ROV PLANET

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The magazine of choice for Subsea Construction and ROV Professionals

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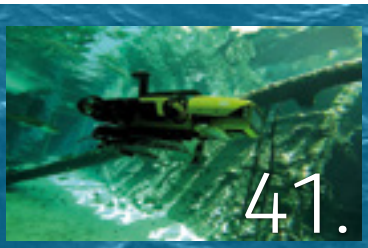

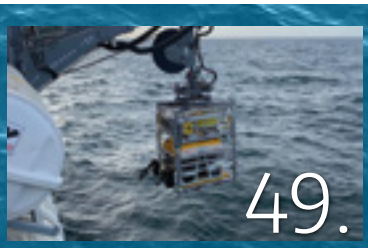

Front Page Cover Photo: Courtesy of Rovco | Poster Photo: Mike Smith Photography / Courtesy of SMD

WELCOME TO ROV PLANET

My name is Richie Enzmann, and allow me to welcome you all to the latest issue of ROV Planet!

Dear Reader,

In the past months several of the events focused on themes around electrification, underwater batteries, advanced underwater comms, unmanned operations, autonomy, and AI. These are not just buzzwords but an indicator of the coming step change that is just around the corner for the offshore oil & gas industry to adopt these new technologies. Hence, in this issue we have some articles focusing around these themes.

Both SWE and Ocean Power Technologies are providing the infrastructure solutions for subsea electrification and paving the way for the subsea residency of tethered and untethered underwater vehicles, many which are currently in the development phase. There is a major shift driven by energy companies to move away from hydraulic driven operations to cleaner and more environmentally friendly electrical propulsion.

There were several new electrical underwater vehicles introduced to the market recently, such as the Freedom Resident ROV/AUV from Oceaneering, the SMD Quantum / EV launched at Offshore Europe and the Bluefin-12 UUV launched at DSEI from General Dynamics aimed for operations in littoral waters.

The digitisation of underwater operations will take efficiency and reliability to the next level and will also allow for continuous monitoring and preventive maintenance of subsea assets. It is exciting times ahead with many innovations being implemented.

Best regards,
Richie Enzmann

Please check out our website on:

www.ROVPlanet.com

UPCOMING EVENTS

7-9 October 2019 – Offshore Energy – Amsterdam, The Netherlands
Leading event that addresses the technical, operational and commercial challenges associated with future offshore sector growth.

27-31 October 2019 – OCEANS 2019 – Seattle, WA, USA
The event for global maritime professionals to learn, innovate, and lead in the protection and utilization of the world's largest natural resource – our Oceans.

11-14 November 2019 – ADIPEC – Abu Dhabi, UAE
Major oil & gas event in the Middle East with ADIPEC bringing together professionals with real buying power, in 2018 US$17.99 billion of business was concluded onsite at the event.

20-22 November 2019 – Sustainable Ocean Summit (SOS) – Paris, France
With the theme of "Investing in Ocean Futures: Finance and Innovation for the Blue Economy", the SOS 2019 will be the foremost international business conference dedicated to investment and innovation for ocean sustainable development.

4-6 February 2020 – Underwater Intervention (UI) – New Orleans, LA, USA
Underwater Intervention is a not-for-profit industry conference and exhibition, jointly owned by the Association of Diving Contractors International and the ROV Committee of the Marine Technology Society.

11-13 February 2020 – Subsea Expo – Aberdeen, Scotland, UK
The World's Leading Subsea Exhibition and Conference that also includes the industry's prestigious awards ceremony, the Subsea UK Awards.

17-19 March 2020 – Oceanology International – London, England, UK
Oceanology International has firmly established itself as the world leading ocean technology marine science exhibition and conference.

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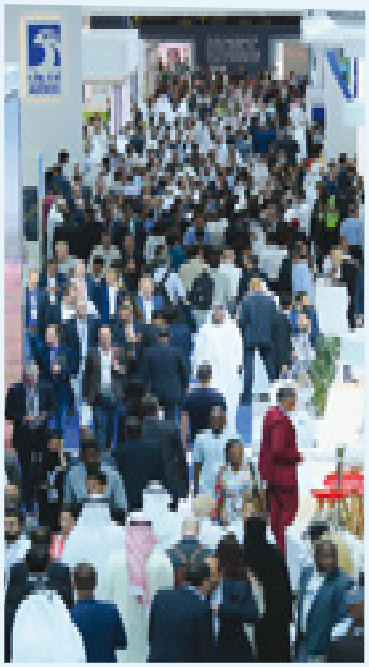

VALUE OF EXHIBITING

Focusing on marine services and logistics, the offshore and marine hall at ADIPEC covers the entire value chain of one of the most important segments of the oil and gas industry.

Innovative technologies and services are showcased across the exhibition floor in the dedicated hall 15 marquee, which will also see live demonstrations by certified divers from leading organisations.

The adjacent water channel and quay-side enables actual offshore support vessels and platforms, including jack-up barges, to anchor alongside the exhibition and conference, with guided tours available to all participants.

Top-level discussions and debates allow key decision makers from the world's leading NOCs and IOCs, EPC's, Service Providers to share knowledge with all across the ecosystem, including suppliers, market analysts and economists in order to get a thorough understanding of the future of the offshore and marine and determine ways to ensure its sustainability and increased productivity.

Building on its successful launch last year, **the Offshore & Marine VIP Club** will enable C level executives to network with their peers and undertake business discussions in a completely confidential environment.

Because of its commitment to best practice and overall industry excellence, **ADIPEC Offshore & Marine receives the support and backing of the major global oil and gas associations,** governmental energy bodies, IOCs and NOCs.

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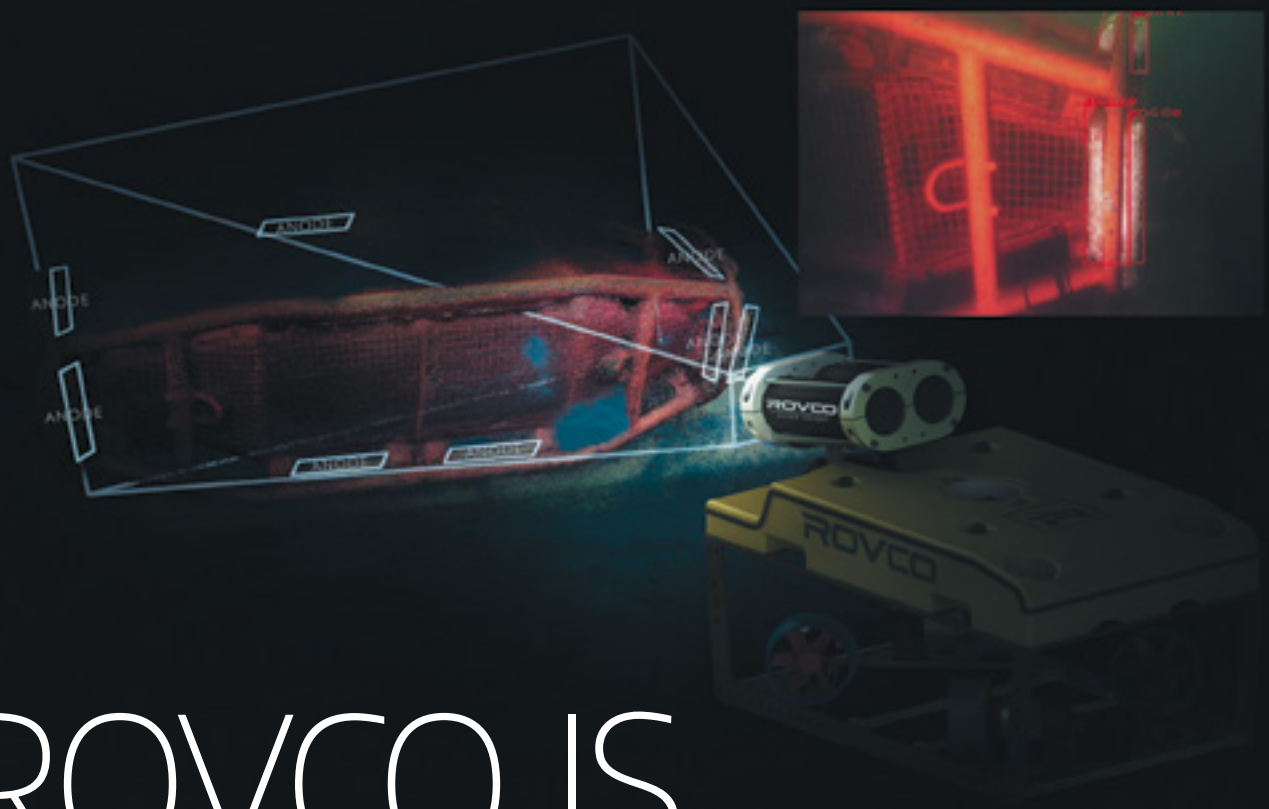
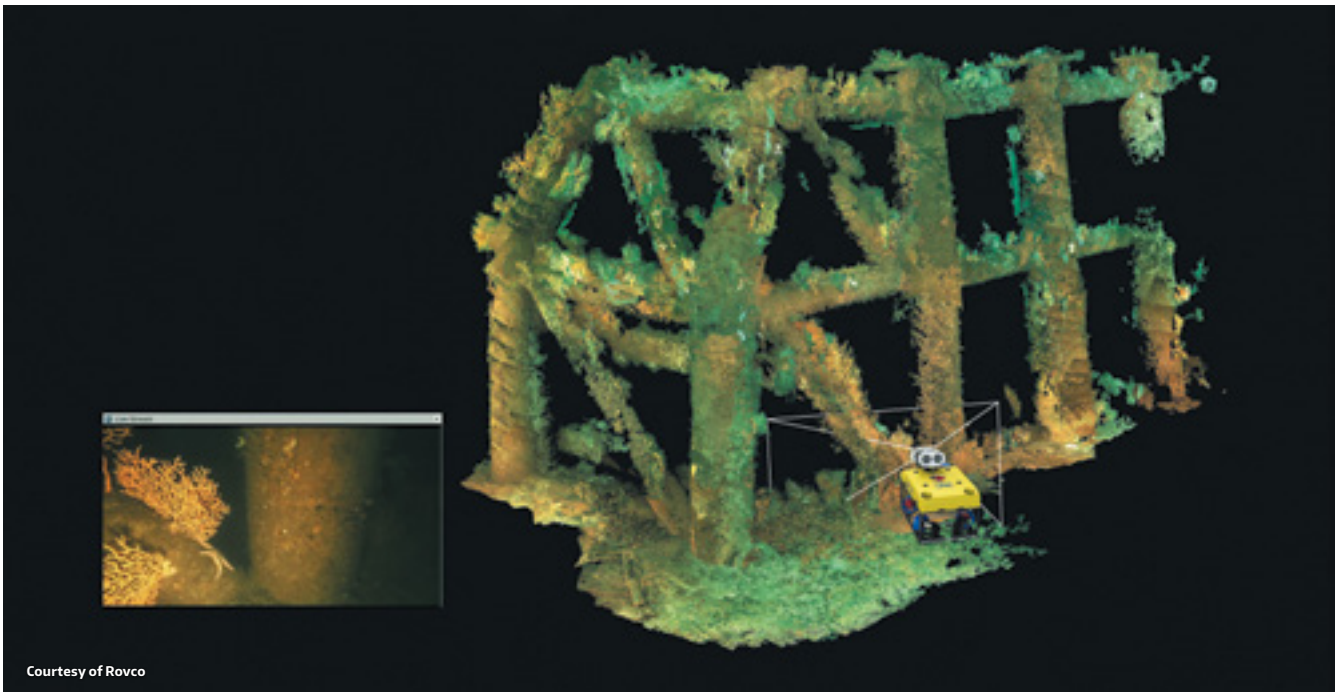


ROVCO IS LEADING

IN SUBSEA AI AND COMPUTER VISION

Technology is moving faster than ever before. With advances in artificial intelligence (AI), the use of technology by governments, world leaders, and autonomous vehicles, the simpler days where people were employed to physically complete every task are being left behind.

In the subsea sector, the creation of self-governing technology is a move in the right direction. Up until very recently as an industry we have relied on divers and piloted ROVs to inspect and survey subsea infrastructure. Whilst confronting the inherent risks associated with working in challenging subsea and offshore environments, AI and advanced robotics offers improved data acquisition, speed and accuracy while the operators of the technology can be moved from their control rooms and cabins on offshore vessels to the comfort and safety of desks in Aberdeen, Houston or Stavanger. Innovations like these in underwater technology are for those forward-thinking individuals and organisations who wish to challenge the status quo and are prepared to work with new technologies to find efficiencies and improve their cost base – companies like Rovco and its customers.


