercluster, Genesis, Launch and more recently, Co. Innovation Centre, said CEO Florian Villaumé. "What excites me most," he noted, "is the collective drive within this ecosystem to foster collaboration and accelerate technological development." He sees the future of the sector being influenced by climate change and AI, with techNL playing an important role to integrate innovations.

SubC Imaging specializes in creating modular, scalable and adaptable underwater optical imaging systems for precise and efficient inspections and surveys, even in the most challenging environments—some of which are right at its

A SubC Imaging technician prepares a Tow Camera System for sea trials, ensuring it can withstand the harsh marine environment.

© SubC Imaging

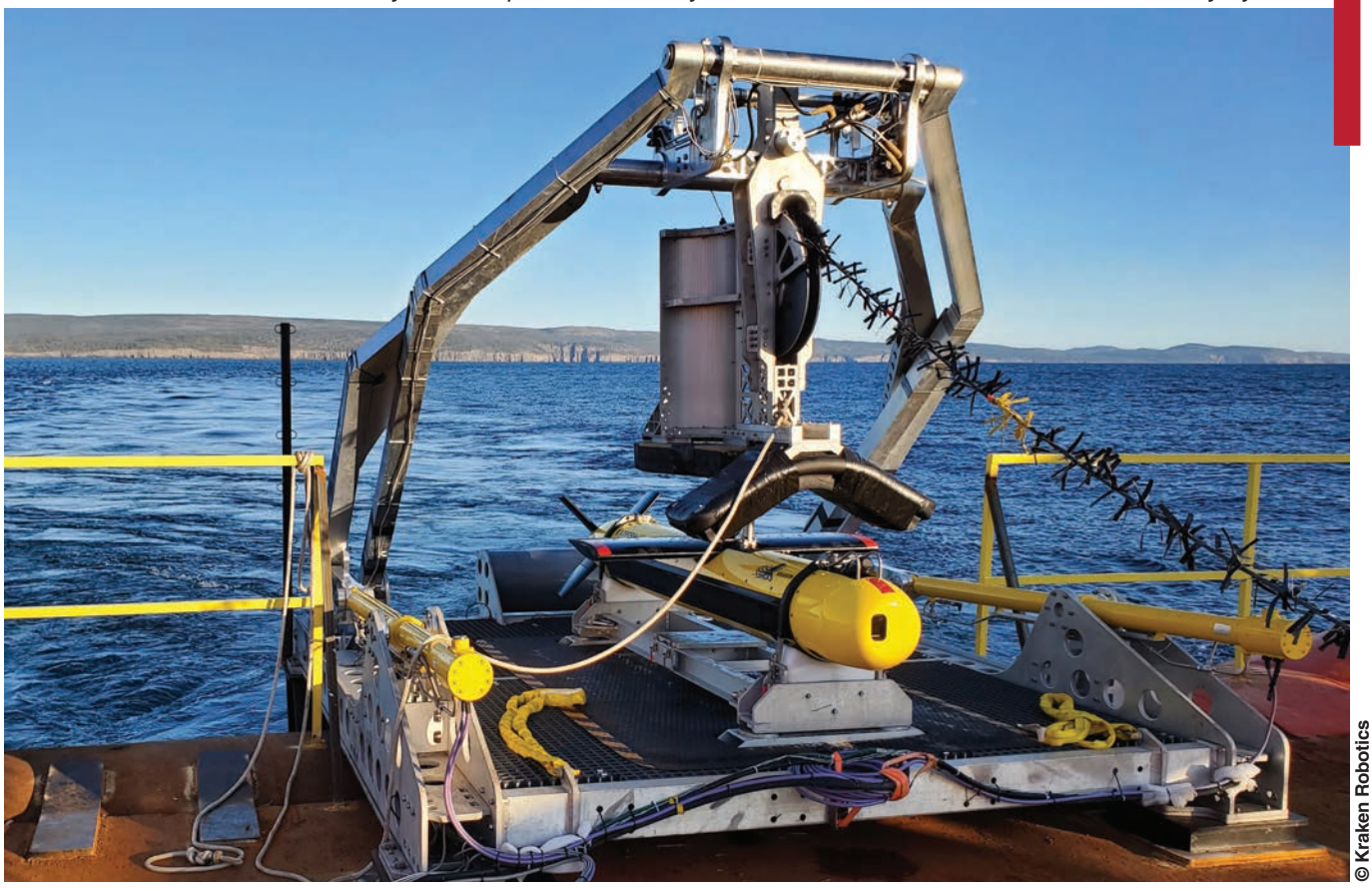
The latest software from SubC Imaging enables live, real-time data transfer and automatically embeds footage with EXIF data.

© SubC Imaging

doorstep. "This region's rich maritime heritage and proximity to some of the world's harshest and most complex marine environments drive us to innovate," explained Chad Collett, cofounder and CEO. "Being here means we're constantly inspired and challenged by the conditions that our technology is designed to thrive in, and it's incredibly rewarding to see our solutions making a real impact globally, all while staying rooted in the community that shaped us." This environment becomes even more important, Collett added, as the industry shifts towards durable, efficient and data-driven operations, as well as increased collaboration within NL and beyond.

Nditive3D specializes in real-time gas detection and pre-

Kraken KATFISH towed synthetic aperture sonar system and autonomous launch and recovery system.



© Kraken Robotics

NavSim's ARGUS Portable Pilot Unit (PPU) software system.

© NavSim Technology Inc.

Virtual Marine Fast Response Boat Simulator.

© Phil St. Aubin

dictive analysis using an AI-powered monitoring system and patent-pending sensor technology. Ideal for high-risk industrial environments, Nditive3D serves chemical plants, manufacturing facilities, offshore energy, the mining industry and marine transportation.

Kraken Robotics provides complex subsea sensors, batteries and robotic systems, with a focus on seabed intelligence. The company is driven not only by NL's dynamic and unpredictable weather—"As we often say, 'If you can make it work here, you can make it work anywhere,'" said David Shea, executive vice president and chief technology officer—but also by the culture of innovation and resiliency amongst the people. The future, he added, is defined by fostering and growing innovative capabilities: "The maritime sector in NL needs to be focused not just on what we can consume domestically, but what can be exported to customers across the globe, to leverage and sustain our oceans."

NavSim Technology is an electronics company that offers an advanced suite of portable navigation systems and services to marine piloting and other specialized commercial and government clients. NavSim is focused on the future as the industry moves towards integration into cloud, quasi-cloud, and network-based interconnectivity, said James E. Locke, vice president of marketing and finance. Locke takes personal pride in the growth of NL's maritime industry to meet industry and government goals: "The successes in marine technology that has occurred here in the province underscores dramatically that the larger marine centers and regions around the world have no monopoly on vision, innovation or excellence."

Virtual Marine specializes in maritime training simulators for lifeboats, fast-response craft and ice management, offering hands-on and realistic training. The harsh environment of the North Atlantic builds the confidence and competence of seafarers, explained President and CEO Randy Billard. Partnering with the National Research Council of Canada and Memorial University of Newfoundland builds expertise for multiple markets, including defense, oil and gas, as well as shipping. Looking ahead, Billard foresees an increasingly digital world requiring technology access anytime, anywhere. "Maritime businesses will have to formulate solutions that can be accessed remotely while still providing high value," he said. Virtual Marine appears well poised to meet these demands through its implementation of artificial intelligence and machine learning.

BioLabMate targets plastic pollution, utilizing seaweed-derived materials to create sustainable labware, which are typically derived from petroleum and quickly disposed of after one use. Being based in NL, cofounder and CTO Sanjay Dubey and cofounder and CEO Sarika Kumari explained, allows the company to draw inspiration from the region's connection to the ocean. "The proximity to abundant natural resources, particularly seaweed, is a unique advantage," they added. Additionally, as the global focus shifts towards minimizing environmental impact, it's crucial for companies to explore and integrate sustainable solutions and practices.

eDNAtec leads in environmental genomics, providing standardized environmental DNA (eDNA) solutions that empower stewardship across marine, terrestrial and offshore ecosystems. The company should be well poised as the maritime industry moves towards sustainability, explained CEO Steve Barrett, who expressed pride in eDNAtec's locally made solutions. "This environment is not just where we work; it's where we innovate," he shared. "Our customers demand robust, reliable solutions that can withstand the toughest conditions, and

Local seaweed and its bioplastic potential.

© Econext

eDNAtec team members working in the lab.

© eDNAtec

NL provides the perfect proving ground to refine and harden our technology."

Duxion Motors Inc. is an advanced motor design and manufacturing company offering an integrated motor/generator with split gearbox for maritime vessels that saves fuel, increases generator capacity and horsepower, has rapid dockside installation, and provides backup propulsion. The patent-pending design clamps onto a ship's existing propeller shaft, allowing for quick conversion from diesel to hybrid electric.

eSonar Inc. improves access to subsea environmental data with sonar and underwater acoustics knowledge, including an Extended Development Team service that helps companies develop subsea technology, continuous marine vessel noise measurement capabilities, and an Autonomous Underwater Vehicle (AUV) perception sensor. At home, "NL-based companies get great exposure to commercial marine activities like offshore oil and gas support, cargo shipping, ice breaking, fishing (inshore and high seas)," said CTO Gary J. Dinn. "We have access to many world-class research facilities," he added. As with many other NL companies, eSonar Inc. looks to further integrate into international supply chains.

From monitoring and navigation to electrification and bio-solutions, Newfoundland and Labrador companies are well-versed in emerging maritime technology challenges. The future of the industry, as many executives noted, will be driven by sustainability, innovation and collaboration. With that prediction and with businesses poised to meet evolving demands, all eyes should look to Canada's north and east.

eSonar staff Matt Dinn and Cory Parsons preparing a hydrophone array mooring prior to deployment onboard the RV Lucy Pudluk at "The Launch" facility of Marine Institute (Memorial University).

© Gary J. Dinn

GLOSTEN

Images courtesy Friere Shipyard

Seattle, WA • https://glosten.com/
No. of Employees: 105
President/CEO: Morgan Fanberg, PE
Vice President: Lisa Renehan, PE
Marketing Director: Maggie Moon
Engineering Director: Justin Morgan, PE

Glosten is a full-service naval architecture and marine engineering consultancy with over 65 years of experience. With offices in Seattle, Washington and Providence, Rhode Island, the firm has a reputation for producing highly customizable designs and providing exceptional engineering support for vessels at all stages of life—from napkin sketch through construction, and beyond. Glosten offers naval architecture, marine engineering, marine electrical and controls engineering, ocean engineering, shipyard production support, marine consulting, and owner and onsite support services to clients across a variety of sectors and vessel types. These include ferries, research vessels, tugs, barges, dredges, bridges, and floating platforms. The firm also specializes in hydrodynamic analysis, climatology, and risk analysis to serve vessel-operating clients, marine civil engineers, and contractors performing challenging in-water projects. Additionally, Glosten provides acoustical engineering services through its subsidiary, Noise Control Engineering—a Massachusetts-based consulting firm specializing in noise and vibration measurement and control for marine, industrial, commercial, and military applications.

The Technology : Earlier this year, Glosten delivered the preliminary design and was awarded Approval in Principle from ABS for a first-of-its-kind hydrogen-hybrid coastal research vessel for Scripps Institution of Oceanography. The vessel, nominally dubbed the Coastal Class Research Vessel (CCRV), will be capable of carbon-free operations and run on hydrogen power—the latter of which is yet to be achieved with a research vessel. The CCRV features a unique hydrogen-fuel-cell propulsion system powered by liquid hydrogen and fuel cells which it will rely on exclusively for 75% of its missions, coupled with a clean-running diesel-electric power plant to provide supplementary power for longer missions. In addition to its innovative propulsion system, the CCRV will be equipped with acoustic Doppler current profilers, seafloor mapping systems, midwater fishery imaging systems, biological and geological sampling systems, and support for airborne drone operations. Once built, it will operate as an uninspected, California Air Resource Board (CARB)-compliant, ABS-classed vessel and an alternative design under SOLAS, and uphold the institutional values of Scripps, minimizing its environmental impact on the Pacific Coast and setting a global standard for innovation. Glosten is also the developer of a tension-leg platform (TLP) technology for deepwater offshore wind turbines called PelaStar, which gained further attention this May after being named a winner of Phase Two of the US Department of Energy's (DOE) FLoating Offshore Wind ReadINess (FLOWIN) Prize. The PelaStar TLP is one of just five winning technologies the DOE recognized as viable for industrialized manufacturing and deployment of gigawatt-scale offshore wind farms in the United States. The most stable floating platform on the market, it features a simple,

robust design that maximizes power production and reduces wear and tear on the turbine. PelaStar's tendons are vertically rigid, which reduces turbine motion, increasing power production and system reliability, and its minimal seabed footprint allows developers to minimize environmental impacts and maximize the power density installed in deep-water wind farms. In Phase Two of the competition, PelaStar leveraged partnerships with major industry players to develop an aggressive deployment plan: one 15MW floating wind turbine assembled and installed every week starting in the early 2030s. In addition to working out the logistics, the team supplied an estimate detailing the cost of such an effort. In Phase Three of FLOWIN, PelaStar will advance location-specific supply chain plans to compete for the final $900,000 cash prize.