Courtesy of Rovco

ROVCO LEADING THE WAY IN AI

Rovco is an innovative subsea technology company headquartered in Bristol, with offices in Aberdeen and partnerships in Egypt, Taiwan and Malaysia. The organisation invests heavily in research and development, with half of its staff in R&D functions creating technology to support its clients. Rovco is changing the face of the subsea industry.

The Bristol-based firm is leading in areas of the subsea technology market, becoming the number one organisation for ROV 3D computer vision technologies and applied AI underwater.

Rovco has enjoyed a period of significant and sustained growth from its inception in 2016, having generated more than £10.5million of booked revenue this past 12 months, compared to just £450k the previous year. CEO Brian Allen and his team of specialists have developed a global footprint real-time completing projects in the UK, South America, Taiwan, Oman, Egypt and Asia. The firm's unique and innovative technologies have been used in multiple sectors, spanning renewables, oil and gas, civil engineering, and soon some approaching defence contracts.

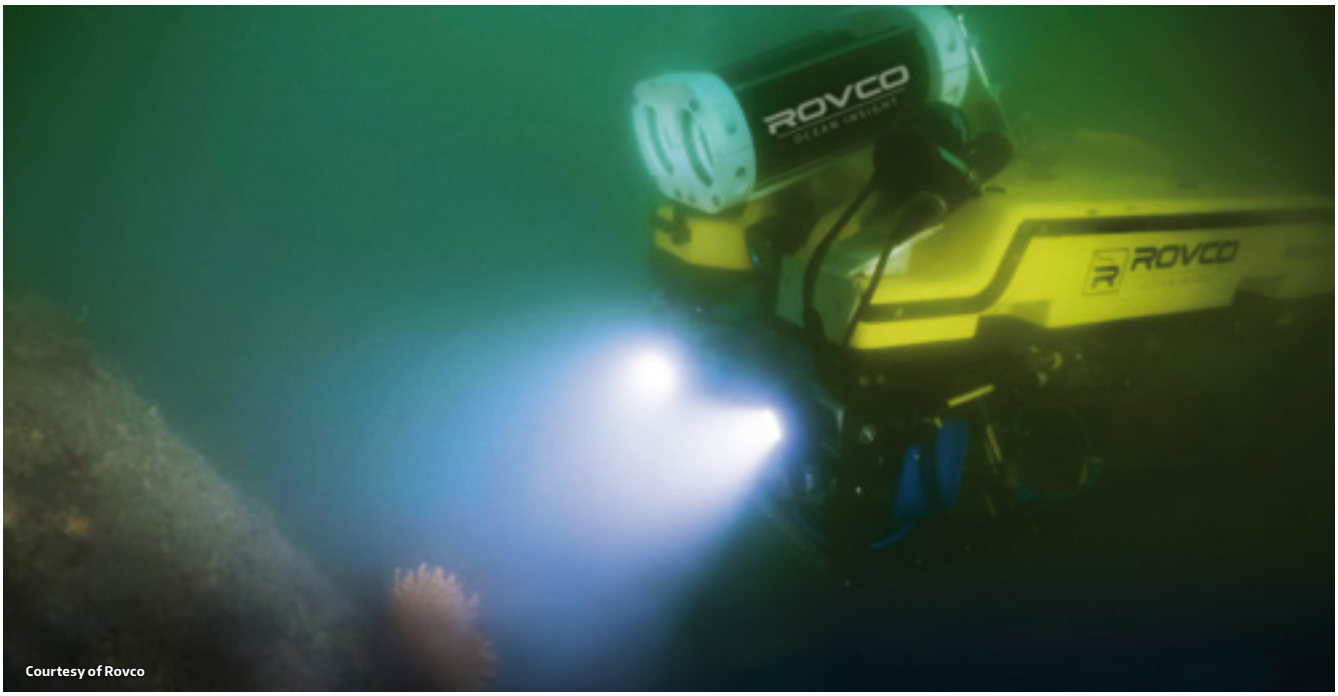
Brian said: "The team are working on a mixture of applied artificial intelligence, autonomous vehicle path planning and live 3D underwater computer vision – many of these technologies have never been used in our sector before.

"Risk-averse organisations sometimes prefer not to rock the boat, and it's often easier to use tried and tested methods to complete tasks even if they take longer or produce lower quality results. We're beginning to disrupt the industry, or at least waking some up to the possibilities of what can be achieved with newer technology. Whilst we work on building systems that make autonomous underwater vehicles truly intelligent rather than just automated, Rovco is moving the subsea industry forwards. Our tech improves infrastructure survey, we make those that use or systems faster than other companies and we mitigate asset risk with exceptional data."


Courtesy of Rovco

SUBSLAM X1 TAKES THE INDUSTRY BY STORM

More recently the company's SubSLAM technology took the industry by storm. The SubSLAM X1 camera, contains a pair of large sensor, 4K cameras and extraordinary processing power, using these to generate dense, live 3D point clouds. This 3D point cloud can then be transmitted live over VSAT or low bandwidth networks to bring accurate, scaled, underwater data back to people's desks in real-time. SubSLAM is used for live subsea metrology, photogrammetry and is capable of producing accurate, relative ROV positioning information without the need for any other sensor (USBL, LBL, INS, or DVLs etc) or even an online survey team.



Courtesy of Rovco

Brian added: "It was designed to enhance the information obtained from visual subsea surveys and considerably reduce associated costs. It's faster to mobilise onto a project as we don't need to do a vessel dimensional control survey, set up an LBL array or spend half a shift doing vessel spins while the positioning system is calibrated. Even the 3D model is just built while we do a normal speed general visual inspection, and we're getting faster still."

This unique, high-resolution stereo camera pair provides its clients with sub-millimetre accuracy, live true colour scaled imagery and 3D models, without the need for any additional sensors or scale bars. It creates a dense 3D point cloud in a fraction of the time of conventional laser scanners and, is capable of instantly conducting point-to-point measurements for subsea metrology.

The live data is immediately accessible for review without the delay of post-processing and contextualisation. Sub-SLAM is a far more efficient means of measuring subsea infrastructure. Repeatable workflows, minimal human intervention, reduced vessel time and the technology delivers far more accurate, dependable results. With Rovco's technology clients receive high-quality, cost-effective inspections and cutting-edge innovation which supports offshore projects.

Through the use of AI, repeatable and consistent results can be transmitted in a fraction of the time. For example, 1000s of hours of subsea pipeline data can be classified in a few hours. Rovco's machine learning models can currently detect pipelines, free spans, soft debris, field joints, mattresses, various anodes, and the list is growing longer every week. Rovco is able to provide its clients with a more robust and focused approach to the assessment of video data.

ROVCO DATA DELIVERY PLATFORM

When studying the data collected, Rovco's clients use the company's Data Control Centre, a proprietary software system which allows for all the various data collected to be combined and presented through a simple internet browser without the need for any other software except google chrome or firefox. Within the Rovco platform, clients can view survey data libraries, reports, videos and extremely dense 3D point clouds. Using the system, teams are able to access their data, allowing data-driven decisions to be made based on accurate information, while machine learning algorithms assist them in their decisions.

Metrics such as point-to-point distances, surface areas and volumes can be taken by anyone, providing a streamlined workflow for future asset management.

With Rovco's continual investment in research and development, its dedication to delivering the latest most technologically advanced AI, and its ability to consider all the challenges that come with working in such challenging environments, Rovco is the subsea technology organisation of the moment.

Courtesy of Rovco

VIEWPORT3 JOINS FORCES WITH RENOWNED EXPLORER TO CREATE 3D ARCHAEOLOGICAL MODELS OF NEWLY DISCOVERED US WWII SUBMARINE, USS GRUNION

USS Grunion – hybrid photogrammetric drawing (Courtesy of Viewport3)

Aberdeen-based subsea 3D scanning specialists, Viewport3, have been collaborating with an eminent international explorer, Tim Taylor to process pioneering underwater 3D scans on the bow and stern of a US submarine which was lost in 1942.

Viewport3 were contracted by Tim Taylor, CEO of New-York based Tiburon Subsea Services and founder of Ocean Outreach Inc, as part of his ongoing "Lost 52 Project", which he states, "honours the men, their memory and their mission". The project is responsible for discovery and mapping of 4 out of 8 of the US WWII submarines located to date.

The 'Lost 52 Project' thoroughly mapped and filmed the site of the USS Grunion at the end of last year. The team located the missing bow section a quarter of a mile away 300 feet above the main wreckage, off the island of Kiska, Alaska. The discovery completes the mission undertaken by the sons of the submarine's captain – Mannert L. Abele 12 years ago.

As an aid to the understanding the submarine's last moments, Viewport3 'fused' the 3D data with the high intensity side scan sonar provided by the customer, showing the relative locations of both parts and surprisingly, the slide made by the stern as it slid down the side of an underwater mountain.

USS Grunion (SS-216) was a Gato-class submarine commissioned on April 11, 1942. On her way through the Caribbean to her first posting in Pearl Harbour she rescued 16 survivors from USAT Jack, which had been torpedoed by a U-boat. Her first war patrol was, unfortunately, also her last. Sent to the Aleutian Islands in June 1942, she operated off Kiska, Alaska, where she sank two Japanese patrol boats. Ordered back to the naval operating base in Dutch Harbour, Alaska, on July 30th, the submarine was never heard from again. She was declared overdue from patrol and assumed lost with all hands, on October 5th, 1942.

Viewport3 have been working with Mr. Taylor to process and develop technical-grade 3D data-sets of the USS Grunion's bow for use in virtual and augmented reality outreach, educational programs and applications. Viewport3 specialise in providing underwater photogrammetry services – using ROV or diver mounted cameras to obtain highly accurate point-cloud data, which can then be measured, compared, assessed, exported and in this instance, to educate.

Viewport3 worked on the extensive project over a period of 4 months, processing 25 hours of HD video of varying quality, frame by frame. The total input for the project was a staggering 5.3 trillion pixels. Co-director of Viewport3, Chris Harvey, developed several new methods of using digital imagery in order to transfer the data into 3D geometry, and process it to create 3D outputs that can be studied and shared globally, without the need to be on-site.

Mr Harvey said: "Using our photogrammetry technology as a digital in-situ preservation technique offers numerous benefits – non-destructive inspection of the site, optimal resource management and an inexpensive capture technique compared to other 3D recording technologies. "We can capture precise, technical-grade results which produce visually correct outputs, whether we are working in archaeology or with operators and marine contractors in the oil and gas industry.

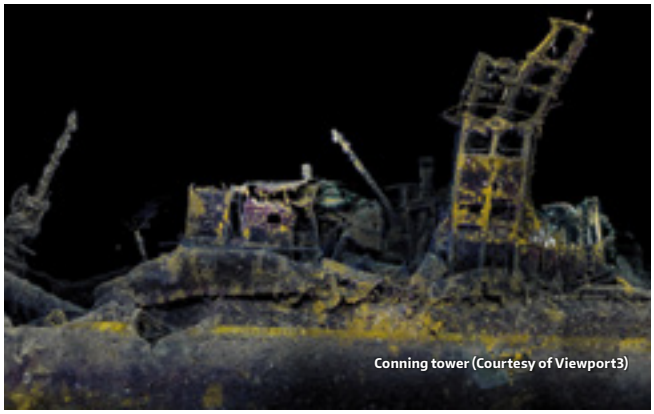
"The work that Mr. Taylor is conducting, coupled with our technology and expertise, is making a wealth of information available across different industries, and opening the door on discovery and expeditions at these unique locations."

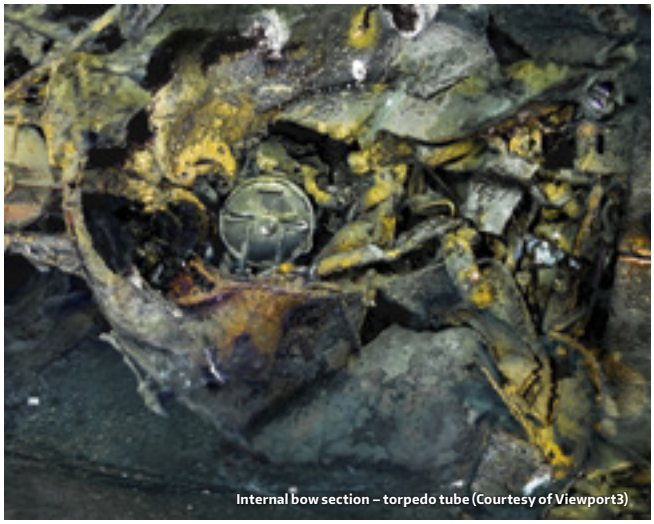
"While this has been an incredibly exciting project to work on, it has also been hugely humbling. The USS Grunion is the final resting place for 70 sailors, and I am proud that we have played a role in commemorating their sacrifice, and in bringing closure for their loved-ones. They, along with the US Navy Heritage Command, have been impressed with our work, which is really gratifying for us."