Noise Control Engineering

Billerica, MA
https://www.noise-control.com/
No. of Employees: 15
President/CEO: Jesse Spence

Noise Control Engineering, LLC (NCE) is an acoustical engineering consultancy based in Billerica, Massachusetts that specializes in noise and vibration design, control, and measurement for marine, industrial, and commercial applications. They specialize in designing and measuring quiet vessels of all types, including research vessels, high-speed craft, tugboats, offshore support vessels, military vessels, dredges, ice breakers, submersibles, offshore structures, and other conventional and non-conventional vessels.

The impact of underwater ship noise on marine life due to an increase in vessel numbers, size, and propulsion power is an emerging issue in the marine industry. Historically, underwater radiated noise has not been a key area of consideration for ship design or construction—however, through a project initiated by the American Bureau of Shipping, Noise Control Engineering and partners will assess the potential of US commercial ship design-build capabilities for co-benefiting low/zero emission vessels and underwater radiated noise reduction and identify where it can be scaled up or transferred to best practice for the US Fleet design-build supply chain. The study will identify barriers, establish a path to broad commercial adoption, and recommend implementation methods

and technologies for reducing URN and GHG concurrently in United States commercial marine vessels. To facilitate rapid assessments of underwater noise from ships and other anthropogenic sources, NCE developed the Buoy Acoustic Measurement System (BAMS). BAMS is a floating buoy capable of underwater measurements to ANSI, ISO, and regulatory body standards, and characterizing the acoustic output of vessels, airguns, pile driving, and all other human activities at close and long ranges. When combined with NCE's expertise in marine acoustics, the system can be used not only to quantify sound levels but also to diagnose noise problems, such as excesses to criteria, degraded sonar performance, and more.

SEABED MINING

While seabed mining faces political and environmentalist backlash, developers move forward with tech designed to maximize efficiency and effectiveness, will minimizing environmental impact.

Belgium-based **GSR**, part of the **DEME Group**, has Transocean as a cornerstone investor, and it conducted trials of a patented nodule collector, Patania II, at 4,500 meters in the Clarion Clipperton Zone in 2021. Full-scale trials will be conducted in 2027. Patania II uses jet water pumps to lift nodules into a collection drum. Peer-reviewed research has indicated that released sediment-laden water led to a low-lying, laterally spreading turbidity current. Only 2-8% of the sediment mass was detected 2m or higher above the seabed and hadn't settled after several hours.

Canada-based **The Metals Company** has partnered with Allseas which has a converted drillship, Hidden Gem, set up for nodule collection. Onboard technology developments include the vessel's launch and recovery system (LARS) which deploys and recovers the collector and feeds its power and control umbilical. It has passive heave compensation which nullifies the wave, current and vessel motions that influence loads in the power umbilical. The LARS can operate in up to 3.5m wave height significant. The physical connection and disconnection

between collector and power umbilical is performed subsea, and the LARS is fitted with a routing system that keeps the umbilical in a single plane during collector operations.

The collector's front-mounted Coandă-effect nozzles guide water over the seabed, creating negative pressure and a suction effect that picks up nodules. A diffuser at the rear creates an exit from where the sediment flows out, over 90% of which stays close to the seabed. The collector is fitted with low-impact tracks, and to further limit sediment disturbance, it has a fines rejection system.

This type of technology was first tested successfully in the 1970s by major Western corporations like Shell, BP and Kennecott.

Digital twin technology analyzes data gathered from multiple sensors and assets to enable 3D visualization of operations in real time. AI modelling can then determine the environmental impacts of the operation and test how, for example, how increasing production rate or collector speed would affect sediment mobilization and enable TMC to model different scenarios to reduce this.

Soil Machine Dynamics (SMD) designed, developed and delivered the mining machinery planned for the Solwara 1 Seafloor Massive Sulphides project some 15 years ago, and it is now developing a patent pending, least impact, nodule collection system that utilizes mechanical and hydraulic technology.

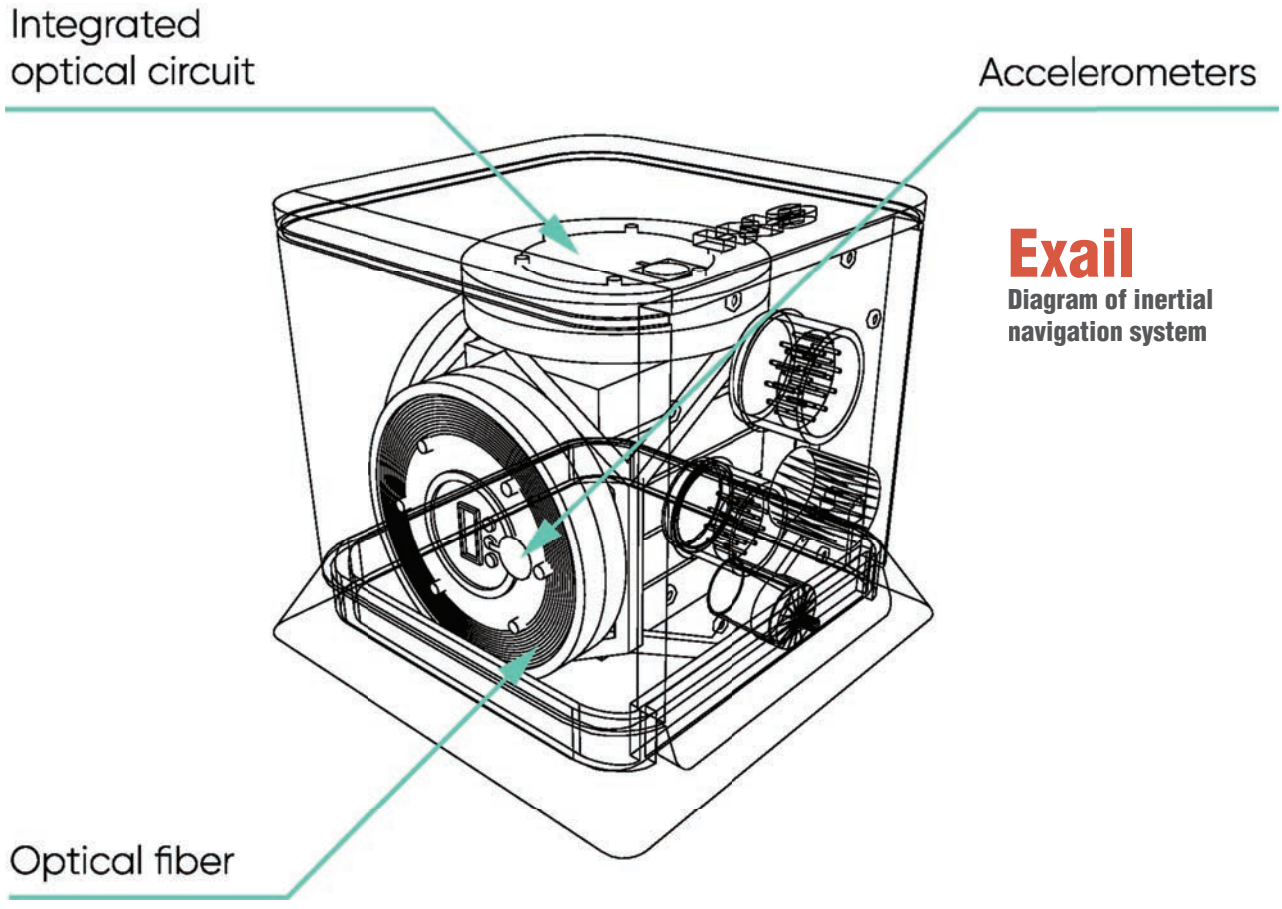
The company's SMD Q-Collector range is available in a variety of sizes to suit vessel and client requirements. Engineered to have a low submerged weight, these vehicles are made with light plastic tracks and buoyant syntactic foam. The collection vehicle uses sonar to identify the position of the nodules and has attained collection efficiency rates of at least 97% in recent university trials.

Over the past four years, SMD has worked with Oil States Industries to calculate cost per ton figures for prospective customers. Oil States' Merlin riser systems were successfully deployed on both the TMC / Allseas and JAMSTEC 2022 pilot projects. They also hold a world record water depth for a producing riser system of 14,764 feet.

Impossible Metals is developing a nodule collector, unlike other technologies, is untethered and hovers above the seabed, picking nodules with robotic arms. Specifically there are three unique developments: the battery-operated buoyancy engine, fast-acting robotic arms and the AI algorithms that guide them, identifying and avoiding nodules with visible life present. A second-generation collector, Eureka II, is currently being tested off the US east coast. It has three arms, but the much larger Eureka III will have 16 arms. Hundreds of collectors can be deployed concurrently. Once a collector has achieved its 6,000kg payload, it can return to the surface, and as the surface vessel reaches capacity, it can return to shore while the collectors continue to load on a second vessel.

GYROSCOPES

A new generation of fiber optic gyroscopes is taking the accuracy of inertial navigation systems higher and the payload lower.



Exail
Diagram of inertial navigation system

Exail
Phins 9 Compact weighs 1.2kg and features a power consumption of less than 7W.

A fiber optic gyroscope (FOG) can now weigh less than three kilograms, less than two kilograms even, and be less than 200mm in diameter. As their host AUVs themselves shrink, FOGs are following suit, and as the AUVs go deeper and perform a wider range of data collection tasks, FOGs continue to be part of the GNSS-denied navigational systems that enable them to do it.

The FOG sensors in an inertial navigation system measure changes in orientation of the AUV to support navigation by dead reckoning as satellite systems such as GPS are not available subsea. FOGs operate by monitoring the difference in propagation time between beams of light traveling in clockwise and counterclockwise directions about a closed optical path. Two beams of light are sent in opposite directions in a fiber optic coil. As the vehicle rotates, the beam travelling

against the rotation experiences a slightly shorter path delay than the other beam, a phenomenon called the Sagnac effect. The difference in phase shift between the two beams is used to estimate the rate of rotation. In an inertial navigation system, there will be three FOGs, each aligned orthogonally and combined with accelerometers to provide the sensed acceleration and rotation across six degrees of freedom.

The goal of minimizing size, weight, power and cost (SWaP-C) is driving much of the innovation underway with these systems.

Earlier this year, **Exail** released a new highly birefringent fiber for military-grade FOGs, featuring what it claims is the highest birefringence and shortest beat length available in the industry (1mm at 633 nm). The inertial measurement unit including fiber coil is now less than 30mm in diameter, and the material enhancements maximize the length of fiber that can be used, thereby maximizing accuracy, whilst ensuring the mechanical reliability of the coils. This fiber is available with a standard 80µm cladding but also with a smaller cladding of only 60µm for even smaller footprint gyros.

Exail sold the first of its latest model, Phins 9 Compact, to Bedrock for a new modular AUV designed for swift deployment in geophysical surveys and monitoring. Equipped with multibeam echosounder, side scan sonar and magnetometer, the AUV boasts a 300m depth rating and 12-hour endurance surveying at three knots with all systems operational.

The Phins 9 Compact adds just 1.2kg to the payload and features a power consumption of less than 7W. It has a Doppler Velocity Logger-aided position accuracy of heading accuracy of 0.07° and pitch and roll accuracy of 0.01°.

The latest models added to **Advanced Navigation**'s DFOG range are the Boreas A Series, including A90 and A70. The A Series is designed for surveying, mapping and navigation across subsea, marine, land and air applications. Both of the new models are strategic-grade inertial measurement units (IMU) that contain ultra-high accuracy DFOG and high performance closed-loop accelerometers.

All the measurements are combined into a proprietary neural network algorithm which removes sensor errors and filters out interference. Advanced Navigation's sensor fusion algorithm is more sophisticated than Kalman filters. Kalman filtering provides estimates for unknown variables that are primarily statistics-based. The sensor fusion approach is more accurate at determining and removing sensor errors, which results in a higher performance navigation solution.

The technologies that have been developed for the DFOG include digital modulation techniques that allow in-run variable errors in the coil to be measured and removed from the measurements. The "learning" capabilities of the AI enable it to accumulate sensor error data and associated conditions during erroneous measurements and post-measurement corrections. The AI can then use this accumulated knowledge and apply sensor error offsets that are tailored to the prevailing conditions. This allows for a smaller FOG with reduced coil length that can achieve the accuracy of one with a longer coil.