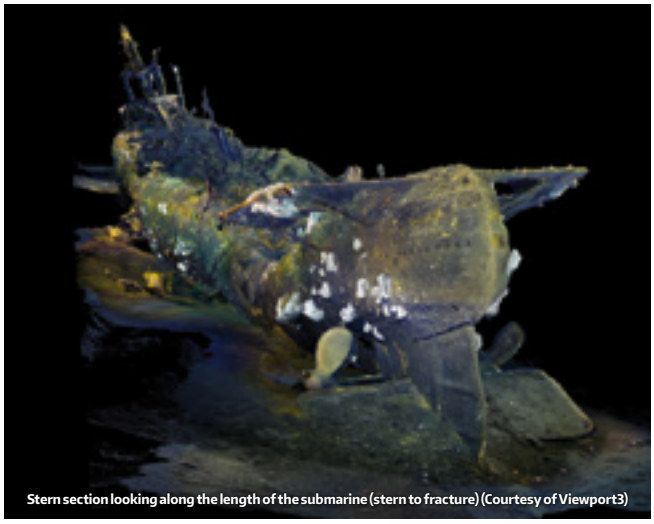
Tim Taylor said: "Viewport3's proprietary scientific approach extracts geometric information from equipment that is already integrated in most of the modern underwater remote filming systems. It is revolutionary. Spending a short time on site collecting a comprehensive 3D historical baseline model allows archaeologists and historians to spend months back in the lab performing detailed archaeological work. This truly is the future of underwater archaeology. We hope this latest data – with its unprecedented accuracy – will help us to explain what happened to the USS Grunion, as well as honour the entombed sailors."

Viewport3 specialise in providing underwater 3D scanning and reverse engineering services – using ROV or diver mounted cameras to obtain technical grade point-cloud data, to allow integration and analysis of subsea infrastructure, which in turn informs measured, accurate decision-making.

Bow section (Courtesy of Viewport3)


Conning tower (Courtesy of Viewport3)


Internal bow section – torpedo tube (Courtesy of Viewport3)


Stern section looking along the length of the submarine (stern to fracture) (Courtesy of Viewport3)

TELEDYNE MARINE OPENS VEHICLE SERVICE CENTER IN EUROPE

Teledyne Marine announces the opening of a Vehicles Service Center at the Teledyne Reson office in Slangerup, Denmark. The expanded facility in Slangerup will support the large number of LBVs, vLBVs, and Z-Boats throughout Europe. Customers of Teledyne SeaBotix and Teledyne Oceanscience will now have the option to have their Remotely Operated Vehicles (ROVs) and Unmanned Surface Vehicles (USVs) repaired, refurbished and tested within Europe. Local service will eliminate the need to ship vehicles back to the United States, saving significant time, effort, and money.

THE SERVICE CENTER WILL FEATURE:

Help Desk – Current ROV and USV users will have email access to a pool of support engineers and technicians to assist with any vehicle questions or issues

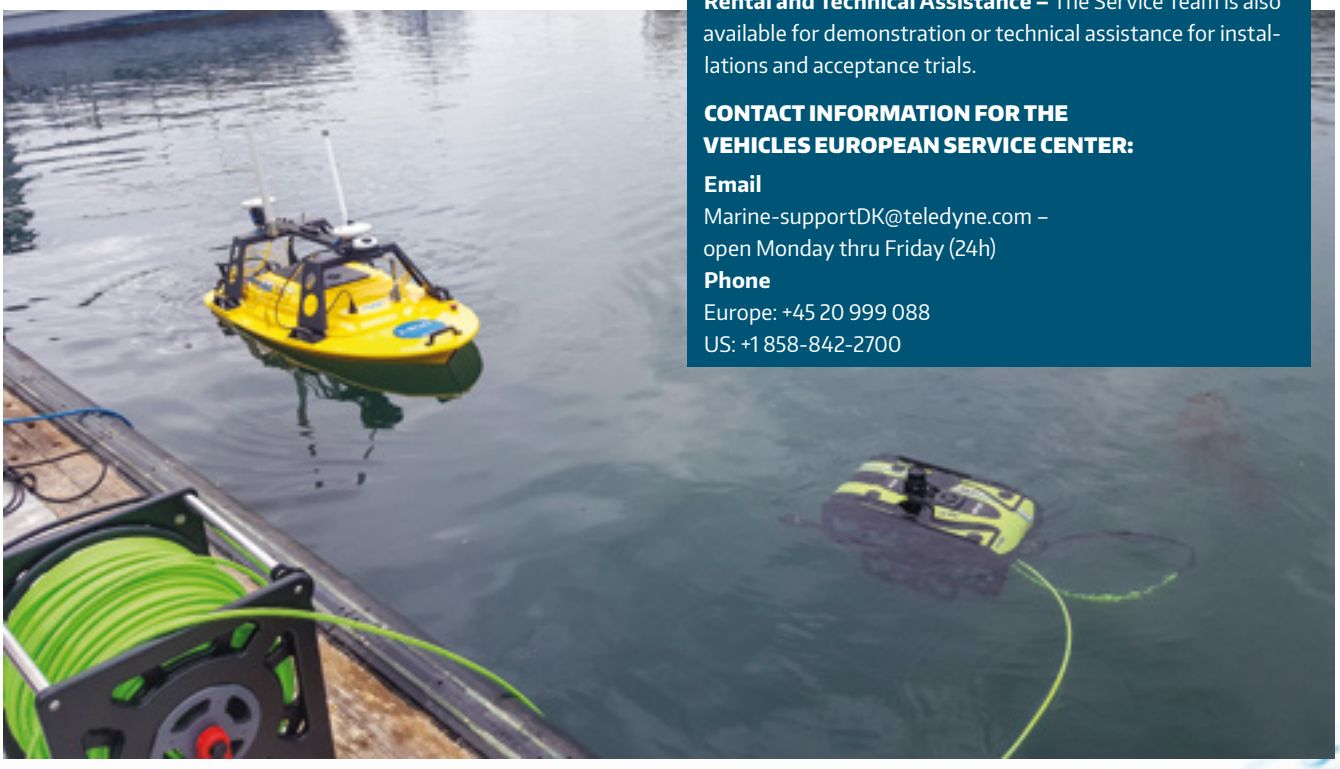
Repairs – Vehicles can be shipped to Teledyne Reson in Slangerup, Denmark for service. A formal RMA number will be required before shipment to the Service Center, which will allow for tracking of the repair.

Vehicle Upgrading, Testing and Ballasting – Upgrades and configuration changes can be performed within the Service Center.

Rental and Technical Assistance – The Service Team is also available for demonstration or technical assistance for installations and acceptance trials.

CONTACT INFORMATION FOR THE VEHICLES EUROPEAN SERVICE CENTER:

Email
Marine-supportDK@teledyne.com –
open Monday thru Friday (24h)
Phone
Europe: +45 20 999 088
US: +1 858-842-2700



NEW TECHNOLOGICAL BREAKTHROUGHS TO ENSURE DAM INTEGRITY

George Galdorisi, Director of Strategic Assessments and Technical Futures at the U.S. Navy's Command and Control Center of Excellence

BACKGROUND

Much ink has been spilled regarding crumbling infrastructure and its impact on the economies of many nations. The importance of investing in repairing and upgrading infrastructure has even become a staple of political campaigns. But much like the weather, everyone seems to agree on the need to deal with infrastructure concerns, but few seem inclined to do anything about it.

Much of the infrastructure in need of repair is obvious to most people. One case that garnered international attention several years ago was the Woodrow Wilson Bridge spanning the Potomac River and connecting Maryland and Virginia along the I-95/I-495 Washington Beltway. Commuters saw the Potomac not just over the railings of the bridge, but also through gaping holes in the roadway.

Crumbling bridges, bad roads, outdated railway systems, and brittle power grids represent some of the infrastructure that is subject to failure and sometimes leads to a local disaster when a bridge collapses, a highway buckles or a power grid fails dramatically. But there is one aspect of our infrastructure that is typically out of view and the attention of most, and that is local dams.

The MANTAS at the dam (Courtesy of Stephen Ferretti)

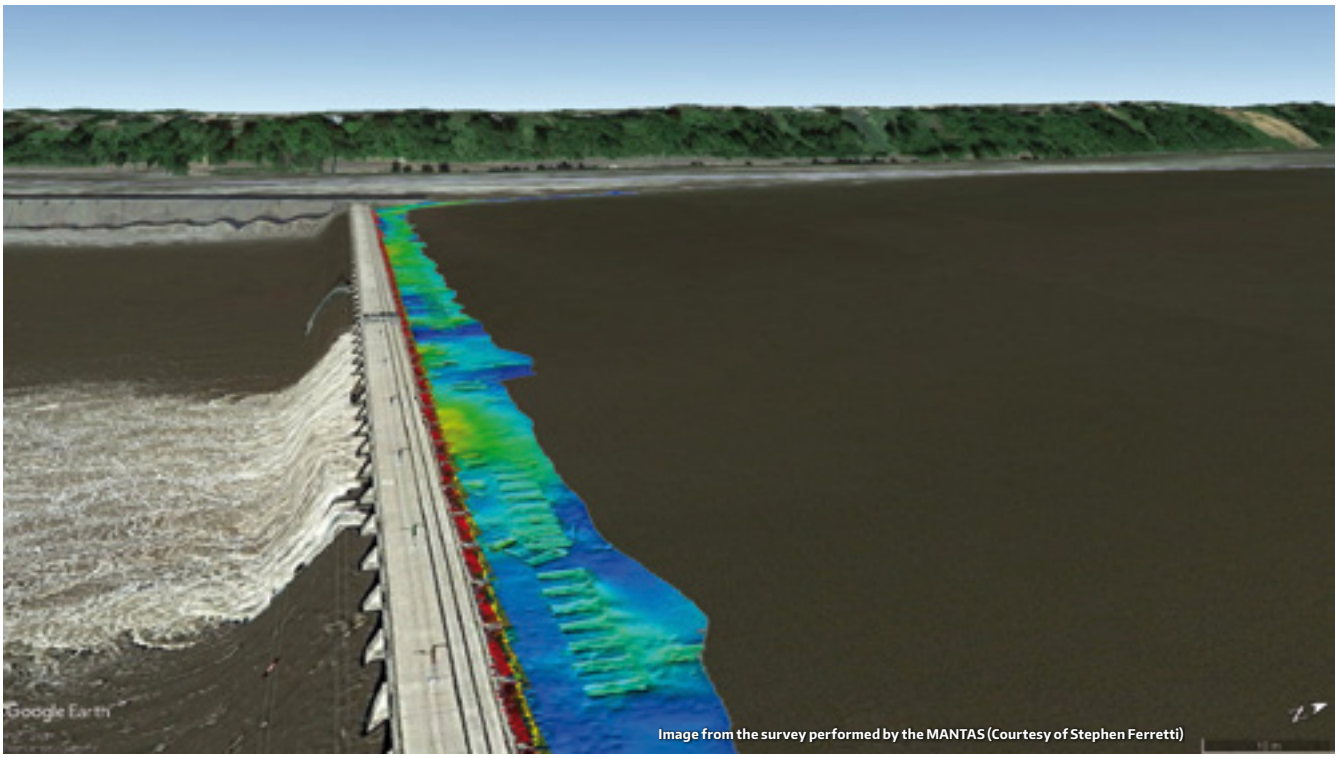


Image from the survey performed by the MANTAS (Courtesy of Stephen Ferretti)

DAMS: A VITAL BUT OVERLOOKED PART OF OUR INFRASTRUCTURE

Dams are critically important to our daily lives. Most citizens are only vaguely aware of what dams do for their local communities. Dams provide essential benefits such as hydro-power, flood control and irrigation. It is not an overstatement to say that without a dam, many communities, cities, or towns simply would not exist.

When the public considers dams, they think of engineering marvels like the Hoover Dam, rather than smaller structures that provide power for a small city, or ensure flood control for a valley, or deliver irrigation to farms. But while a road buckling or a bridge collapsing might injure people, a dam failing could suddenly flood entire communities, potentially causing scores or even hundreds of deaths and untold financial loss.

Sadly, dams represent some of the most stressed infrastructure in both developed and developing countries. In the United States, the nation's civil engineers provide an assessment of the nation's sixteen infrastructure categories using an A-to-F report format. Dams fared worst, garnering a grade of D.

DAMS ARE NOW IN THE PUBLIC EYE

The January 2019 failure of a Brazilian iron-ore mining company dam – the second dam failure in just over three years – flooded the town of Brumadinho. Two hundred and seventy people died in this event, and the disaster dominated international headlines for months. But much like the tip of an iceberg, the dam failure that decimated Brumadinho was not a "one-of" event, but merely part of the story of how ensuring dams don't fail is a wicked-hard problem.