Advanced Navigation

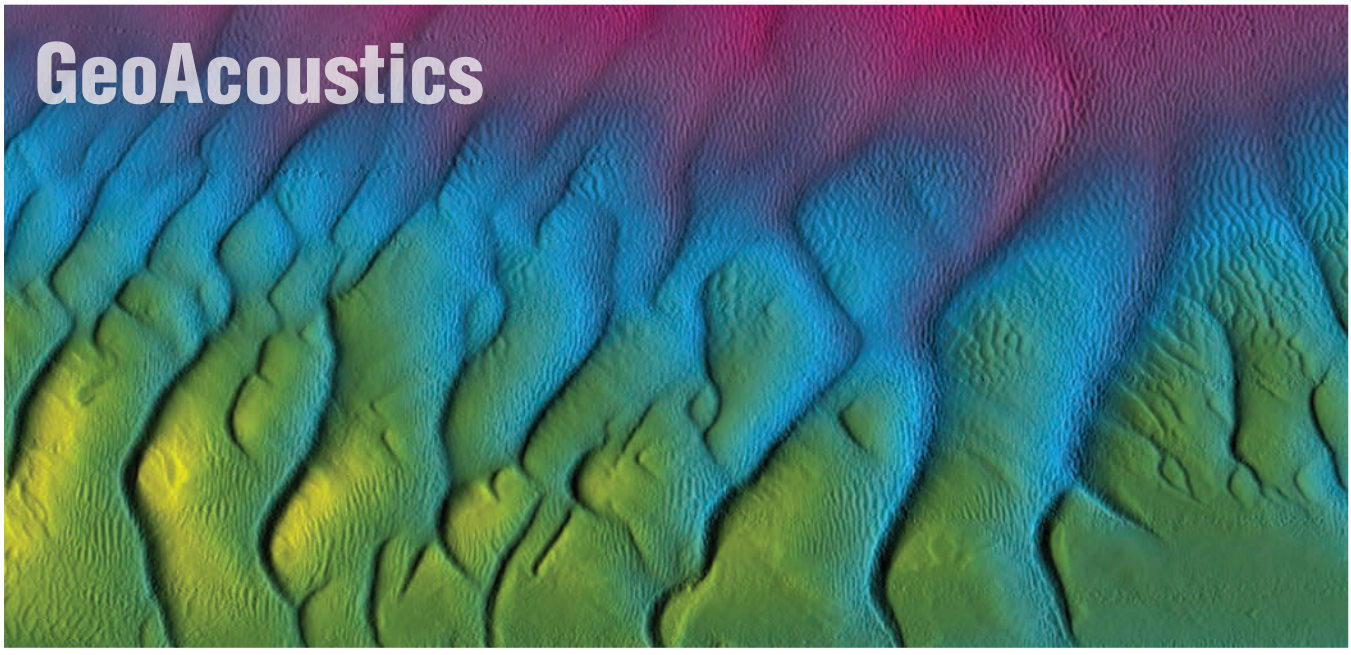
Boreas A Series is designed for surveying, mapping and navigation across subsea, marine, land and air applications.

"The coil lengths in our Boreas DFOG systems range from 300m on the smallest systems to 5km for the ultra-high accuracy systems. The most popular unit we sell currently is based on 1,000m coil length. The coils are very precisely wound by specially designed robots at our high-tech manufacturing facility in Sydney, using the quadrupole winding method," says Xavier Orr, CEO and co-founder of Advanced Navigation.

Additionally, an optical chip is used to integrate the sensitive components into a single chip, thus removing all the fiber splices and reducing SWaP while increasing reliability and performance.

DATA: GETTING IT, USING IT, ALLEVIATING BOTTLENECKS

While data processing continues to play catch-up to acquisition, things much changes – immediately and dramatically – if it has any hopes of keeping up with what's coming next.



AI hasn't worked all that well when it comes to object detection using conventional image or video data as is typically found on ROVs. The problem, says Dr. Adrian Boyle, CEO and Founder of **Cathx Ocean**, is that environmental variables, such as turbidity, vehicle movement and the distance to target, make it incredibly difficult for any kind of automation algorithm to detect objects or features in near real time with any reliability.

Color and range are a good examples. If you are two meters away, color is pretty obvious; five meters away and it is gone. So a distance algorithm is required before color identifications can be made.

"Applying AI and machine learning is not enough," says Boyle. "There's a whole set of other steps needed to pre-process the data, to apply physics constraints for example using range information, to provide the metadata that enables that, and to then link it all together so that the AI algorithms can work much better."

When image and laser data are combined, we can achieve this, says Boyle. "We strobe the lights and synchronize the laser so it does not appear in the image data. This also reduces backscatter and allows us to travel 10 times faster. The area and therefore volume of data increases by a factor of 10 or more, providing higher quality and a lot more data for machine learning model development."

Add more sensors and higher frequency surveys and it increases by hundreds. And that's where the industry is headed, whether it's monitoring a habitat, an offshore wind farm, a pipeline or critical subsea infrastructure. The current processing bottlenecks, that can delay survey data reporting by weeks or months, will limit adoption of high-endurance, high-speed, autonomous data acquisition AUVs.

With Cathx Ocean, event detection can now happen in milliseconds using shape information to "measure" change, and it can happen in the AUV if the company's **CLARITY software** is included on the vehicle's system. Cathx Ocean is now developing the same processes for sonar target detection and AI processes that involve sensor fusion on the AUV in real time.

Without pre-processing about 70% of events can be detected

by AI algorithms, says Boyle. Processing boosts that to about 80%, and then if sensor fusion is incorporated, it reaches about 95%. "We need to take it in small steps initially as each application is different. There is no silver bullet, but with the right tools and a unified approach we can transition much more efficiently from manual workflows."

PlanBlue uses hyperspectral imaging combined with AI to deliver greater speed for assessing seafloor characteristics such as biodiversity. Where a camera typically uses red, green and blue light, a hyperspectral camera can record hundreds of bands in the visual spectrum. Combining this with images from a regular camera, precise location data and AI processing, the company can tell whether the seafloor is healthy, how much carbon it stores, its biodiversity, whether there is pollution, and more. It can identify key species and remove caustics, the shadows cast by the waves on the surface.

GeoAcoustics has made progress on processing bottlenecks for sonar data by incorporating AI data cleaning in its GS4 software for GeoSwath bathymetric sonars. With manual configuring, says CCO Richard Dowdeswell, the quality of results produced is correlated to the user's experience. Instead, the AI-based system can log clean data in milliseconds across diverse seabed environments and water depths without any user intervention in the cleaning process, handling thousands of data points at a rate of 30 pings per second. "Receiving AI-processed data from GeoSwath 4, an AI-powered survey platform can make the same decisions as that of a human operator following the live stream," says Dowdeswell. While it cannot replicate all the nuanced understanding and decision-making capabilities of a surveyor, it will help them operate more effectively over a larger area.

Jann Wendt, Founder of **north.io**, is tackling the data bottlenecks that can start once even cleaned data is on the survey vessel. The company's cloud-agnostic **TrueOcean** platform uses a range of programming languages, each chosen for specific tasks, that maximize data processing speed. Horizontally flexible and scalable, the components

Ocean Infinity

Ocean Infinity completed a first of its kind offshore wind farm survey for Ørsted and PGE in the Polish sector of the Baltic Sea. The project team based in Ocean Infinity's Operations Centre in Gothenburg, used a multibeam echo sounder (MBES) and 3D multi-channel ultra-high resolution seismic (3D-UHRS) equipment deployed from an Ocean Infinity Armada lean crewed vessel over 540 km to identify sub-surface boulders in support of the Baltica 2 project installation campaign for wind turbine generators (WTG) and offshore substation (OSS) locations. Key to the project's success was the use of real-time remote data management.

Ørsted and PGE operate on a 24-hour delivery schedule, necessitating data products to be produced within 24 hours of logging off. This can pose a challenge even on conventional vessels, where data is logged and processed on the same server. With Ocean Infinity's sophisticated remote data collection system, however, the survey data was accessible to the office based processing team within the same timeframe as an offshore team would expect, enabling us to meet Ørsted's high expectations and deliver according to specification.

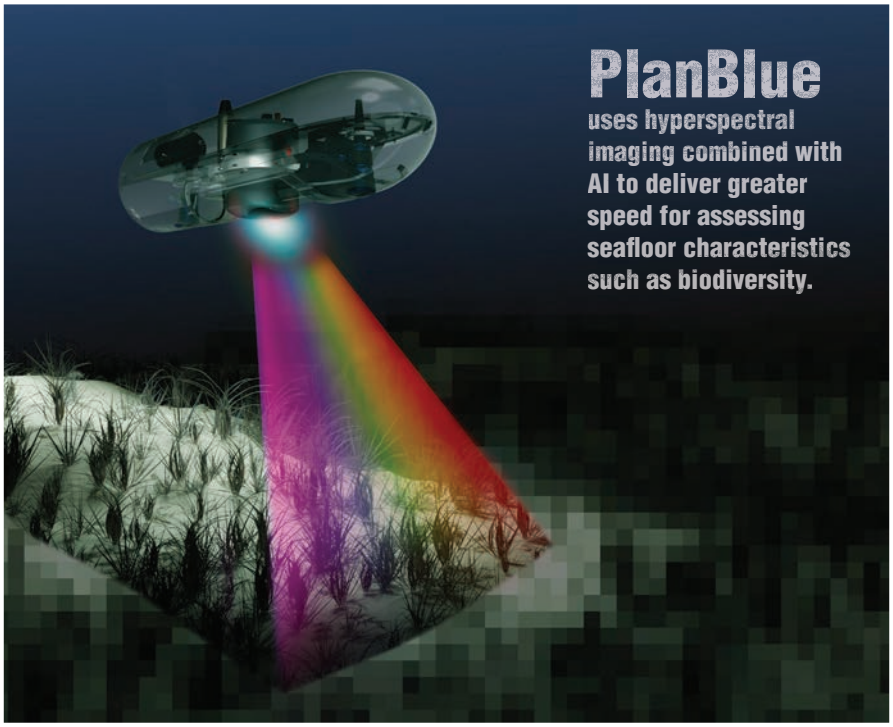
Terradepth

Terradepth will partner Hypack enable surveyors to run Hypack's software directly in the cloud through Terradepth's Absolute Ocean platform, aiming to streamline the hydrographic survey workflow, addressing a critical challenge in the hydrographic surveying industry.

Traditionally, surveyors process data locally on laptops and face significant hurdles in receiving the data in a timely manner and then sharing that data with end users when processed, often relying on slow and inefficient methods such as file hosting services or physical hard drive shipments.

By integrating Hypack software with Terradepth's cloud-native Absolute Ocean platform, hydrographic surveyors can now process ocean data in near-real time during surveys and seamlessly contextualize it with existing geophysical data. This integration dramatically reduces the time from data collection to actionable insights, shrinking lead times from weeks to hours.

"We are very excited to share our latest innovation in ocean data processing with the integration of Absolute Ocean and HYPACK's sonar data software," said Joe Wolfel, CEO of Terradepth. "Our goal is to revolutionize the hydrographic industry, making ocean data more accessible, efficient, and actionable than ever before, and this partnership is a great example of this."



can rapidly ingest and process the data and make it available as petabyte-scale file structures for processing.

The TrueOcean platform technology already contains over 65 individual microservices, each conducting highly specific tasks in a large-scale but modular environment. "Traditional monolithic and non-cloud architectures, where all functionalities reside within a single codebase, struggle to handle the scalability and agility demanded by the industry. As geospatial data volumes grow exponentially, monolithic systems experience performance bottlenecks, become cumbersome to maintain and are reaching their limits very fast," says Wendt.

Instances of the platform can be deployed across geographically dispersed cloud platforms. Individual microservices could be deployed on edge computing devices like those found on research vessels and operate even in remote locations. This enables data-driven decisions in real-time, leading to more productive expeditions.

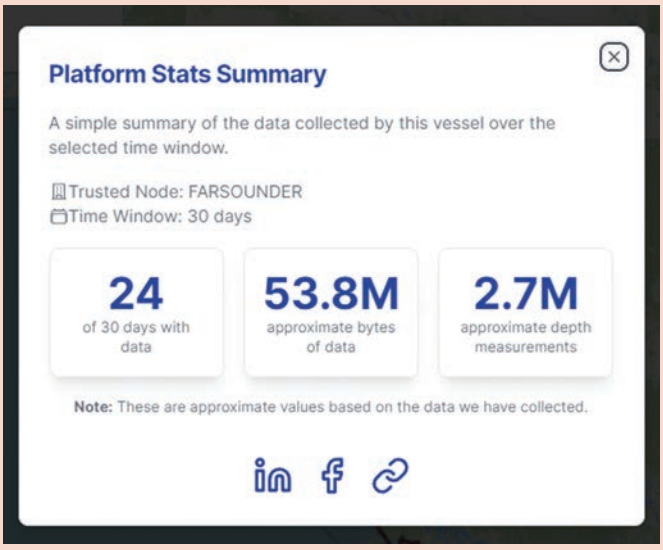
Rather than aggregating data into raster grids, the company's latest development on big data processing, Zeus, enables 2D or 3D point cloud analysis of sensor data using tools that make it easy to isolate specific geographic locations and to look for historic trends even with complex data formats involving multibeam, side scan and sub-bottom profiler data. Data quality metrics like point spacing, motion and horizontal and vertical resolution can be computed on an individual ping basis in hours rather than weeks or months.

Taking advantage of cloud computing, north.io is working with NVIDIA on physics-based AI approaches for underwater acoustics modeling. Wendt is comparing the use of modeled values of sound speed in water, which can change with temperature and salinity, to those typically measured every six hours at sea. AI modelling has achieved 99.7% accuracy compared to the physical measurements, and it can be performed for every data point in a dataset, instead of every six hours. This physics-based approach could change how surveyors work with AI, says Wendt. "It is so new that we have yet to evaluate what it means in the end from a professional and business perspective." He is now talking with experts across the industry to find out.

FarSounder

FarSounder released its CSB Data Explorer, a web-based platform that enables contributors of crowdsourced bathymetry (CSB) data to see where they've made contributions and gauge their support of the CSB community. This tool provides a visualization of where your vessel or vessels are making a difference in the daunting task of mapping the world's oceans.

The CSB Data Explorer is designed as a simple to use dashboard enabling users to view their contributions and monitor statistics highlighting the value of their individual contributions. This not only allows contributors to better understand where and how much they have donated, but it also facilitates the recruitment of other contributors via streamlined functionality to share their stats on social media. Additionally, in an effort to provide additional motivation through gamification, contributors can compare their contributions to the overall FarSounder fleet's contributions and view the entire International Hydrographic Organization's (IHO) CSB database on top of a global map.



The CSB Data Explorer.has been created in partnership with the International SeaKeepers Society, the IHO, and The Nippon Foundation-GEBCO Seabed 2030 Project.

Subsea Europe Services

https://www.subsea-europe.com/

Subsea Europe Services is an innovator in marine data acquisition technology and services. Established in 2020 and headquartered in Rostock, Germany, the company specializes in simplifying marine data acquisition through uncrewed survey and inspection platforms, sensors and new cloud-based data management. With the major ports of Hamburg and Kiel close by and offering direct access to the North Sea and Baltic Sea, Subsea Europe Services is strategically located to serve industries ranging from offshore wind energy to port authorities and telecommunications firms. The company is also involved in developing new remote and autonomous situational and domain awareness capabilities with clients for maritime security applications. Subsea Europe Services' array of products and services includes Uncrewed Surface Vessels (USVs) and Autonomous Underwater Vehicles (AUVs). The company provides seamless integration of equipment and data systems facilitated through partnerships with leading technology innovators like AML Oceanographics, BeamworX, BeeX, GeoAcoustics, MARTAC Systems, R2Sonic, and Sonardyne. The company also offers an extensive subsea rental pool, delivered in collaboration with Rental Technology Services (RTS), with facilities in Scotland and Norway.

The Subsea Europe Services rental pool is a diverse source of technology and equipment for marine survey and underwater inspection in the European market. Besides sensors and systems rental, the company provides expert on board support for any survey in addition to client representation. Subsea Europe Services offers advanced solutions, including the integrated Hydrographic Survey System (iHSS) combines all the sensors and systems needed to simplify marine data acquisition so that users of any experience can select the right configuration for the job, quickly install and calibrate the system on almost any type of vessel available and collect outstanding subsea survey results under even the harshest conditions. Based on the MARTAC Systems Inc. manufactured MANTAS T12 USV, Autonomous Surveyor is a 3.6 meter 'X-Class' Unmanned Surface Vessel (USV).

AUTONOMOUS SURVEY TECH

These companies and technologies are leading the way toward 'cutting the cord.'

The deeper you go, the quieter the ocean becomes. It's something that Kyrre Tjøm is exploiting in his back-to-basics approach to ocean bottom nodes (OBNs). The CEO and Founder of **iDROP**, is developing autonomous OBNs that can deploy themselves on to the seabed without ROV support. The current method for laying the nodes, which catch reflected waves during seismic surveys, involves specialist vessels and specialist crews. It only takes one member of the team to fall sick to disrupt an entire survey schedule, says Tjøm. That's how in-demand the expertise is. He has caught the attention of Woodside, ExxonMobil and others. Tjøm aims to avoid high-tech complexity above and below the surface. One way he is doing this is to exploit the quiet ocean floor to enable his **Oceanid OBNs** to communicate with others in the swarm and with the ship, using acoustics. This is facilitated by having upright OBNs that aren't obstructed by seafloor topology. OBN-to-OBN communication is used for navigation and, as a swarm, to produce relatively small but high-resolution seismic datasets. In the future, it will enable the swarm to report back to the launching vessel even if the vessel has moved beyond the reach of an individual OBN.

The OBNs are designed to glide to the seafloor without the need for ROV help or DP-positioning mother vessels. As part of their patented autonomy, the OBN's will use flight data to create a current profile as they traverse the water column at a predefined heading, constantly adjusting angle of attack to create the required lift to navigate autonomously into position while the deployment vessel has moved on.

iDROP's gravity-based OBNs use only around 5% of their battery power for launch and retrieval operations. They use their rudders and landing gear to slow their descent prior to landing and correct their vertical inclination before mechanically deploying their payload of sensors into the seafloor. As there's no need for ROVs or umbilicals, if one OBN fails its target spec, it is easy to deploy another.

Each OBN is about a meter long and weighs around 25 kilograms. The whole swarm system is containerized, up to 250 OBNs per container, and suitable for deployment by the deck crew of an OSV without ROV support.

PXGEO's
MantaRay is a hovering autonomous underwater vehicle engineered to deploy and recover ocean bottom nodes with minimal impact to the ocean floor.

Last year, Blue Ocean Seismic Services claimed its autonomous OBNs outperformed ROV-positioned OBNs. **PXGEO** uses hovering autonomous underwater vehicles rather than ROVs, claiming they are capable of deploying and recovering OBNs significantly faster and with better precision than traditional methods.

Ocean Infinity is not removing ROVs from its autonomous processes, but it is removing on-site human supervision. This year, the company signed an agreement with Shell for the provision of lean-crewed and robotic geophysical and geotechnical services. This includes using **Ocean Infinity's Armada surface robot vessels** of various sizes which only require a skeleton crew because data processing and payload control is conducted from onshore operations centers.

Andrew Galbraith, Managing Director of Ocean Infinity, says that while ROV-based survey operations are integral to the Armada solution, the difference lies in their integration within a comprehensive system. "ROVs are launched, recovered, and operated from a mother Armada vessel, alongside various other payloads like Ocean Drill, SonicCorer, Infinity CPT and AUVs. This consolidated approach optimizes efficiency and coordination in offshore operations."

Ocean Infinity has already entered the offshore wind geotechnical market with its newly developed autonomous cone penetration test (CPT) device, Infinity CPT 250. Last year, for the Ossian wind farm, deep push seabed CPTs, seabed seismic CPTs and vibrocore operations were carried out remotely using over-the-horizon commands sent via a remote-control system.

Recent advancements in AI and in low orbit, low latency satellite communications which have greatly enhanced remote control solutions and real-time data transfer have made it possible to do this. Infinity CPT and other payloads communicate directly with control systems on the mother vessel via a lift umbilical. The vessel's control systems communicate via satellite to the remote control center and the cloud. Infinity CPT can receive mission statements and execute them with minimal supervision. The data is automatically processed and reported to clients.

Robots such as Ocean Infinity's Ocean Drill or SoniCorer rely on an array of sensors that are used by algorithms to allow the robot to interface with the environment that it encounters during the completion of a given task. The data from the sensors will also be used to supervise or monitor the status of the robot and to allow the human monitor to intervene if needed from a remote location.

SOFAR OCEAN

sofarocean.com
No. of Employees: 100
President/CEO : Tim Janssen

Sofar is changing our knowledge of the world's waterways by leading the global effort to unlock ocean data at scale for government, industry, science, and society. Sofar's story starts with Spotter, its marine sensing platform that collects and transmits ocean data in real time. Sofar has deployed hundreds of Spotters globally and now operate the largest privately-owned network of ocean sensors, which produce more than 1.5 million real-time observations of waves and other variables each day. Sofar's team of ocean scientists uses this dataset to improve its proprietary marine weather forecasts.

Sofar's forecasts, data and hardware are used by many key maritime stakeholders:

• Ocean industries, from offshore wind to aquaculture, deploy fleets of Spotters at coastal and offshore sites to remotely access real-time surface and subsurface data. These insights help them better understand ocean weather conditions and promote safe and efficient operations.

• Marine researchers use the Spotter Platform — as well as data from Sofar's global network of ocean sensors — to bolster environmental monitoring efforts and further essential climate research. Coastal communities benefit directly from this research, which is increasingly critical as the effects of climate change intensify.

• Maritime shipping companies use Sofar's Wayfinder dynamic voyage optimization platform to keep their vessels on the most efficient path to port and save an average of 4-6% on fuel and emissions per voyage. The route and RPM guidance that Wayfinder sends vessels is powered by Sofar's superior weather forecasts and data.

• Government stakeholders leverage Sofar's forecasts and data, the Spotter Platform, and Wayfinder in operations.

Sofar Ocean was founded in 2016 and is based in San Francisco, California. Its mission is to connect the world's oceans to power a more sustainable future. Its global team comprises approximately 100 ocean scientists, engineers, and business professionals.

• Key customers (Wayfinder): MOL Group, Star Bulk, Berge Bulk, and other leading carriers.

• Key customers (Spotter Platform): University of Western Australia, USGS, NOAA, U.S. Army Corps of Engineers, Mørenot.

• Key partnerships: U.S. Naval Meteorology and Oceanography Command (CRADA), NDBC (CRADA), National Oceanographic Partnership Program (NOPP) Hurricane Coastal Impacts project (NHCI)

The Technology

Earlier this year, Sofar added a current meter integration to the Sofar Spotter Platform. This upgrade has enabled Spotter users to streamline the process of collecting subsurface currents data at scale. Spotter sims to simplify subsurface currents measurement, without compromising data quality or accessibility. Users can equip Spotter's subsurface extension (Smart Mooring) with multiple current payloads, and remotely access the current speed and direction data they collect in real time using the Spotter Dashboard and API. These observations of subsurface currents can be made in tandem with other surface and subsurface observations at the same site; for example, a current payload and a water level payload deployed in tandem on a Smart Mooring can combine to act as a tidal gauge. The integration of a current meter with the Spotter Platform was made possible by our Bristlemouth open ocean connectivity standard. Bristlemouth supplies plug-and-play interfaces for marine hardware, simplifying the process of connecting platforms, sensors, and devices. Spotter is fully Bristlemouth-enabled, meaning that marine professionals can swiftly integrate and interchange different payloads, including the current meter. Bristlemouth will facilitate the integration of other sensors and devices with Spotter in the future.

TDI-BROOKS INTERNATIONAL, INC.

www.tdi-bi.com

TDI-Brooks was formed in 1996 when Dr. James Brooks and Dr. Bernie Bernard recognized the market need for specialized oceanographic research. TDI-Brooks is a research and service company specializing in high-end environmental chemistry; multi-disciplinary oceanographic and environmental projects; surface geochemical exploration and heat flow; geotechnical and offshore survey projects for the Renewable, O&G industry as well as federal and state agencies.

TDI-Brooks offers a comprehensive suite of geotechnical analytical services for characterizing offshore geotechnical samples. Our suite of geotechnical tools are for soil sampling and measurement and include box corers (BC), piston corers (PC), gravity corers (GC) and jumbo piston corers (JPC). Since the inception of the EBS concept in the early 1970's, TDI-Brooks International's scientists have been performing EBSs for clients in the most rigorous regulatory environments.

South Bay Wire and Cable Company, LLC

www.southbaycable.com

South Bay Cable was founded in 1957 in the South Bay of Los Angeles. Gordon and Joyce Brown, the founders and owners, started by building custom cables, assemblies, and connectors in their garage in Gardena, California. The technology used by South Bay Cable combines proven methods and the latest advances. Advances in material chemistry have increased SBC's ability to build cables that are lighter and stronger than ever before, which allows for exploration at greater depths.

SEAmagine Hydrospace Corporation

Upland, California
President/CEO: Sam Sheard
www.seamagine.com

SEAmagine Hydrospace Corporation SEAmagine is a manufacturer of two-to nine-person submersibles.