In the wake of the Brumadinho disaster, safety issues have been discovered in many more dams, not just in Brazil, but in nations like Canada. Fifty years ago dams were built with the best engineering and construction standards of the time, not the more-stringent design criteria used today. But while the desire may be there to determine the condition of a dam, how to do this is more daunting.

What has also been revealed in the aftermath of the Brumadinho disaster is the fact that part of the reason that dams are not as safe as they might be is the fact that dam owners and operators find dams extremely difficult to inspect. A major challenge in determining the condition of a dam is the lack of ability to survey that portion of the dam that is underwater.

Current underwater dam inspection involves divers, but surveying with divers is expensive and potentially hazardous. Many dams have violent, high speed, high volume currents that even the strongest divers cannot cope with. Not putting humans at risk has likely been an impediment to doing thorough inspections on dams worldwide.

Until recently, the technology needed to do a proper survey of the underwater portion of dams without putting humans in danger did not exist. Today it does, through the use of emerging technologies such as unmanned vehicles equipped with echo-sounders and sonars. These systems can perform surface and subsurface dam inspections without using divers. One recent example from the United States may well offer a best-practices example for others to emulate.

The importance of harnessing this new technology is difficult to overstate. No matter how large or small, dams are

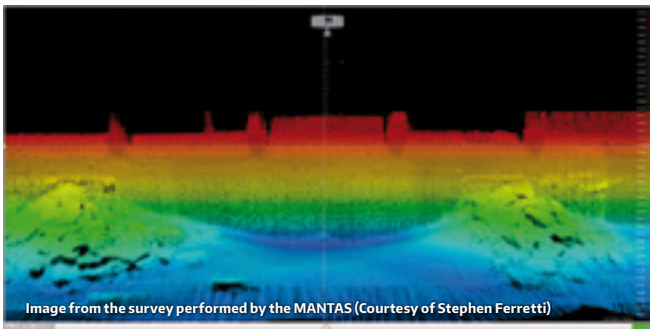


Image from the survey performed by the MANTAS (Courtesy of Stephen Ferretti)

typically overlooked until failure occurs. By 2025, seven out of ten dams in the United States will be over fifty years old. It is no surprise that civil engineers identified over fifteen thousand U.S. dams as high hazard, while over eleven thousand more were listed as significant hazard.

THE KEOKUK DAM INSPECTION IN THE UNITED STATES: HARNESSING NEW TECHNOLOGY

New technology has been used to survey dams in the United States by marrying an unmanned surface vehicle with a high-resolution multi-beam imaging echo-sounder sonar. Recently, this technology was used to conduct a surface and underwater survey of the Keokuk Dam and Energy Plant on the Mississippi River.

Inspecting and evaluating the Keokuk Dam presented a significant challenge since this dam was graded as a "nine out of ten" on the scale of danger and difficulty due to the strong currents and dangerous eddies caused by water flowing through the dam. This made using an appropriately equipped unmanned surface vehicle a viable solution to examine the dam and provide comprehensive underwater structural imaging.

The Keokuk Dam, owners and operators needed a thorough inspection of the dam but did not want to put divers at risk. Therefore, they contracted with a Florida unmanned surface vehicle manufacturer, Maritime Tactical Systems (MARTAC) Inc., to conduct a thorough survey of the underwater portions of this dam. MARTAC produces a family of MANTAS unmanned vessels built on a catamaran hull. The owner of the Keokuk Dam selected a twelve-foot MANTAS for this underwater bathymetric imaging. For this task, the MANTAS was equipped with a Teledyne Reson T20 Multibeam Echo-sounder/Sonar.

The objective of the Keokuk Dam hydrographic survey was to map underwater structures with an unmanned surface vehicle, followed by the USV performing the survey of the upstream and downstream sections of the dam. This comprehensive hydrographic survey evolved into a complete high-resolution bathymetric map and inspection report.

The final survey took less than two days to complete and was performed through the joint effort of a MANTAS remote operator seated next to a hydrographer. Operating as

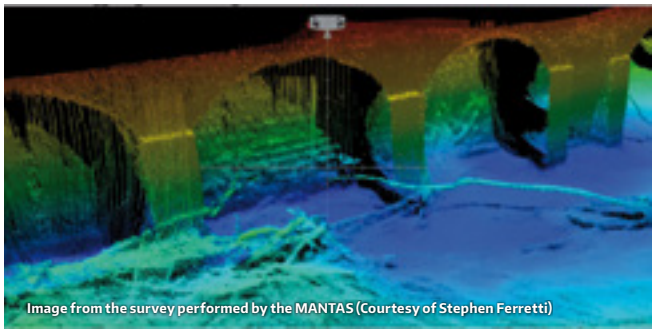


Image from the survey performed by the MANTAS (Courtesy of Stephen Ferretti)

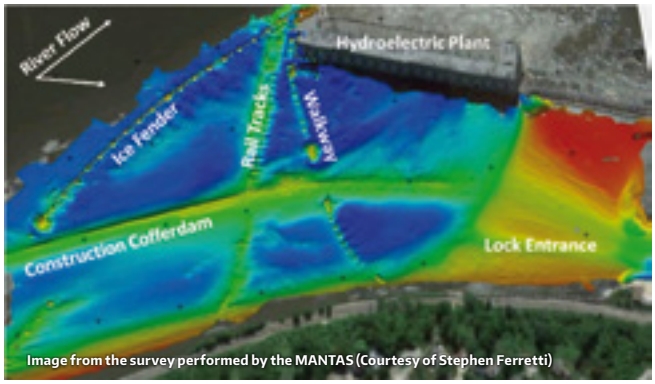


Image from the survey performed by the MANTAS (Courtesy of Stephen Ferretti)

a team, the USV track and the real-time display of the echo-sounder imaging was coupled to achieve the best dam and bottom images possible.

Based on the results of the Keokuk Dam hydrographic survey, additional proof of concepts were requested and demonstrated. As a result, other dam imaging has been performed and more are scheduled. With over twenty-six thousand dams in the United States deemed structurally unsound, the market for such surveys that don't put people at risk is virtually unlimited. These best-practices can readily be extrapolated for other dam inspections.

LOOKING AHEAD: GREAT OPPORTUNITIES FOR NEW TECHNOLOGY

The dam failure that flooded the Brazilian town of Brumadinho was not an unusual event. In 2018 alone there were major dam failures in Afghanistan, Kenya, Laos and Myanmar with a total of almost 100 fatalities among them. It is clear that the stakes of dam failure are high and that, due to recent failures, the public is keen to ensure that dams in their communities are safe and secure. Having the ability to use commercial off-the-shelf technology to conduct rapid, safe, and comprehensive bathymetric dam imaging is a life-saving solution that all nations should consider adopting before a disaster occurs.

Using low-cost, off-the-shelf unmanned vehicles such as MANTAS that have had thousands of hours of military and civilian use to replace human operators when inspecting this infrastructure will be a key factor in successfully undertaking needed infrastructure upgrades. All nations with aging dams would be well-served to study the results of the U.S. Keokuk Dam survey as a best-practices example of surveying this part of their infrastructure.

ELECTRIFYING SUBSEA OPERATIONS

Leon Adams, VP at Southwest Electronic Energy Corp

Onboard batteries are an enabling technology for underwater vehicles. They eliminate the need for a costly umbilical by putting electrical power where it is needed. The benefits extend beyond capex reduction into the world of performance improvement.

Power needs of underwater vehicles can range from short duration, high-power demand applications to long duration, low-power demand situations. The subsea industry is in the midst of an electric revolution and hydraulic power on underwater remote operated vehicles (ROVs) is on its way out in favor of electric power with support from onboard batteries.

Classic ROVs are powered by umbilicals, but long umbilicals are extremely heavy. If they become long enough and heavy enough, it can lead to a tail wagging the dog situation.

Preventing that scenario is straightforward: Electric thrusters and actuators with onboard battery power support. Work-class ROVs can rely on battery power to provide backup power in the case of an umbilical issue as well as deliver extra local peak power for electric manipulators, lights and high thrusts. Batteries can be charged topside or via umbilical at low power levels, enabling lighter weight, lower gauge copper power lines in the umbilical.

When it comes to hybrids, in which the ROV is driven by the pilot in ROV mode but autonomously navigates when in AUV mode, both modes use batteries for all power needs. Those needs may be for high-power bursts, such as using electric thrusters for urgent maneuvers, or to operate the manipulators, or to meet ongoing low-power requirements. Sensors, video cameras, LED lights, communications systems, guidance and control electronics are all examples of ongoing low-power needs.

Underwater vehicles require power for safe operations. The power unit should be high capacity and able to deliver higher power when bursts are needed. Other characteristic needs are for smaller and lighter battery units, longer life and high reliability.

An AUV needs a lighter weight battery that will allow it to perform longer survey runs and deeper dives. Beyond that of thrusters, the power needs of the robotics within the AUV are often longer duration, lower power, and variable based on equipment deployed. Such needs can be continuous demand of lower current or low to moderate voltage loads with peaks and dips on power demand. Such power needs include the control electronics and the communications systems between man and machine or machine- to-machine to issue commands, manually pilot robotics, or communicate feedback visually or via datacomm. Other demands include operating the small electric motors for

Courtesy of Southwest Electronic Energy Corp

Courtesy of Southwest Electronic Energy Corp

servo control and actuation of manipulators as well as running digital video and still cameras, plus lighting to enhance the imagery. Robotics require power for control processors and interface electronics, as well as sensors that carry out measurements and deliver feedback of node status information to the control processors.

Southwest Electronic Energy Corp's (SWE) SeaSafe batteries serve up the power that ROVs and AUVs require. SWE SeaSafe battery modules, typically 30 VDC or 24 VDC, can be configured in battery system matrices to deliver a wide variety of DC voltage and power size battery systems. Connecting modules in series provide DC voltage as required in 30 VDC or 24 VDC increments. For example, a 120 VDC battery would be achieved by connecting four of the 30 VDC SWE SeaSafe battery modules in series. Larger count module strings would achieve higher voltage. Parallel copies of the voltage strings provide higher capacity of amp hours or more watts of power. The parallel strings of same count modules are easily interconnected on output via SeaSafe Diode ORing Module for common output to the load.

These parallel strings also provide redundancy of power available at the DC voltage. Each Diode ORing battery string can provide stand-alone power at the DC voltage even if another string goes down. The max battery system capacity will be less than the total prior capacity from combined strings, but you still would have the same voltage to continue operations, even if at a reduced power level.

ROV UNDER ICE

Woods Hole Oceanographic Institution (WHOI) found that tethers used for ROV operations from an icebreaker working in permanent moving ice faced a number of issues. First, they were constrained by their tethers, and those tethers were vulnerable to ice damage. The vehicle with tether damage would switch to slow speed acoustic modem or beacon mode to "come home". Surface ships could not hold position, limiting the ability to work predictably in specific sea-floor locations with vehicles. Conventional Arctic ROV footprints of operations are small, about 500 meters, and the unit was under a ship that was moving with the ice.

The solution was enabled by recent advances in ROV tethering technologies that make real-time control over extended distances possible, which frees the vehicle from restrictions imposed by surface ice cover.

WHOI's battery requirement for the Nereid UI (nUI) included safe and reliable operation in water depths to 2000 meters, about 88 volts and 40 amps continuous, 100 recharge cycles, the ability to operate from -20 degrees Celsius to +50 degrees Celsius, 12 hours recharge time, at least 15 kWh in a space 36 inches by 24 inches by 12 inches, protection and balancing internally and diagnostic information logged externally.

WHOI selected the SWE SeaSafe lithium-ion battery, which comes with a patented Battery Management System (BMS) for safety and reliability, internal protection and balancing, and its ability to access battery status on demand and log the data externally. It operates in water depths to 6000 meters and temperatures of -40 degrees Celsius to +85 degrees Celsius. In the Nereid UI configuration, it delivers 87 V Nominal and 96 V Maximum along with 40 Amps continuous power. The SeaSafe can recharge more than 1000 times and takes less than 12 hours to recharge. The three SeaSafe battery pods in-

stalled in nUI deliver a total capacity of 18 kWh. Using onboard SWE SeaSafe batteries on the light-tethered nUI drove the ROV's footprint of operations up by 40x to about 20,000 meters.

PACKAGED POWER

SWE SeaSafe, a pressure-tolerant lithium-ion polymer battery is ideal for subsea use, compared to traditional lead acid batteries. For starters, SWE SeaSafe lithium-ion battery delivers four times more energy density for its size and weight compared to standard lead acid batteries while providing discharge/charge cycle lives that are up to eight times more than their lead acid counterparts. The SeaSafe also performs 1.5 times better at the low temperatures of subsea than standard lead acid batteries. Standard lead acid batteries also outgas during charge, which can be hazardous due to ignitable hydrogen gas. This typically prevents subsea charging of lead acid batteries. SWE SeaSafe, by contrast, does not outgas during charge. In general, standard lead acid batteries are less durable than SWE SeaSafe potted lithium-ion polymer batteries. Finally, traditional lead acid batteries don't come with smart battery management systems or health and status reporting capabilities while SeaSafe comes with SWE's patented and user-friendly Battery Management System (BMS) to manage the battery safety and monitor the health of the battery.