SEAmagine delivered a newly constructed scientific submersible model that is owned and operated by a U.S.-based, globally operating scientific organization. The organization specializes in environmental research of our world's oceans with the ultimate goal of preserving the precious ecosystems that thrive there. Using this 1,300m depth-rated Aurora-80 SEAmagine submersible, the group will spend five years studying, documenting and identifying the potential for expanded protections in waters crucial to the survival of the oceans. The submersible is equipped with a series of subsea imaging and navigation tools as well as a Schilling Orion seven-axis hydraulic manipulator, a custom 5k pan and tilt camera, an 8k UHD camera, a custom collection tray and equipment, and even a custom eDNA sampling system. Built for science, this ABS-classed three-person sub is designed for harsh sea conditions, has a dry weight of 9,000Kg, and can perform multiple dives daily. The Aurora-80 series can accommodate three to five people, with a depth rating of up to 1,300m.

SEAmagine also introduced Aurora-90 Submersible Series SEAmagine recently launched its innovative Aurora-90 series of submersibles, with a design ideal for leisure, science and/or tourism. With an extra-large cabin and modular seating, this towable series accommodates three to five passengers in luxurious comfort. Depending on your chosen interior and desired depth rating, models are available for depths up to 500m. An extra metal hull section behind the window provides precious additional interior space and allows passengers to each have seats located inside of the bubble for a nearly 270-degree panoramic view. The pilot is nestled in the center rear section. The entry arrangement for passengers is unparalleled. The top deck, made of synthetic teak, offers a safe and highly accessible boarding platform supported by two retractable handrails on each side. A staircase leads passengers to the large entry hatch and two additional steps in the cabin extend the upper staircase all the way inside to the cabin floor. With four vectored propulsion thrusters on each corner, plus two vertical thrusters, this series can maneuver in all directions. SEAmagine's thrusters can provide practically the same amount of thrust force in forward and reverse-flow directions, giving the vessels excellent agility and power. This important characteristic allows pilots to safely approach reefs, walls, seamounts or structures for exceptionally close viewing. With this power, the Aurora-90 is one of the quietest subs on the market, ensuring tranquility and focus during underwater operations. As with all SEAmagine's submersibles, the Aurora-90's robust construction means unmatched reliability and safety. It can also be equipped with a wide array of cameras, robotic arms and scientific tools in the name of scientific research or even citizen science. This summer, SEAmagine successfully conducted sea trials on a newly constructed Aurora-90 sub in Redondo Beach, California. The American Bureau of Shipping (ABS) supervised all phases of the sub's development and construction, including a final test dive to its maximum depth.

Freudenberg e-Power Systems

www.freudenberg-eps.com
No. of Employees: over 800
President/CEO: Dr. Max Kley

Helping customers to reduce emissions with every heavy-duty application is the goal. Freudenberg e-Power Systems designs, develops, and manufactures reliable, high-performance power cells, battery, and fuel cell systems with exceptionally long operational lifetimes for buses, trucks, maritime, and off-road applications, with more than 30 years of experience. Freudenberg e-Power Systems is a leading suppliers of emission-neutral energy systems for heavy-duty applications. With its experience and expertise in battery and fuel cell technology, the company offers tailor-made solutions, in particular combined systems, for sustainable and economical e-mobility. With more than 800 employees, Freudenberg e-Power Systems supports its customers from application development through to production, commissioning and service. The company is part of the global Freudenberg Group, which has four business areas: Seals and Vibration Control Technology, Nonwovens and Filtration, Household Products as well as Specialties and Others. In 2023 the Group generated sales of 11.9 billion euros and employed more than 52,000 associates in around 60 countries. The XPAND battery system for maritime applications features a modular design, with small packs combining to make bigger power units, enabling easy customization. For small vessels, the single pack solution can be neatly and flexibly distributed across the vessel. For large ships, we offer fully integrated battery rack solutions based on the required power demands. The company's methanol and liquified natural gas fuel cell systems with integrated reformer are ideal for long-haul maritime applications, including container ships, freighters, and cruise ships. It also designs hydrogen fuel cell systems that are scalable for use in near-shore applications, such as ferries and tugboats.

HUNTINGTON INGALLS INDUSTRIES

Huntington Ingalls Industries (HII) Mission Systems developed and delivered the REMUS 620, a completely modular and open architecture platform designed to be easily reconfigurable and to carry a wide range of payloads. A great example of the modularity is the energy system. It can carry 1 to 3 energy modules that when using a Li-Ion batteries provides up to 110 hrs/275nm of range. The open architecture interfaces allow the integration of 3rd party software and compatibility with open architecture standards such as the U.S. Navy's Unmanned Maritime Autonomy Architecture (UMAA).

HII started detailed design of the vehicle in October 2022 with the goal of having an operational vehicle in the water within 12 months, and the new REMUS 620 completed its first sea trials in December 2023. "We will continue testing this development vehicle in 2024 and start construction of the first two production vehicles for delivery to NOAA in mid-2024," said Duane Fotheringham, President, Unmanned Systems, HII Mission Technologies division, in an interview with MTR earlier this year. "We went from concept to in the water in 12 months and we will deliver a production vehicle to the customer in under 24 months. The REMUS 620 was developed completely on internal development funding and was completed on time and on budget."

Last month HII Mission Technologies division announced that it had built and delivered two REMUS 620 uncrewed underwater vehicles (UUVs) to the National Oceanic and Atmospheric Administration (NOAA) for enhanced high-resolution ocean floor mapping.

The REMUS 620 vehicles provided to NOAA feature advanced modular design and engineering enhancements. These custom modifications include a synthetic aperture sonar module, an additional energy module, and auxiliary equipment specifically for NOAA's underwater mapping and habitat restoration projects.

NOAA intends to use these REMUS 620 UUVs primarily for high-resolution mapping in the Gulf of Mexico. A key focus will be on restoring Mesophotic and Deep Benthic Communities—dark, sunless seafloor habitats impacted by the 2010 Deepwater Horizon oil spill. The addition of these vehicles is expected to accelerate NOAA's environmental restoration and exploration efforts, complementing the agency's ongoing use of other REMUS models for habitat characterization, marine archaeology, and oceanographic research.

Globally, more than 600 REMUS UUVs have been sold and are operational in more than 30 countries, including 14 NATO member nations. More than 90% of these vehicles remain in service after 23 years, showcasing the platform's durability and its capacity to integrate evolving technologies.

PMI Industries

https://pmiind.com/
President/CEO: Bob Centa

Based in Cleveland, OH, PMI Industries, Inc., is a leader in engineered solutions for underwater marine cable connectors and subsea cable terminations. Earlier this year it earned the certification as a NAVSEA S9320-AM-PRO-020 approved molding facility from the U.S. Navy's Submarine Maintenance Engineering, Planning and Procurement (SUBMEPP). By achieving this qualification, PMI is one of only a handful of companies in the country with the NAVSEA S9320-AM-PRO-020/MLDG certification. As a result, PMI is now an approved vendor to fabricate, mold, and inspect outboard cable assemblies and components for the U.S. Navy.

The approval process required a rigorous audit by SUBMEPP, which performs life cycle maintenance and modernization planning for the U.S. Navy nuclear submarine fleet. During the audit, PMI's cable assemblies and terminations, along with its quality assurance team, demonstrated adherence to the exacting standards and specifications outlined in the NAVSEA Technical Manual.

The certification opens other opportunities for PMI, an ISO 9001:2015 with Design certified global leader in the design and manufacturing of high-performance, custom, and to-print cable assemblies and cable protection hardware.

Another achievement this year was the introduction of the Fiber Optic Splice Kit, an innovative kit designed to ensure a waterproof splice while terminating each end of the cable, making it secure even in the harshest environments. The Fiber Optic Splice Kit can be installed anywhere along the cable to create a highly reliable, full ocean-depth splice with multiple levels of sealing protection. PMI's splice kit enclosure family of products is specialized to each customer's application.

SCOTTISH-BUILT LIGHT SENSOR REVEALS OCEAN DISCOVERY

New technology built at the Scottish Association for Marine Science (SAMS) that can measure the tiniest trace of light beneath the ocean surface ocean has revealed photosynthesis occurring at greater depths than previously believed.

The discovery is part of a new international study published in Nature Communications that shows how the photosynthetic potential of phytoplankton in the global ocean may have previously been underestimated.

The study was carried out as part of the MOSAiC expedition at 88° northern latitude and revealed that even in the Arctic far north, phytoplankton can build up biomass through photosynthesis as early as the end of March. At this time, the sun is barely above the horizon, so it is still almost completely dark under the snow and ice cover of the Arctic Ocean.

Fieldwork during the MOSAiC expedition deployed three OptiCAL sensors built at SAMS that can measure light almost down to photon level and showed how photosynthesis can occur with a quantity of light that is close to this minimum. SAMS scientist Dr Phil Anderson, who designed and built the OptiCAL sensors, said: "The sensors picked up photosynthetic activity at conditions 10 times dimmer than previously modelled, so this was an exciting discovery. Photosynthesis in the ocean plays a huge part in producing oxygen and capturing carbon, so it is important to know if we have underestimated this process.

"Through this study, we've discovered that tiny ocean organisms respond to light in underwater conditions that humans would consider utter darkness. They are remarkably efficient in harnessing all of the light physically possible to make energy.

"We're currently working on a new OptiCAL that is 100 times more sensitive to light in order to explore even darker layers of the ocean."

As part of the MOSAiC expedition, the German research icebreaker Polarstern was frozen into the icepack of the central Arctic for a year in 2019, in order to investigate the annual cycle of the Arctic climate and ecosystem.

The team led by Dr Clara Hoppe from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) focused on studying phytoplankton and ice algae. These are responsible for the majority of photosynthesis in the central Arctic. Unexpectedly, the measurements showed that just a few days after the end of the month-long polar night, plant biomass was built up again, for which photosynthesis is absolutely essential.

The results were particularly surprising because photosynthesis in the Arctic Ocean takes place under snow-covered sea ice, which only allows a few photons of sunlight to pass through. As a result, microalgae only had about one hundred thousandth of the amount of light of a sunny day on the Earth's surface available for their growth.

"It is very impressive to see how efficiently the algae can utilize such low amounts of light. This shows once again how well organisms are adapted to their environment" says Dr Hoppe. "Even though our results are specific to the Arctic Ocean, they show what photosynthesis is capable of. If it is so efficient under the challenging conditions of the Arctic, we can assume that organisms in other regions of the oceans have also adapted so well."

Kongsberg Discovery

Horten, Norway
President: Martin Wien Fjell
https://www.kongsberg.com/discovery/

Kongsberg Discovery is a perpetual staple in the MTR100, as subsea and maritime innovation tend to flow freely from Norway.

Recently, the company reported anachievement in the field of autonomous underwater technology with the **HUGIN Endurance** [pictured above], which completed a multi-week autonomous mission, showcasing the capabilities of this 8-ton, 40-foot AUV. During the mission, HUGIN Endurance operated without human intervention or external navigation aids for the entire duration. After receiving a final navigation update from a pre-deployed transponder 10 hours into the dive, the AUV maintained its autonomy while navigating depths ranging from 50 meters to 3,400 meters. The vehicle met its advertised range of 1,200 nautical miles and returned with a position error of just 0.02% of the total distance traveled. The mission plan included straight-line transits covering distances between 60 and 300 nautical miles, as well as extensive survey areas. The AUV successfully surveyed 36 square nautical miles using Kongsberg's HISAS 1032 Dual Rx synthetic aperture sonar (SAS) system, capturing high-resolution imagery and bathymetric data within 48 hours. Additionally, camera imagery and laser profiling data were collected at depths as shallow as 9 meters.

Another significant achievement was the strengthening of Kongsberg Discovery's **EK80 echo-sounder product** family [pictured top of next column] with unprecedented wideband low-frequency capability that will enable customers across governments, academia and industry to gain a much more detailed picture of the ocean environment. The EK80 product family is part of Kongsberg Discovery's portfolio of monitoring and measuring tools and is used for all types of ocean research. The product family has historically been used primarily for biomass assessments, but the instruments are seeing increased adoption for other biological, physical and chemical oceanography applications. An EK80 vessel-mounted system typically comprises six transducers operating at different sound frequency spectra, matched with transceivers, software, and planning tools. The transducers are calibrated to give highly accurate, quantitative metric values of application targets.

MARINE TECHNOLOGY REPORTER

2025 Editorial Calendar

01 | Jan/Feb 2025
Ad close Dec. 31, 2024

Underwater Vehicle Annual

- Subsea Defense
- Manipulator Arms & Tools
- Autonomous Navigation
- Battery Technology

Events
UDT, Oslo, Norway

DEEP DIVE
PODCAST: Underwater Vehicle Tech

02 | February 2025
Ad close Feb 4.

Oceanographic

E-Magazine Edition

Tech Focus: Sonar, Telemetry & Data Processing Software

DEEP DIVE
PODCAST: Digitalization

03 | Mar/Apr 2025
Ad close Mar. 21

Oceanographic Instrumentation & Sensors

- Offshore Energy
- Seismic & Geotechnical Surveys
- Inspection, Repair & Maintenance
- Workclass ROVs

Events
Ocean Business 2025, Southampton, UK
OTC, Houston, TX
IPF Wind Conference, New Orleans, LA
AUVSI Xponential, Houston, TX

DEEP DIVE
PODCAST: Subsea Survey Technology

05 | May/Jun 2025
Ad close May 21

Dredging Technology

- Subsea Defense
- Hydrographic Survey
- Scientific Deck Machinery
- Cables & Connectors

Events
Underwater Technology Conference, Norway
WEDA Dredging Summit & Expo, San Diego

DEEP DIVE
PODCAST: Dredging Technology

07 | Jul/Aug 2025
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Autonomous Vehicle Operations

- Underwater Tools & Manipulators
- GPS, Gyro Compasses & MEMS Motion Tracking
- Deck Machinery & Cranes
- Battery Technology

Events
Offshore Europe, Aberdeen, Scotland
Oceans 2025, Great Lakes

DEEP DIVE
PODCAST: Subsea Defense

08 | August 2025
Ad close Aug. 1

Hydrographic

E-Magazine Edition

Tech Focus: Underwater Communications

DEEP DIVE
PODCAST: Research Vessels

09 | Sep/Oct 2025
Ad close Sep. 21

MTR 100

Focus on 100 Leading Companies, People and Innovations in the Subsea Space

DEEP DIVE
PODCAST: Inside NOAA

11 | Nov/Dec 2025
Ad close Nov. 21

Ocean Observation: Gliders, Buoys, & Sub-Surface Networks

- Instrumentation: Profilers, Samplers & Sediment Corer
- Subsea Defense: The U.S. Navy
- Subsea: Electrification
- Cameras & Multibeam Sonar

Events
Underwater Intervention, New Orleans, LA

DEEP DIVE
PODCAST: Ocean Observation

12 | December 2025
Ad close Dec. 4

Subsea Vehicles

E-Magazine Edition

Tech Focus: Underwater Imaging: Lights,

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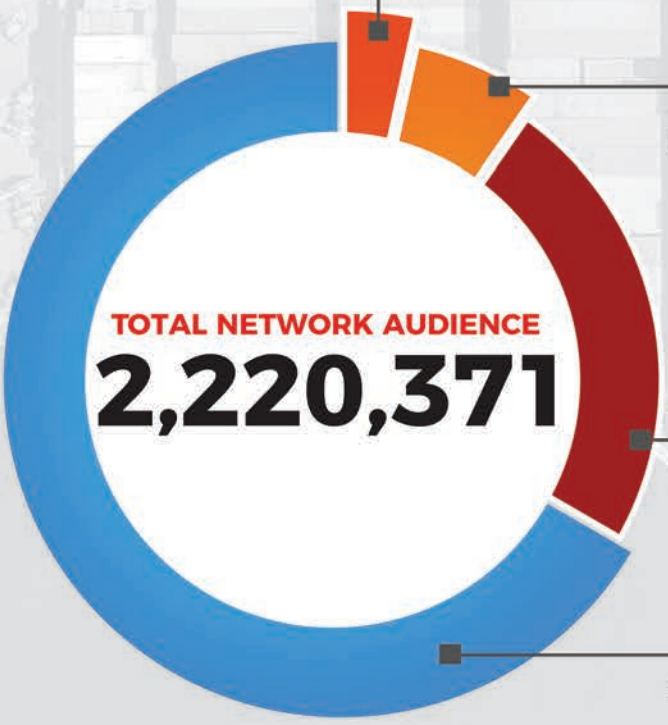

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TELEDYNE RD INSTRUMENTS – WORKHORSE PROTEUS ADCP

Teledyne RD Instruments (RDI), founded in 1982 and a part of Teledyne Marine, designs and manufactures wave measurement, current profiling, and precision navigation solutions. Teledyne RDI has recently released Workhorse Proteus, the evolution of its original Workhorse ADCP, which revolutionized physical oceanography, ocean engineering, and river hydrology with its acoustic Doppler and broadband techniques. RDI developed the industry's first commercially available ADCP in 1982. Its game-changing technology has allowed tens of thousands of scientists, engineers, and researchers to explore and understand our world's oceans, rivers, and streams in a way that was previously thought impossible.

The **Workhorse Proteus** collects current and wave data, measurements of flow, transport, and discharge, in oceans, estuaries, and rivers. It is not just a scientific powerhouse but an operational, practical one spanning all coastal marine industries, with features needed for time-efficient, cost-effective fieldwork. It can be used in a variety of offshore and nearshore applications; for example, ocean circulation; biological studies; sediment transport; ocean and coastal engineering; port and harbor operations; fisheries and aquaculture; hydrology and flood warning; and renewable energy.

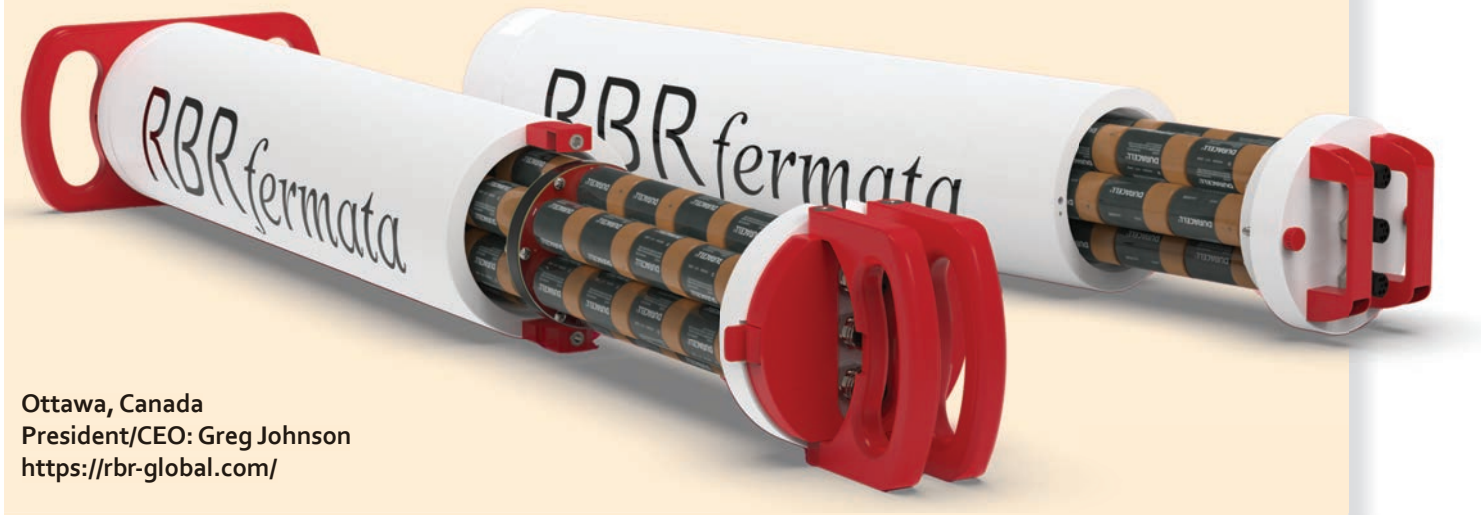
Proteus continues RDI's proven track record of over 40 years of data quality and reliability. Its technical advantages deliver the most data possible with a single instrument, both in terms of useable data per ping and the number of different ways a single system can be used. With the processing horsepower to simultaneously sample at multiple spatial and temporal scales, Proteus can unlock a new understanding of waves, turbulence, and the changing currents below the surface. Proteus has RDI's reliable bottom-tracking velocity ping to allow moving boat surveys or ice keel tracking while also taking advantage of a very low power sleep state to allow multi-year durations on alkaline battery power. It has flexible onboard processing to allow sampling schemes to continue to evolve in response to a changing ocean.

Features of Proteus include Advanced Doppler Sonar Platform (ADSP) - the most advanced Doppler processing platform; Catalyst Processor for fast processing; new RDI AHRS for the most rigorous dynamic bin mapping; elegant planning software; five beams for direct measurement of ocean's vertical velocity; versatile deployment options; RDI's robust, repeatable broadband techniques; and multiple communication options.

The first two features mentioned above deserve some elaboration. The RDI Advanced Doppler Sonar Processor (ADSP) board expertly handles the front-end sampling of water velocity profiling pings, classic bottom tracking, new boundary detection and water column processing, passing raw information to the Catalyst board. Catalyst builds on RDI's 40-year proven bin mapping algorithm by using dynamic tilt measurements from a new AUV/ASV-suitable Attitude and Heading Reference System (AHRS). Catalyst enables superior transformation into the earth coordinate system, and ensemble averaging for high precision velocity profiles. Catalyst's processing power has the potential to produce turbulent Reynolds stresses, directional wave information, or other higher order parameters. Its flexible design allows algorithms to run either inside the ADCP for real-time decision-making or within the ADCP utilities software for in-depth post processing.

Teledyne RDI is committed to offering state-of-the-art solutions that drive innovation. The end goal of Proteus and all other RDI products is to help clients obtain accurate and reliable information leading to correct and confident decisions.

RBR



Ottawa, Canada
President/CEO: Greg Johnson
https://rbr-global.com/

Founded in 1973, RBR has evolved from a small Canadian engineering contractor into a leading instrumentation company in global oceanography. RBR's instruments are designed to be compact enough for deployment from smaller craft, rugged enough to withstand freezing in ice, power-efficient to support extended missions on autonomous platforms, and user-friendly for operation by citizen scientists in remote locations. RBR designs, manufactures, and calibrates high-precision oceanographic instruments and related systems. RBR's instruments can be configured to measure up to ten physical or biogeochemical water parameters. Communication is available with USB-C as the standardized connector on every instrument, and Wi-Fi connectivity is available on every standard logger.

Earlier this year we caught up with **RBR President Greg Johnson** in London to discuss latest innovations from the company. "I think we've been known for our CTDs and tide and wave recorders for a long time, but we've been pushing into optical sensors in the last couple of years," said Johnson. "Following our acceptance into the Argo program, it's been clear that the power consumption versus measurement policy of some of those optical sensors really is crippling the deployment lifetimes of a lot of those instruments. And the cost of an instrument is often relatively small compared to the cost of getting the instrument into the water, whether it's ship time or building a float, so we want to build sensors that are particularly low power. And we've recently come out with some chlorophyll, other fluorometry backscatter sensors, which work optically but give the same kind of accuracy that people are looking for, that kind of Mercedes-Benz class that we're known for, but consume about 5% of the power consumption of our competition."

The company also has developed a new winch system to make the process of exploring the world's oceans even more efficient and effective.

"As I said, with the CTDs, we've been adding more optical sensors, but we've also been starting to move into that system side of things, equipment or accessories that makes it easier to deploy. One of the things, particularly in research oceanography, is that ship time costs you $50,000 to $100,000 a day and you want to do it from this location, so you burn a lot of oil to get there. And often that time to get there is wasted time, because unless you stop, you can't really make accurate measurements, because you need to be making vertical measurements through the water column.

So we've developed a winch that runs at about 10 meters per second. That is to say 20 knots worth of line ejection speed. Which means that if we want to drop an instrument vertically through the water at three or four meters per second, the boat can still be moving at 8, 10 knots and there's no pull on the line. And so the line is being chucked out so fast that the boat is effectively leaving the line free of drag behind it, and you can deploy line lengths of a 1000 meters, get down to three or 400 meters before you have to pull up, and do it completely autonomously.

So you don't need somebody on deck to be doing this. The data's coming in real-time. The data can even be deployed not only to the ship's network, but we can telemeter it straight off. So you can deploy this winch on a fishing boat or another kind of vessel of opportunity, as long as the deck hand says it's clear to deploy and I'd like to recover, scientists back in the office can see the data straight away."

UNIQUE GROUP

Sharjah, United Arab Emirates
No. of Employees: 650
President/CEO: Sahil Gandhi
www.uniquegroup.com

Established in 1993 in a small garage in Sharjah (UAE), the company began its journey with a focus on providing one-stop solutions for the subsea industry. Today, Unique Group operates across five divisions: Unmanned Surface Vessels (USV), Survey Equipment, Buoyancy + Water Weights, Diving + Life Support, Lifting + Mooring, and Subsea Innovation.

Unique Group presents the Uni-USV Fleet, an unmanned survey solution designed to revolutionize data collection across a wide range of maritime environments. Spanning from extreme shallows to offshore depths, the Uni-USV Fleet offers versatility, cost efficiency, and ease of operation. The fleet features three distinct models:

1. Uni-Mini: The latest design, made from carbon fiber, is lightweight (50kg) and can be easily transported in the bed of a pickup truck. Measuring 1.6m x 0.8m, the Uni-Mini offers a single payload capability and a battery life of 4 hours, making it ideal for operations in confined spaces.