In addition, the pressure tolerant feature of SWE SeaSafe eliminates the often heavy, expensive and implosion risky pressure vessel requirement for batteries. Examples include 18650 based lithium-ion, alkaline or primary lithium-based batteries when used in subsea applications.

The level of intelligence in these batteries is new to the subsea world. Because of the growing importance of condition-based monitoring, SWE developed the BMS to enable these smart batteries to provide data on demand, allowing condition-based monitoring of the batteries, which is crucial to maintaining reliable operations.

The integrated BMS automatically manages and tracks the safety, reliability, charge and discharge of the batteries and reports technical information on demand. These safe and smart batteries can take care of themselves, and the reporting communications capability makes the batteries more reliable than other battery systems because more information is available on demand.

SWE developed the SeaSafe pressure-tolerant lithium-ion polymer subsea battery pack in conjunction with WHOI, and the first SWE SeaSafe battery pack went to market in 2013. The original SeaSafe battery represented an efficient move away from the heavy sealed lead acid batteries toward using lighter, more powerful lithium-ion batteries, which take up less space. These batteries were easier to install than lead acid batteries, and while they don't require a pressure vessel, they did require a pressure balanced oil-filled container, since contacts are not sea-ready.

SWE SeaSafe represented a major breakthrough in subsea power operations because it was one-quarter the weight of the traditional sealed lead acid batteries, did not require a pressure vessel, and offered a longer service lifetime.

The second generation SWE SeaSafe II, released in 2017, incorporated lessons learned, reliability improvements and American Bureau of Shipping (ABS) Certification. Driven by customer request, the SWE SeaSafe Direct, which can be placed directly into the water without requiring a pressure vessel, was developed and has also been available since 2017. This ease of use convenience – direct-in-the-water use – eliminates the need for pressure balanced oil-filled case is growing trend in the industry.

Both SWE SeaSafe II and SWE SeaSafe Direct are ABS certified in various voltage size configurations. These batteries make it possible for underwater vehicle operators to squeeze more power and lifetime out of their battery packs to further their mission in unearthing the mystery of the deep sea.

POWERFUL SOLUTION FROM OCEAN POWER TECHNOLOGIES

Ocean Power Technologies has developed leading-edge sustainable, independent power and communications systems to enable truly autonomous underwater vehicle residency while reducing OPEX and risk.

Autonomous underwater vehicle (AUV) residency is fast becoming a reality and promises of ever-lengthening periods of operation. But without continual power and communications even self-contained AUVs paired with resident seabed charging stations will require reliance on manned surface vessels for data offload and eventual charging.

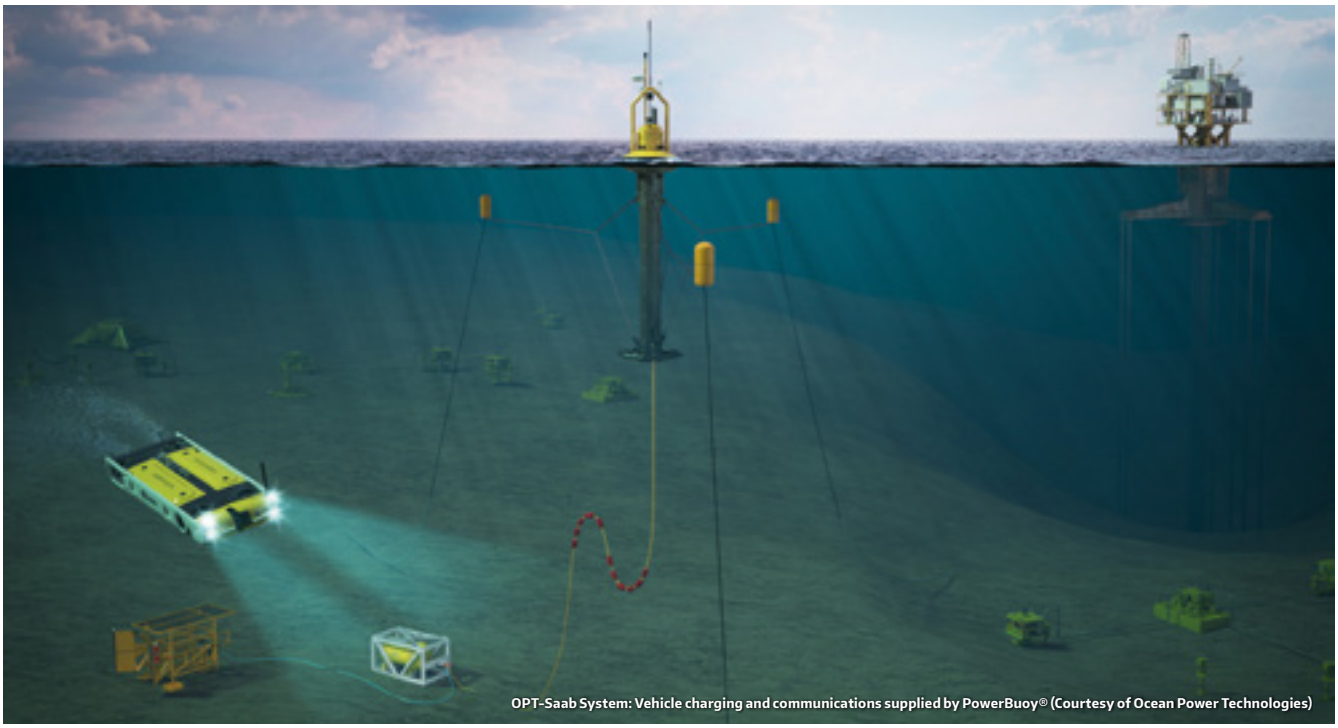
Ocean Power Technologies' (OPT) patented PB3 PowerBuoy® harvests wave energy to create electricity to power AUV applications while also providing a real-time data communications link with onshore operations. By substantially lowering reliance on vessels and providing a reliable lifeline to AUV residence, the PB3 PowerBuoy® can ultimately reduce operating expenditures (OPEX) and extend the value of investments in unmanned marine systems.

MAKING POWER FROM WAVES

The OPT PB3 PowerBuoy® is a moored floating mini-spar buoy that generates power from ocean waves. Power is generated through the relative motion of the spar and float components and energy is stored in on-board batteries which can then be used to support topsides or subsea payloads. Power and data can be transmitted to and from the seabed through an umbilical.

A three-leg compliant mooring system controls the response of the buoy and allows it to remain on-station during storm events.

OPT's PB3 PowerBuoy® (Courtesy of Ocean Power Technologies)



OPT-Saab System: Vehicle charging and communications supplied by PowerBuoy® (Courtesy of Ocean Power Technologies)

BUILT FOR HARSH ENVIRONMENTS

With their ability to operate below surface environmental conditions, resident subsea vehicles promise to extend operating windows that are traditionally limited by seasonal conditions. OPTs PB3 PowerBuoy® can further extend this capability from months to years by providing continual power and communications access in the world's least forgiving ocean environments, lessening risk to vessel crews and equipment.

By reducing the need for physical visits to routinely retrieve and deploy equipment for battery recharging/replacing or data transfer, vessel personnel are not exposed to severe weather or open water operational risks, making deployments both safer and more cost effective. The buoy system also allows the underwater vehicles to continue to operate during extreme storm conditions, which extends the weather operating window since the vehicle can dock below the wave zone.

The PB3 PowerBuoy® makes most of its power in short waves (4.5 < Tp < 7.5 seconds) instead of longer ground swell, which greatly extends its operational range. During extreme storm events (hurricanes, typhoons, etc.) the control system locks the float to prevent damage to components, in a similar manner to turbines in a wind farm.

Hull and mooring system components are design certified to withstand the 100-year return period storm. The topsides payload equipment is also designed for the wave slam and submergence events associated with 100-year waves. All components are designed according to the latest international engineering standards.

Originally developed for the U.S. Navy to extend its radar range, the field-proven technology of the PB3 PowerBuoy® was deployed in 2017 for a seven-month research project off the coast of Japan. It is currently being used commercially in oil and gas applications in the Adriatic Sea and in the North Sea.

CONSTANT CONTACT

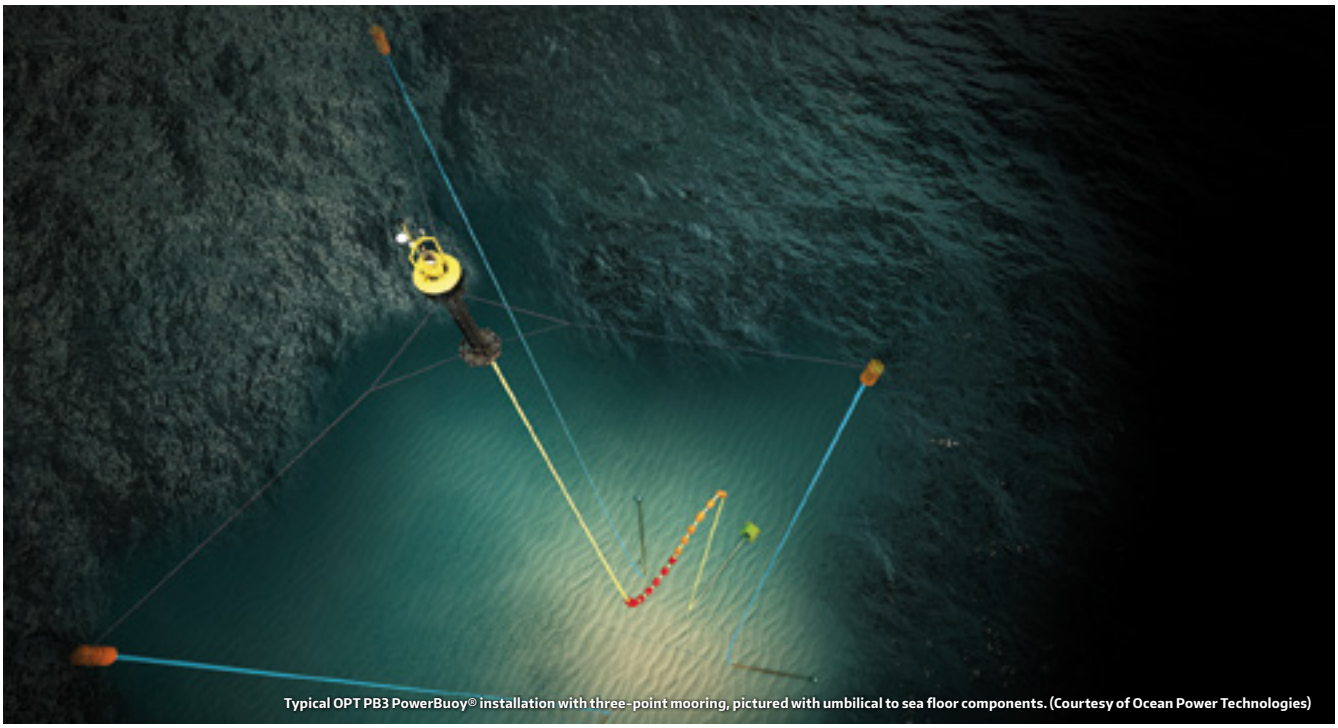
Onshore personnel can communicate with the underwater vehicle via the onboard systems of the PB3 PowerBuoy®, making subsea vehicles available for 24-7 monitoring and real-time data processing, including transfer of updated mission profiles. The combined availability of deep-sea power and communications is vital to a future of semi- and fully autonomous, artificial intelligence controlled AUV operations.

The PB3 PowerBuoy® is payload agnostic, both subsea and on the topsides. It can provide a stable platform and power for a range of communications systems including wi-fi, 4G/5G, and satellite-based communications.

All communications between the shore-based operations and the deployed assets occur over secure, encrypted data connections. The PB3 PowerBuoy® can provide data access and AUV control directly to customer operations independent of the buoy native communications.

REMOTE OPERATIONS AND MONITORING

The buoy can be remotely monitored, diagnosed, operated, and tuned, either via personnel on vessels in the area, or via personnel ashore. Remote monitoring functions include monitoring of buoy performance, operation, and health. Through the multitude of onboard sensors, OPT personnel have a real time view into buoy operation. From our shore-based operations center, OPT can ballast and de-ballast the unit, optimizing buoy draft, control the operation of the float during extreme weather events, push application updates, and control various payload elements.



Typical OPT PB3 PowerBuoy® installation with three-point mooring, pictured with umbilical to sea floor components. (Courtesy of Ocean Power Technologies)

In addition, the tasks of the underwater vehicles can be monitored and altered via the buoy. Based on performance data downloaded from the vehicle via the buoy, vehicle operators can change the mission program, and diagnose vehicle performance. These functions can be performed by OPT clients directly or by engineers at OPT's United States-based facility.

CLOSED SYSTEM IN DEVELOPMENT

OPT has an agreement with Saab Seaeye to co-develop an autonomous offshore charging and communication solution, which will substantially lower the reliance on vessels and ultimately reduce operating expenditures. This stand-alone closed system mates a docking station and subsea vehicle with the PB3 PowerBuoy® to charge batteries on the buoy and on the docking station while providing a real-time data communications link with an onshore operations center.

By allowing an AUV to stay subsea longer, this leading-edge independent power and communications system allows operators to be less reliant on manned vessels thus substantially reducing risk and ultimately substantially lowering operating cost.

OPT's PB3 PowerBuoy® and mooring system. (Courtesy of Ocean Power Technologies)

ENDLESS APPLICATIONS

Because the PB3 PowerBuoy® exists as its own source of power and communication, it can provide the vital infrastructure ROVs and AUVs need to operate. This powerful autonomy can be applied to various fields, including

- OIL & GAS – Inspection, maintenance, repair (IMR) – pipeline monitoring, leak detecting, field mapping, minor maintenance of subsea equipment, drill support;
- DEFENSE – Surveillance and monitoring
- COMMUNICATIONS – Offshore communications networks
- SCIENCE & RESEARCH – Monitoring, data collection, migration patterns, early tsunami warning systems

Beyond ROV and AUV-specific applications, additional Oil & Gas applications of the PB3 PowerBuoy® including monitoring subsea wells post drilling, powering subsea equipment, and various aspects of decommissioning (guard vessels, and well monitoring).

READY TO RIDE THE WAVE

The PB3 PowerBuoy® integrates patented technologies in hydrodynamics, electronics, energy conversion, and computer control systems to extract the natural energy in ocean waves. The result is a leading edge, factory and ocean-proven, proprietary autonomous system that turns wave power into reliable, environmentally clean electricity for a range of offshore applications. Find out more at www.oceanpowertechnologies.com.

Courtesy of General Dynamics

GENERAL DYNAMICS MISSION SYSTEMS LAUNCHES NEWEST UNMANNED UNDERWATER VEHICLE AT DSEI 2019

Introducing the Bluefin™-12, the newest member of the Bluefin Robotics® family of autonomous unmanned underwater vehicle (UUV) products.

General Dynamics Mission Systems today released the new Bluefin-12 autonomous unmanned underwater vehicle at Defense and Security Equipment International (DSEI) 2019 in London. This new vehicle uses shared Bluefin Robotics' core capabilities, increased mission modularity and embedded intelligence to complete users' long endurance, high-consequence and changing missions.

The base Bluefin-12's extended modularity supports the integration of user designated sensors and payloads to deliver new mission-critical capabilities. The Bluefin Robotics Standard Payload Interfaces (SPI), open-architecture compatibility and greater than 4,000 cm3 payload section supports the rapid integration of sensors and payload needed for the successful completion of new missions. The Bluefin-12 may be configured with an optional turnkey survey package delivering integrated survey capabilities including high-resolution sonar, environmental sensing, powerful on-board data processing and highly accurate navigation.

The Bluefin-12 UUV with the Optional Integrated Survey Package includes the base model vehicle's core capabilities and adds select integrations including the Sonardyne Solstice Multi-Aperture Sonar, forward looking sonar, 1TB removable data storage module (RDSM), high-definition machine-vision camera, on-board data processing, and integrated Acoustic Communications. The Bluefin-12 with integrated Survey Package provides an advanced, modular, long-endurance, high-fidelity sonar survey vehicle able to maintain up-tempo operations or extend missions beyond the horizon.

Designed for detailed hydrographic surveys, the Solstice MAS provides high-resolution imagery even in shallow, littoral waters. Sonardyne Solstice MAS delivers a 200-meter swath range and ultra-high, along-track resolution of 0.15°. Solstice delivers undistorted, high-contrast imagery in shallow water, where other sensors fail, by using dynamic focusing while also allowing for wide swath coverage.

"The General Dynamics' team has invested in a completely new generation of vehicles. The new Bluefin-12 provides superior design, high quality, excellent modularity and best-in-class reliability to deliver exceptional mission capability and range," said Andy Rogers, vice president of undersea systems at General Dynamics Mission Systems. "We are proud to add the Bluefin-12 to our UUV family of products and to deliver both the Bluefin-12 and Bluefin-9 UUVs to Thales in support of the Royal Australian Navy's SEA 1778 program."

Courtesy of General Dynamics

Courtesy of General Dynamics

SMD UNVEIL GREEN, SUPER CAPABLE ROV TECHNOLOGY

SMD unveiled their electric Work Class ROV at Offshore Europe. Their new Quantum EV ROV introduces electric drive technology to the subsea sector in an optimised, modular package which brings Work Class ROV performance and capability to a new level. The high capability Quantum EV is SMD's environmentally responsible solution designed around five key principles covering performance, reliability, flexibility, ease of use, and compact form factor.

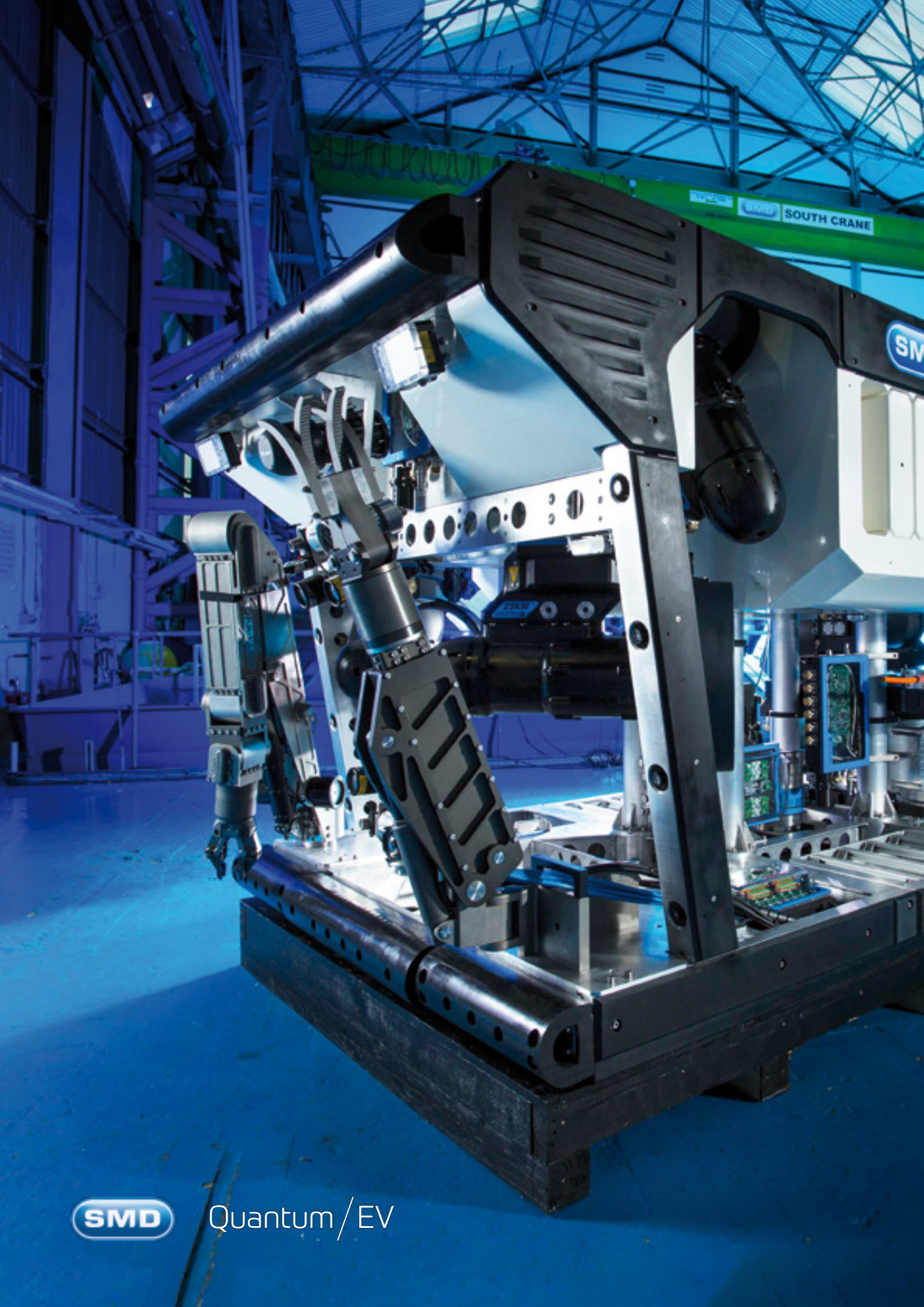
GREENER, MORE EFFICIENT ELECTRIC PROPULSION

The first thing SMD wanted was to ensure a greener and more environmentally responsible robotic solution. Until now, SMD have used oil-based systems so they wanted to come up with something more efficient, as the efficiency of the power put into an ROV is typically only 30%. In order to double the efficiency, there was a need to move to electrical propulsion: a better and more environmentally friendly option that costs even less to run. In addition to being more reliable and smaller, this solution gives ROV operators better results and lowers their operating costs.