2. Uni-Pact: This mid-range USV, introduced in 2019, is recognized for its versatility. The catamaran-style vessel measures 3m x 1.6m and is constructed with high-density plastic (HDPE) sponsons for rugged operations. It supports a single payload, with the option to upgrade to a dual-payload configuration. The Uni-Pact's battery can last up to 8 hours, making it a reliable tool for a variety of survey tasks.

3. Uni-Max: The largest in the fleet, this catamaran-style USV measures 5m x 2.2m and features high-density plastic (HDPE) sponsons and a marine-grade aluminum deck. With dual payload capabilities and a hybrid powertrain that provides 96 hours of endurance, the Uni-Max is designed for extended operations in challenging environments.

The fleet's standardized spares, ease of training, and cost-effective operation ensure that clients can perform complex surveys with minimal overhead.

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SeaTrac

SeaTrac Systems, Inc.
Marblehead, Massachussettes
www.seatrac.com
President/CEO: James Herman

SeaTrac Systems, Inc. has demonstrated leadership in the evolving unmanned surface vehicle (USV) industry thanks to its SP-48 platform's design, payload and sensor capabilities, as well as the success of the missions its vehicle continues to enable. Most recently, it partnered with the University of Southern Mississippi and NOAA to map for potential hypoxic conditions in the U.S. northern Gulf of Mexico. This mission reduced the manpower needed to collect data vital to the Gulf Coast's ecosystem while eliminating safety risks to scientists who would otherwise be on a crewed vessel. This alone has significant implications for marine research and the goal of gathering reliable data while reducing the need for human intervention in risk-prone areas. In the midst of challenging conditions, SeaTrac's team and equipment succeeded in: Real-time adjusting of winch bottom-detection parameters to collect data within one meter of the seafloor - a critical measurement in collecting accurate hypoxia data Integrating wireless charging capabilities for the sonde for extended duration sampling Configuring the SP-48 with multiple, redundant cellular and satellite communications to ensure data was transmitted in real time over available communications links and backed up locally on the USV.

The mission continues in the U.S. Gulf, currently with multiple USVs. SeaTrac is continuing this critical work as a partner to USM and NOAA to gather additional mapping data, which will be compared for quality against the data collected by the crewed vessel.

SP-48 is a system aiming to lower operational costs and improve efficiency for offshore and near-shore data collection.

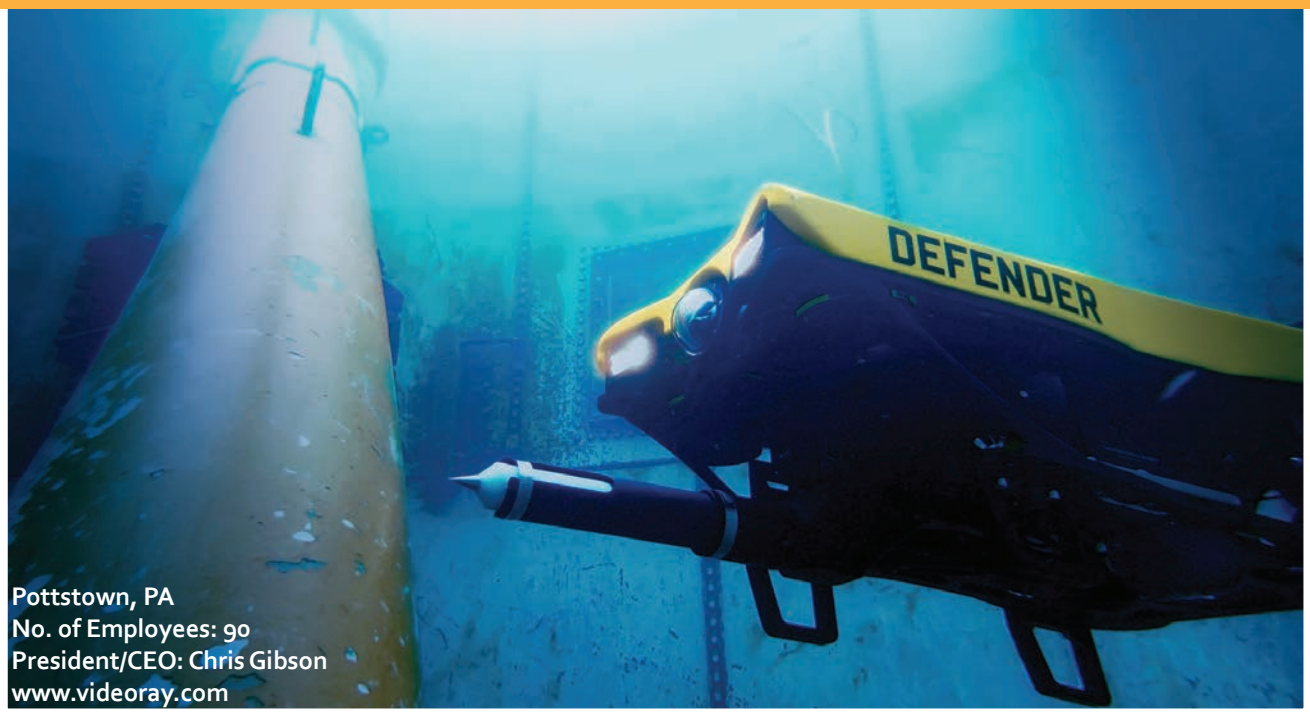
SeaTrac's SP-48 USV is a complete system for maritime observation, data collection and reconnaissance. Powered by the sun with high-reserve batteries, the SP-48 operates in both near-shore and offshore environments through varying weather and sea conditions. SeaTrac's USV executes programmed missions that can last from several hours to several months. Users can easily update missions on demand, as needed, supporting human-in-the loop remote operations. The USV includes a variety of built-in sensors, and the system is designed to support a wide range of customer payloads. The software provides a live link to the boat and the payload to retrieve data and send commands. Highly portable, the SP-48 includes a trailer for towing behind a car and a single lift point for ship-based launch and recovery. Customers can choose to control their missions or have the SeaTrac team manage them.

To mitigate the obstacles of gathering oceanographic data, SeaTrac launched an all-new winch this year. Paired with the USV platform its new winch is capable of multiple applications to aid marine research.

SeaTrac's winch lowers instruments, or sondes, to collect sound velocity profiles using multibeam echosounders or other equipment. The resulting data can be used to verify or correct existing multi-beam data, ensuring the accuracy of detailed ocean floor maps. Researchers can strategically drop sondes at regular intervals during surveys for redundancy and optimal mapping.

SeaTrac's winch also facilitates the measurement of various aspects of ocean health, including oxygen levels (including identification of hypoxia) and water properties (conductivity, temperature and depth [CTD]) using CTD casts. SeaTrac's deployed sonde works by combining data from the surface (such as air temperatures and pressures) with data from deeper water. This allows researchers to gain valuable insights that would otherwise be difficult or impossible to obtain.

VideoRay



Pottstown, PA
No. of Employees: 90
President/CEO: Chris Gibson
www.videoray.com

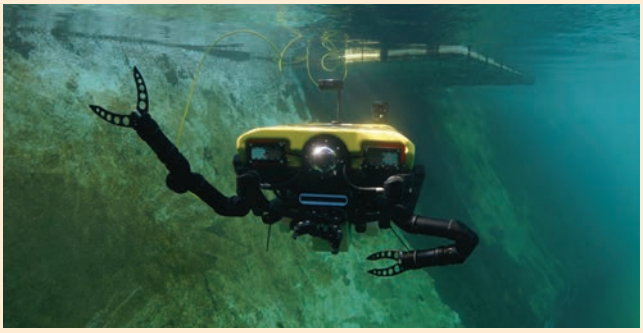
VideoRay is celebrating its 25th anniversary of staying ahead of the technology curve delivering groundbreaking inspection class ROVs. Now with over 90 employees, exponential year-over-year growth, a Navy contract of record (MESR), a full line of Mission Specialists underwater robots, and an aggressive five-year roadmap - the company continues to set the standard in the industry.

VideoRay is a leading dual-use defense technology company, dominating the portable underwater robotics market by delivering unmatched solutions for the world's toughest missions.

Designed to operate in the deepest, swiftest, and murkiest waters, VideoRay's Mission Specialist ROVs excel where others fail. Their ability to locate, identify and render safe underwater targets has earned VideoRay several large orders from the US and allied Navies, including the MESR program of record. Their modular design, which allows for up to 400 configurations, and swift in-field repairs make them a favorite for offshore energy, infrastructure, and search and rescue operations where uptime is of critical importance.

Renowned for reliability, exceptional customer support, and relentless innovation, VideoRay's name has become synonymous with superior performance.

The core of the VideoRay technology offer is centered on its underwater robots, including the Mission Specialist Defender, Pro 5 and Ally.



REGAL REXNORD

Reducing Complexity in Marine Winches with Powertrain Solutions

By Jesse Dupuis, Director of Powertrain Product Management, Regal Rexnord

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The Challenge:

An international engineering technology company that strives to develop unique, innovative, sustainable products for their customers needed assistance with designing a marine winch, which is a critical component in the marine industry. This component is used for the control, lifting, and retrieval of remote operated vehicles (ROVs) on sea/ocean fairing vessels.

The winch needed to lift a type of ROV called a hull cleaner, which is designed to remove fouling on the ship hull. This reduces the risk of transporting biological contamination across different zones, and improves fuel efficiency on the ship.

The company discovered they could not find a winch solution that met all their objectives on their own. They had an initial concept in mind but wanted help reducing its complexity and potential maintenance. By partnering with the Powertrain Solutions team at Regal Rexnord, they were able to eliminate components from their original concept, while meeting the tough demands of a seafaring application.

The Solution:

There were both physical and functional challenges to keep in mind when designing the marine winch. The physical needs of the winch were high corrosion resistance in the harsh salt spray environment, a simplified design to minimize potential failures and maintenance, and ensuring it was small enough to fit the limited enclosure size on the vessel. Functionally, the winch needed to meet the torque and speed requirements to have enough torque development to control, retrieve, and lift the ROVs, while also having dynamic braking to both let out more line for the ROVs and hold the brake to lock the line.

The Powertrain Solutions team partnered with the engineering technology company to come up with a

design that significantly reduced the complexity, cost, and weight of their original concept, while increasing

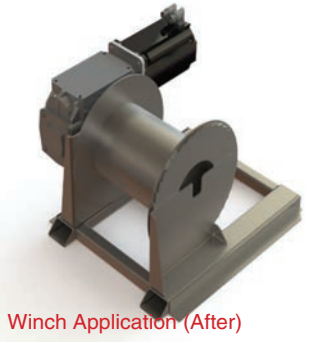
its robustness. The complexity was reduced by 58% by eliminating seven components, such as the synchronous belt, sheaves, belt guard, and flange mounted bearing, and by combining the motor, brake, and encoder into one Kollmorgen™ servo motor.

The Results:

In addition to reducing complexity, these changes reduced the

cost of the entire winch system by 32% and its weight by 13%. Reliability and efficiency also improved by 3% and maintenance was reduced by removing the synchronous belt and sheaves, as they have a hard time standing up to the exposed saltwater environment. The Kollmorgen servo motor and drive with resistive load bank allows the customer to dynamically brake by dumping power to the resistor bank and hold statically via an integrated holding brake inside the motor. Multiplying the motor braking through the gearbox ratio allowed a much smaller braking solution than the initial drum winder shaft-mounted brake that the customer used, resulting in a significant cost reduction.