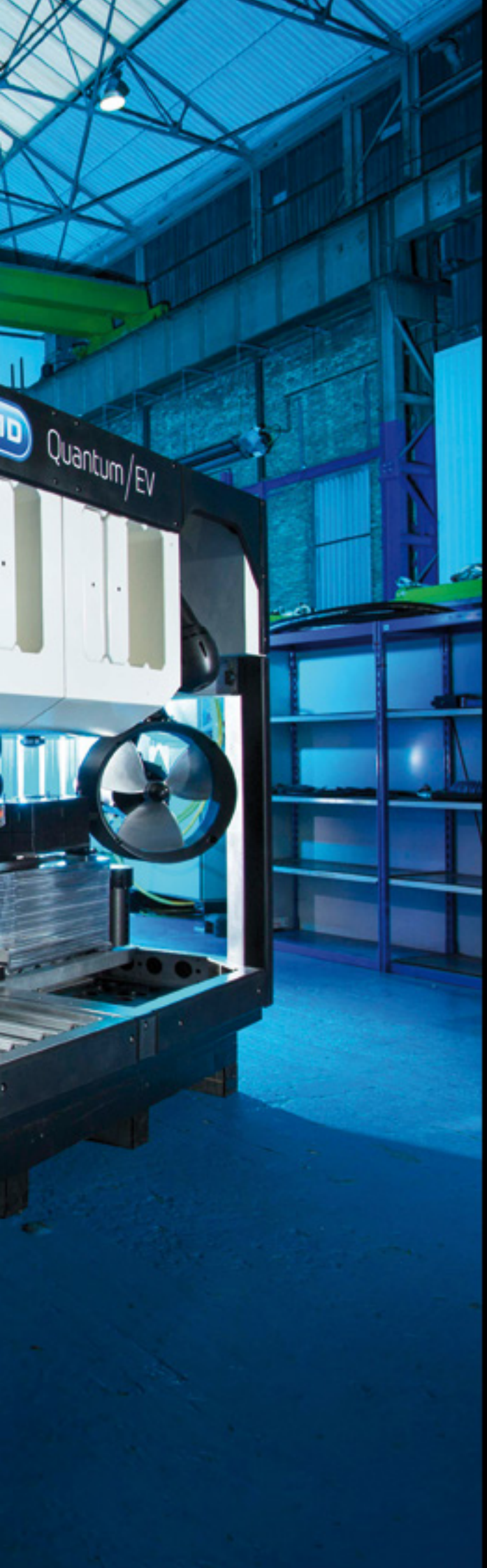
THE PRINCIPLES OF DESIGN

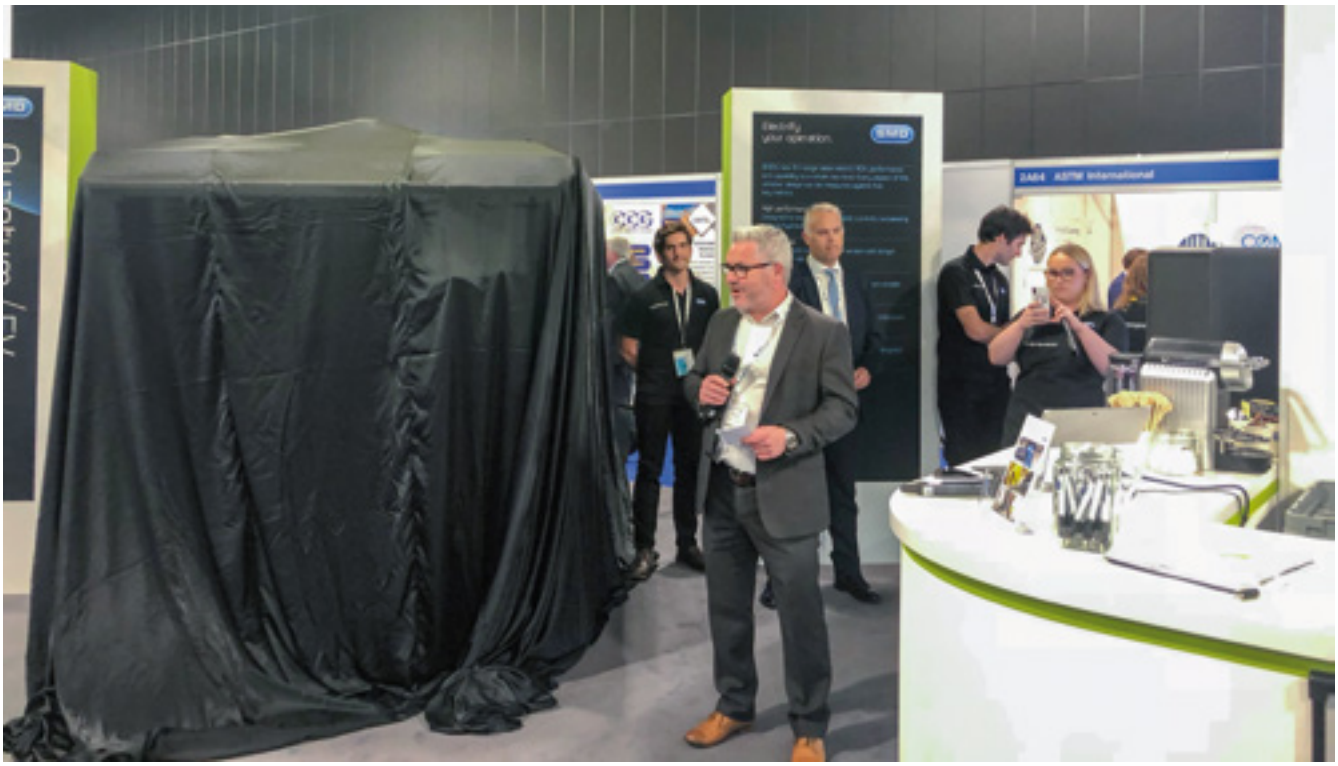
Catering for changing requirements and the evolution of applications, the company had to come up with an architecture for technology that would allow different types of AI to be integrated, as and when they were developed. It was important to ensure that the solution for the architecture and product could also be tethered or untethered. Finally, the design needed to be tested; put into residency (staying underwater); run from an unmanned surface vessels (USV); or just run from conventional vessels.

Courtesy of SMD



SMD Quantum / EV



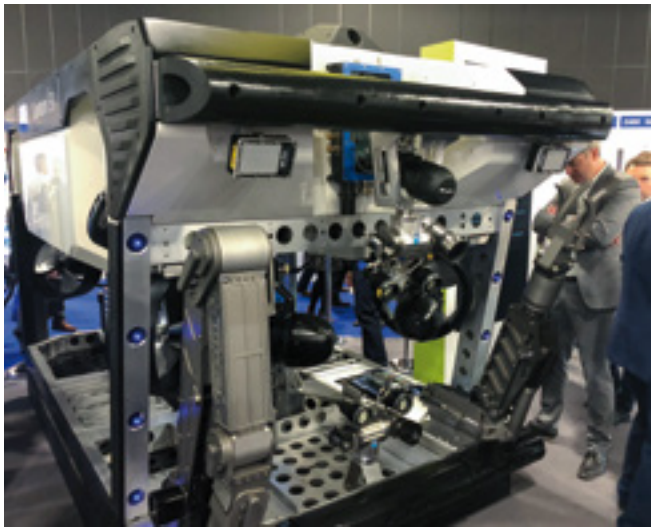


The concept was to bring all components together to give operators a step change in operations. This change promises to reduce both costs and risks, ensure more accurate data gathering, and perform tasks faster. The main principles of design were:

- HIGH PERFORMANCE VEHICLE: it's all about having the stability and the accuracy to match. What SMD have achieved is that this ROV is a 270 HP vehicle in the form of a medium sized vehicle. It has 20% more thrust compared to today's hydraulic ROVs.
- MORE RELIABLE: because moving parts tend to wear out, 50% fewer moving parts were used.
- REDUNDANCY: the Quantum EV can be used in unmanned situations and could be submerged for longer periods of time to be used as a resident ROV.
- MORE COMPACT: this design is 20% more compact and lighter than anything on the market making it is easier to store and transport, and of course operate from a smaller vessel.
- FLEXIBILITY: the system can be run via umbilical or simply by battery.

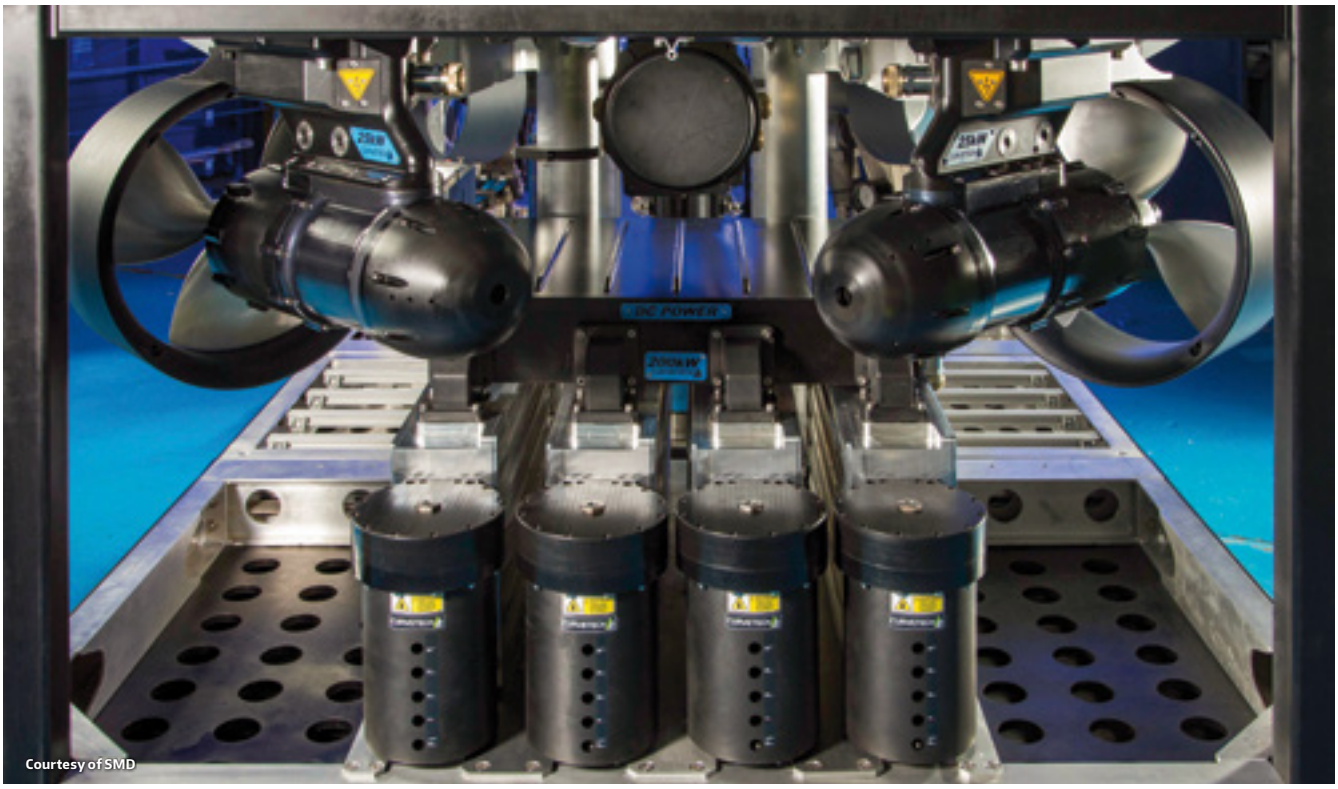
FEATURES OF THE ROV

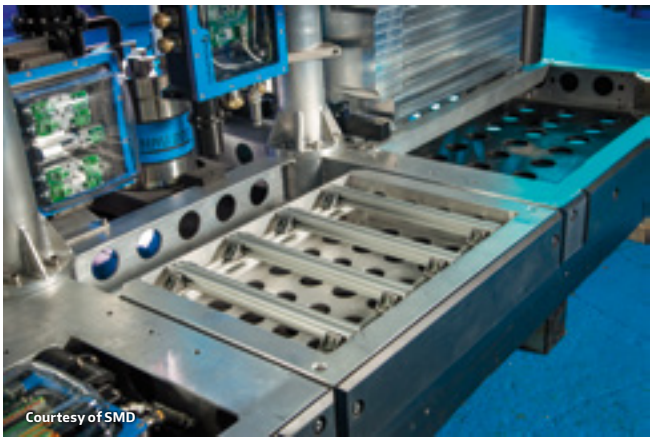
The main thing one would notice is the space in the vehicle. At the heart of the vehicle is SMD's new propulsion technology. This has been a ground up development. SMD have been making and designing thruster systems and electrical motors for 25 years. Their parent company are experts in high energy drive systems. This has helped mould this powerful thruster on this particular ROV.



This Quantum EV has a thruster of 25kW unit 550kgf. This is around 20% more than an equivalent hydraulic system, but with only two moving parts: the primary and secondary shaft. However, the really cool thing about this thruster is its magnetic gearbox. There are no mashing gears in this thruster and there is no way that seawater can get into the electrical parts of the thruster. The final advantage of the magnetic coupling is that if rope gets tangled into it, then it would automatically clutch then slip, avoiding destroying the motor.

The next innovation on this vehicle is the DC power system. The high voltage DC transmission system allows the vehicle to go all the way down to 6,000m. DC is far more efficient on the umbilicals. Typically, a work class ROV would have a 40mm diameter umbilical but with this vehicle we are down to 30mm diameter umbilical. This means a lot less copper in the umbilical: less weight and a lot more efficiency.


Courtesy of SMD


Courtesy of SMD

The other component of the DC system is on the vehicle itself. The vehicle runs a 680V system. It's a plug and play system that you can plug those 8 multi drop thrusters in to. You can also plug in the electric tooling as it comes along.

There is a lot of space in the vehicle system. You can start moving the tools that were on the skids previously onto the vehicle. There is some innovation to slide mini skids into the vehicle. There is an HPU option for it which has been developed to allow legacy tools connected to the vehicle that run on hydraulics. Two of these HPUs can be fitted to the front of the frame. 4 of these can be added giving it an overall 270HP of hydraulic power, far in excess of anything currently on the market.

Other specific additions include: Developments made to the hydraulic control unit by creating a series of modules where one can plug in and configure the HCU; Easy payload adjustment allowing for easy configuration of buoyancy to match required payload without the need to add excess ballast; Tool drawer sliding system has been developed with several tool drawers added to the front and the side of the vehicle to mount the tools to replace the traditional skids; The DC system allows for a new plug in umblical termination to mobilise the system quicker. SMD have developed a new connector that is very simple to unplug, take out, and demobilise the system. The same connector also goes into the TMS, and the additional use as busbar allows multiple connection options.

Mark Collins, SMD's Director for Remote and Autonomous Technologies has been involved throughout the development process "We have been listening to what our customers and the industry want and using our extensive real world, and sometimes painful experience, we've developed a new product range which has their needs at its very core. We have really focused on developing a tool that can be relied upon to take operational efficiency to a new level that's easy to own and use. The technology will support our client's ambitions and is suitable for traditional vessel, Unmanned Vessel and resident applications. One of the novel things about the EV technology is its modular flexibility. We've created future-ready, component-based, modular architecture which can be extrapolated for different uses; easily transferred for use in AUVs and USVs."

BUILDING ON HERITAGE

To create this truly outstanding vehicle, SMD has built on its industrial heritage from the North East of England. It considered both the requirements of the industry, and the support of its parent company CRRC TEC, who have been supporting the development financially even during a period of downturn. With this ongoing support, we here at ROV Planet are certain that SMD will continue to bring exciting new designs to market in the near future.