Winch Application (Before)



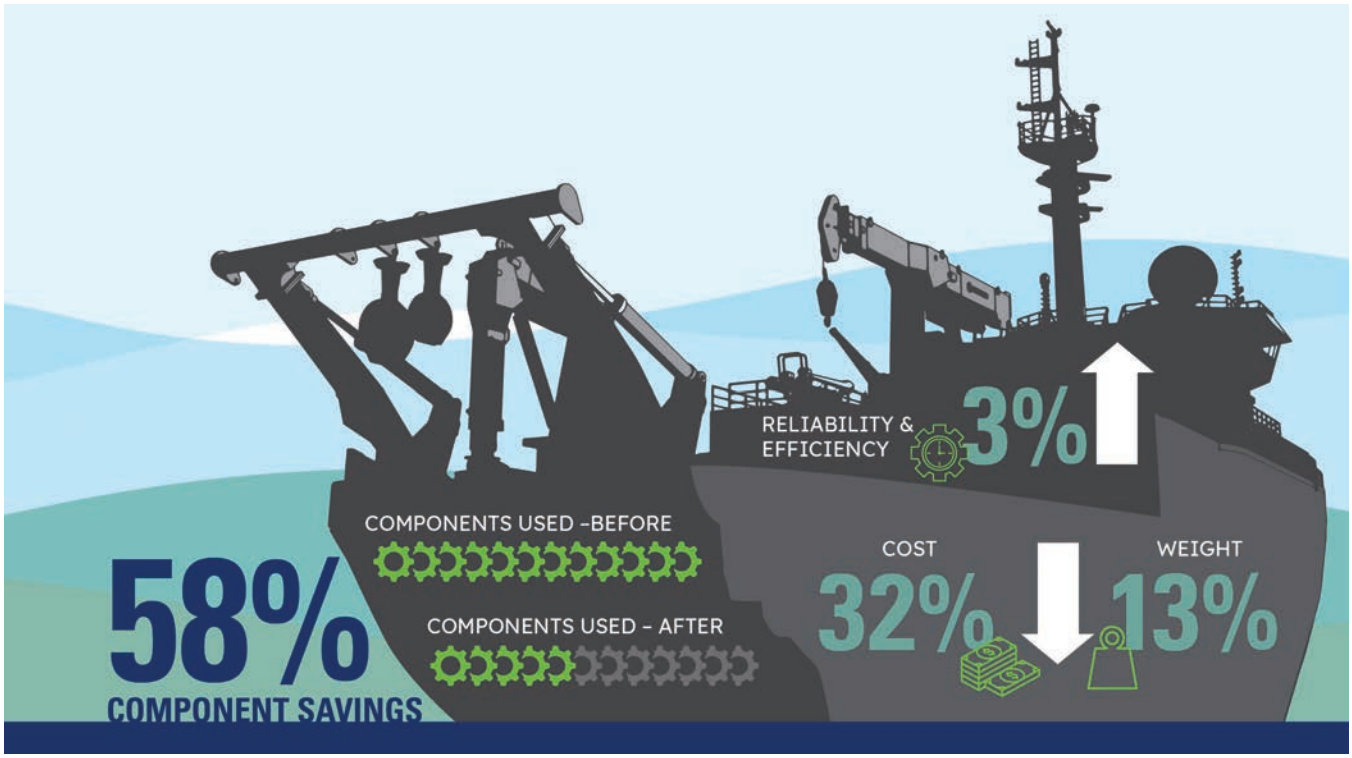
Winch Application (After)

Finally, the customer was able to eliminate one of the roller bearings and bearing mounts that support the drum winder shaft by rigidly mounting the gearbox and using the gearbox's overhung load capability to support the drum winder instead.

While the individual components in the proposed design have a higher upfront cost, having fewer of them results in an overall lower total cost solution. Additional benefits of the Powertrain Solutions winch assembly include:

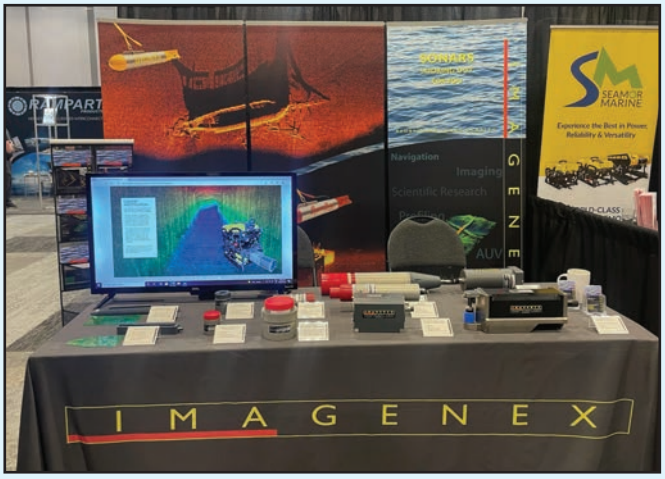
- Simplified assembly with fewer components resulting in a 50% reduction in time.
- Reduced processing costs, fewer logistics hassles, and one partner for the entire system by using a single supplier.
- Faster response time (acceleration & braking) and redundant braking (motor dynamic braking and servo motor brake) with the improved design.
- Improved safety (load dropping if the belt fails) and reduced guarding required (lower cost) due to the elimination of the belt system.

This collaboration exemplifies how innovative engineering can simplify complex systems, reduce costs, and enhance performance. By rethinking the original winch design, the company achieved significant reductions in complexity, weight, and maintenance, while improving reliability and efficiency. This streamlined approach not only met the rigorous demands of a marine environment but also delivered a robust and cost-effective solution that exceeded the customer's expectations.



Images this page courtesy Regal Rexnord

OCEANS 2024: *That's a Wrap!*



Imagenex

OLSPS Marine

Voltai

Axys

My Gear Tag

Teledyne Marine

The 2024 Oceans Conference in Halifax, Nova Scotia provided a unique glance into the newest innovations in the maritime sector. The industry continues to be proactive in sustainable and environmentally friendly technology, seeking to produce renewable energy, make maritime activities more efficient, and gather data to better assess, navigate, and predict the changing climate. Notable companies from the week to keep an eye on include:

- **Axys**, collecting wave and current data with the TRIAXYS buoy.
- **EcoMarine**, battling biofouling on vessels with the new EcoMarine OmniBot ROV.
- **Imagenex**, with the DT360xi, a 360 degree multi beam profiler designed for large pipe and tunnel surveys.
- **MacArtney**, with a new hybrid connector.
- **My Gear Tag**, collecting fishery data and recovering lost items underwater.
- **OLSPS Marine**, with apps to collect data on fisheries and other marine activity.
- **Pinpoint Earth**, tracking and monitoring fishing vessels globally.
- **Teledyne Marine**, with the Workhorse Proteus that col-

EcoMarine

EcoMarine combines two technologies into its ROV solution that provides the marketplace with a unique cleaning ROV option.

EcoMarine's ROV offers effective, touchless cleaning by means of a unique cavitating jet cleaning head that employs multiple cavitation nozzles.

The cavitating action provided by the cleaning head is able to quickly take care of biofouling and is capable of addressing macrofouling without becoming bogged down. Additionaly, the ROV does not use magnets to securely connect to a hull, but instead uses thrusters to securely press the ROV against the surface.

This avoids issues presented by powerful magnetics such as interfering with ship electronics, scratching of surfaces, or simply being limited to steel surfaces. EcoMarine's ROV therefore is able to effectively clean aluminum, fiberglass, and composite hulls, or indeed any in-water infrastructure that requires cleaning such as bridge piers or hydro-electric dams.

EcoMarine

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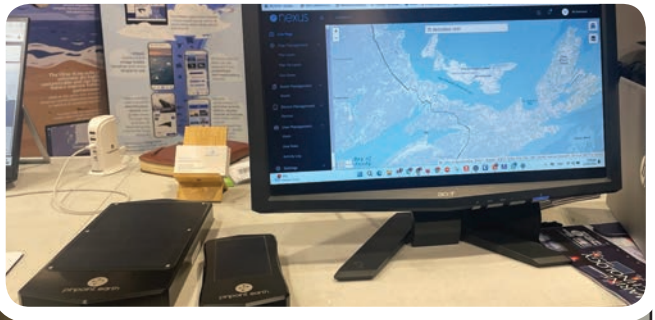
Voyis

lects current and wave data, measurements of flow, transport, and discharge, in oceans, estuaries, and rivers.

- **Voltai**, harvesting energy from motion, like waves, with 100x energy density compared to traditional turbines.
- **Voyis**, with underwater laser scanners and imaging payloads.

Companies were present from across the globe, but there was a notable presence of Canadian and specifically Atlantic-based companies, seeking to further connections and find new opportunities. As the maritime technology industry grows across the Atlantic provinces (New Brunswick, Prince Edward Island, Nova Scotia, and Newfoundland and Labrador), there are innovative and cutting-edge solutions in continuous development. Collaborations fostered by groups like COVE and local universities provide unique resources and testing capabilities.

With recent, new, and soon-to-be-unveiled maritime solutions, the Oceans Conference was an excellent space to foster collaboration, connections, and innovation. The Conference will reconvene in 2025 in both Chicago and Brest, France.



Pinpoint Earth

MacArtney

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Fugro completed the survey work for the 2024 MAREANO seabed mapping program, including an innovative environmental DNA (eDNA) service, as part of a hydrographic survey contract awarded by the Norwegian Hydrographic Service (NHS). Supported by the Central Government of Norway, MAREANO is a multidisciplinary initiative aimed at mapping the seabed to generate scientific information for the responsible management and preservation of Norway's marine resources. This year's survey covered an extensive 2,823 km² region in the North Sea, with water depths ranging from 146 to 337 meters. Using the Fugro Discovery, equipped with high-resolution multibeam echo sounders and sub-bottom data acquisition systems, the primary goal is to gather seamless datasets, integrating bathymetry, water column, and acoustic backscatter data.

Fugro employed cutting-edge sensors and advanced calibration techniques tailored to these challenging conditions. The survey was completed in September and work is now progressing on the final reports and data that will be available via VirGeo, Fugro's web-based Geo-data platform.

In a first for the program, Fugro included environmental DNA (eDNA) sampling as part of the survey datasets. eDNA enhances existing environmental sampling programs to gain deeper ecological insights, complementing other survey activities such as metocean, geophysical, and geotechnical surveys.

Furthermore, Fugro collected transit data for NHS to share with the European Marine Observation and Data Network (EMODnet). This data will contribute to The Nippon Foundation-GEBCO Seabed 2030 Project. Fugro has a track record of conducting successful surveys for the program since 2006. To date Fugro has acquired more than 140,000 km2 of data under the program.

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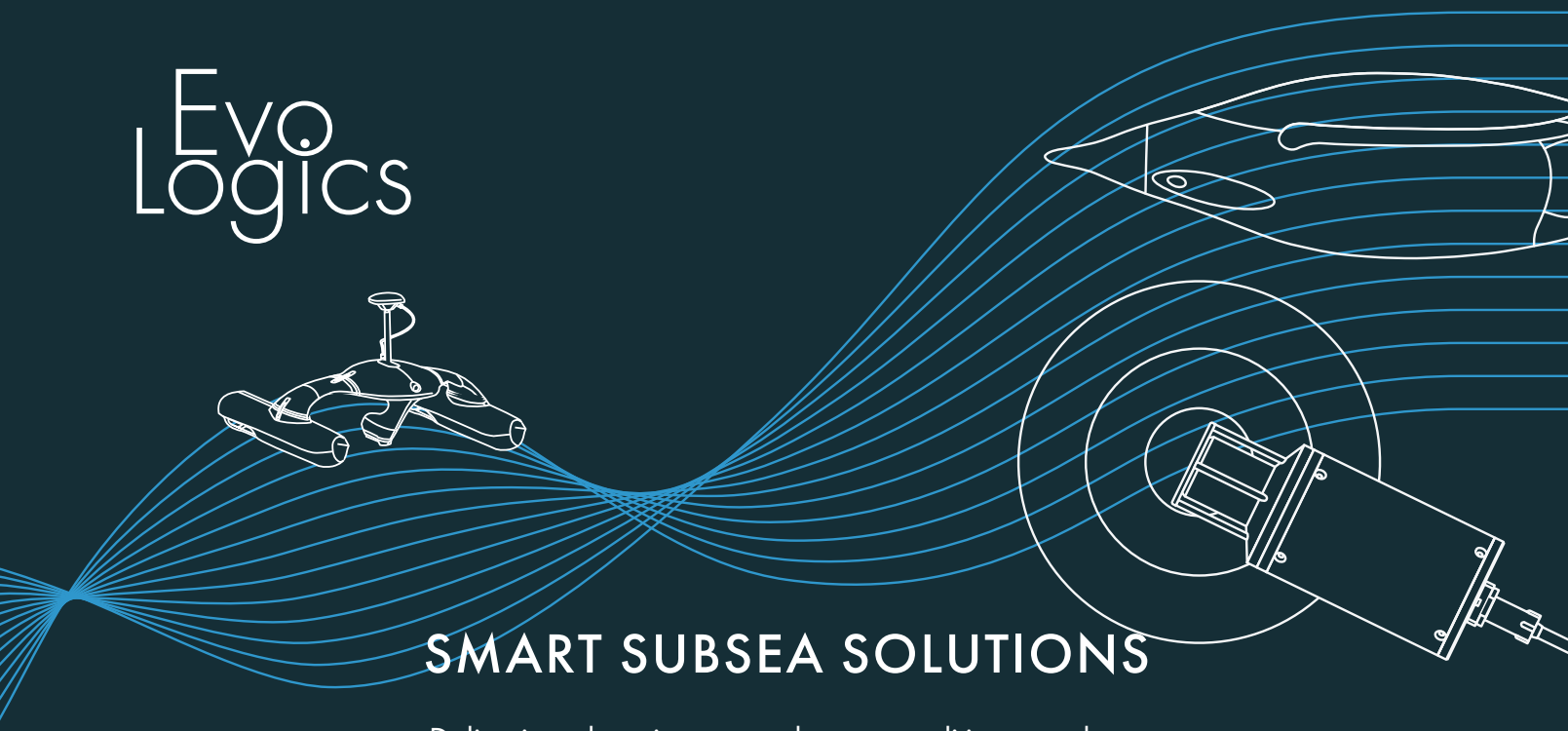

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