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Courtesy of WFS

THE VISION OF A DIGITAL SUBSEA FUTURE

Theo Priestley, WFS

In the past few years, the term 'digitalisation' has become synonymous with innovation in the oil and gas sector, and vital to corporate strategy as operators seek to take advantage of new and emerging technologies. Big Data, predictive analytics, and cloud initiatives are key in being able to make sense of real-time information from services, sensors and systems, says Woodmac in a recent article, and the role of Subsea Internet of Things (SIoT) technologies is picking up pace across both the energy and oil and gas sectors as a critical piece of the digital infrastructure, offering the industry solutions to improve safety, increase operational flexibility and production, reduce costs and extend the life of assets in the oil and gas industry.

The application of these types of technologies within the oil industry illustrates the ways that subsea technology is changing attitudes in line with the sector as well as embracing critical, adaptable and relevant solutions. Reducing the risk and operational costs associated with coiled tube fatigue is just one example, which has resulted in savings of over £1m million in a single installation.

As a result, subsea technology has become a key driver for safety in the oil and gas industry, providing real-time monitoring for offshore and subsea assets.

There is approximately 3,500,000km of pipeline across the world, and for those under the ocean subsea technology is a booming £7.5bn sector according to Subsea UK. Beneath the waves an estimated 70% of this pipeline is already at or beyond its design life and it is subsea innovation which enables connected solutions in these extreme environments to support digitalisation of assets in order to monitor integrity in real-time.

WFS Technologies has developed the building blocks for addressing these challenges through patented Seatooth technology. Initial applications have been focused on maintaining, and where possible, extending asset life through corrosion, crack and fatigue monitoring. This addresses a major concern for the oil industry, as costs soar towards an asset's end of life while production declines. Production itself can be enhanced by up to 5-15% through collecting measurements that generate the level of data required to help influence effective decision making. Subsea technology helps to collect information such as temperature, which can highlight production upsets and ultrasonic flow measurements which has the potential to increase production by up to 15%. Such techniques are being used in the North Sea.

However, this technology is not static, and its evolution continues to provide solutions beyond asset integrity and production enhancement. Workforce safety has been improved with edge computing and subsea wireless IP camera technology, which

has reduced the requirement for divers, for example in a North Sea construction project managed by WFS. Historically, one of the key challenges was how to monitor the PIG (an internal pipeline cleaning device) as it is passed through the pipeline at high pressure without the need for a diver or ROV. The new remote device now enables divers to be out of harm's way as well removing the need for unnecessary ROVs.

Where ROV, AUV and divers are required there have been significant improvements made in subsea navigation. Underwater navigation has typically been accomplished using inertial navigation or acoustic beacons. Acoustic systems are degraded by noise and interference from a number of sources. They are also subject to multi-path effects and in some environments are virtually unusable. Inertial navigation systems are complex, bulky, high cost, accumulate inaccuracy over time and require knowledge of an initial reference point. A subsea navigation system that uses electromagnetic transmission (RF) is far more effective and considered innovative. Each antenna is electrically or magnetically coupled to subsea structures and signals emitted by the antennas are used by a detection means on a subsea vehicle such as AUV to allow the vehicle to navigate relative to the sub-sea structure. The detection means uses a measure of the electric field of the emitted signals in order to determine the position of the vehicle which offers a greater degree of navigational accuracy.

The reduction of risk, of both monitoring assets and for those working in the industry, will continue to be a crucial consideration as subsea technology evolves. However, asset integrity is only one key aspect of maintaining an efficient, productive and compliant energy network and the next step for subsea technology is likely to involve blockchain as a solution to manage increasingly complex asset repairs and replacements.

Although the underlying aspect of blockchain is purely a distributed ledger and therefore a backbone infrastructure technology, the fact that an asset's lifecycle can be recorded, and every component digitally traced offers enhanced asset lifecycle management.

Similarly, combining real-time sensor information, edge computing and blockchain driven asset lifecycle optimisation, the concept of the Digital Twin is brought to life (the idea of creating a digital representation of an asset or device combined with the real-time sensor data). Blockchain used alongside subsea technology is a valuable addition to networks in any sector, including oil and gas.

Subsea technology has already proven that it offers innovative solutions to challenges facing the wider industry. It works to ensure the integrity of an asset's lifecycle, reduce its cost of ownership, while enhancing and improving offshore safety. This disruptive technology not only offers reliability and greater flexibility in difficult and unknown conditions but will enable the successful 'future-proofing' of the wider industry, while supporting its transition to a sustainable future.

SUBSEA OPS AND ROV TRAINING

AT THE CHAGUARAMAS DEEPWATER HUB IN TRINIDAD

Courtesy of Offshore Innovators

Chaguaramas, which was named by its original Amerindian Inhabitants, describes the Palmiste Palm which lined its shores in their native language. The 14,000 plus acre peninsular and archipelago, which projects westward from Trinidad's mainland towards Venezuela, acts as the gateway to the Gulf of Paria, one of the largest natural harbors in the world.

The Port of Chaguaramas, first home to Amerindians, was settled and fortified on Gasper Grande Island by the Spanish Navy in 1796 under Admiral Sebastian Ruiz de Apadoca. Some 145 years later, in 1941, Chaguaramas was leased to the United States Government for the establishment of a Naval Base and Air Station in support of the allies World War II efforts.

When the last of the Americans vacated Chaguaramas in 1978, the Peninsular became host to a combination of industrialized business, maritime services, commercial fishing and recreational marine activity. In recent years, the Port of Chaguaramas has emerged as a Deepwater Hub for the offshore oil and gas industry in the region.

The sheltered anchorage of the port, which is protected from the North-East Trade winds and the North Atlantic Ocean Swells, provides safe and comfortable berthing of commercial vessels of almost any size. The deep waters of the port, combined with the availability of world class docking facilities, make Chaguaramas a preferred staging point for major projects in the region that require larger deep draft vessels for execution.

The port is home to shore base facilities for multinational logistics companies that support the drilling and production activities of operators such as BHP, Shell and Bp on the east coast shelf of Trinidad. From 2012 to 2017, it served as a logistics hub for exploration and development drilling for new prospects in Venezuela and Grenada, while also supporting the subsea field development of the large Dragon Gas field in Venezuela.

Courtesy of Offshore Innovators


Courtesy of Offshore Innovators


Courtesy of Offshore Innovators


Courtesy of Offshore Innovators

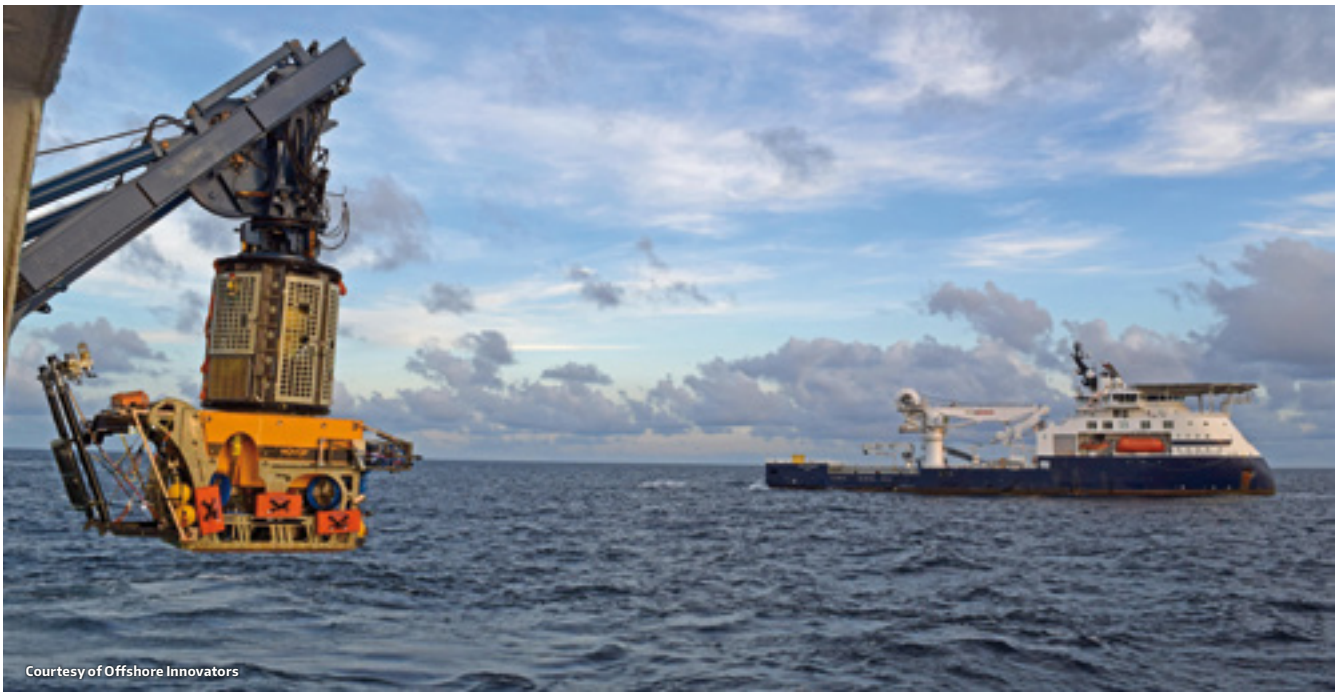
During the downturn in the energy industry from 2015 to 2017, the port arose to support yet another niche in the oil and gas industry, facilitating the cold stacking of nine (9) drill ships belonging to Transocean. These operations provided a much-needed activity boost to the marine industry and six (6) of the vessels are still moored in Chaguaramas providing revenue and work opportunities for government, contractors and personnel.

Most recently, the advent of deep-water drilling in the Caribbean has generated exceptional activity in Chaguaramas. The hub is currently supporting exploration drilling in Trinidad & Tobago, Guyana and Suriname by BHP, ExxonMobil and Tullow, respectively. It is also supporting the development drilling and FPSO installations for ExxonMobil's world-famous projects Liza Destiny and Liza Unity, while continuing to service Trinidad's daily offshore operations.

Hosting support services for modern Deepwater developments inherently means that Chaguaramas is exposed to new and emerging technology. The ChagTerms port has been used as a staging and pre-commissioning facility for the TechnipFMC Subsea Trees and associated hardware being installed on the ExxonMobil Liza Destiny Project. The transfer of technology process extends regionally with Chaguaramas playing host to world class energy-based educational training. This demonstrated by Subsea Specialist Ltd hosting TechnipFMC Subsea School and Blue Laguna ROV Induction Training for Guyanese and local engineers.

Offshore Innovators Ltd, the only Caribbean-based Subsea Personnel Agency, is headquartered in Chaguaramas and provides ROV, Diving and Deck Personnel for both the local and international market. Offshore Innovators, in partnership with Team Trident LLC in Houston, have been exporting the Trinidadian "brand" of ROV personnel to international Subsea Robotics Operators with great reception and performance feedback.

These ROV operators continue the legacy of past energy industry exports from Trinidad such as world-class Directional Drillers and Welders. For a small country, with a population of less the 1.5M people, it has been noted that you can find a "Trini" in just about every oil field in the world.


Courtesy of Offshore Innovators

Offshore Innovators recently recruited five (5) Guyanese engineers and brought them to Chaguaramas for intensive ROV training in preparation for the growing demand for local content personnel in the deep-water developments in Guyana. In addition to the standard Offshore Training, the engineers benefitted from hands on training onboard the DOF Subsea Skandi Neptune, gaining exposure to the Perry XLX vehicles onboard. These engineers are currently rotating offshore Guyana supporting the ExxonMobil Liza 1 subsea development.

In 2018, Subsea Specialist Ltd imported and commissioned the first TechnipFMC Schilling HD simulator in the region for use in Subsea Training and Project Simulation. This is housed at their facility in Chaguaramas and available to the public for a supervised subsea experience. ROV personnel can attain supervised piloting hours towards their IMCA competency schemes and sharpen their skills on the Hammerhead Software. The simulator also allows operators to develop proficiency on the Titan 4 manipulator arm with the actual master controller found on most work class ROVs worldwide.

Chaguaramas is home to the Caribbean Oceanography Aquaculture and Subsea Technology Foundation (COAST), a non-profit NGO registered in Trinidad. This group, made up Maritime Professionals, is focused on giving back to the industry and young maritime hopefuls. COAST is engaging corporate citizens and governments agencies to diversify the maritime industry in the Caribbean, while creating new opportunities for careers paths for young people. COAST has also taken up environmental challenges and is working to stem the invasion of the Lionfish species in the Caribbean by employing the services of ROVs.


Courtesy of Offshore Innovators


Courtesy of Offshore Innovators

As the Caribbean Deepwater Industry continues to grow, Chaguaramas is well poised to flourish with it, taking advantage of its physical and technological features that have set it apart from any other port in the Caribbean. If the current trajectory is well managed, the Deepwater Hub of Chaguaramas can come to represent what Aberdeen is to the North Sea.

HOW LOW-COST SUBSEA COMPONENTS ARE CHANGING MARINE CONSERVATION EFFORTS

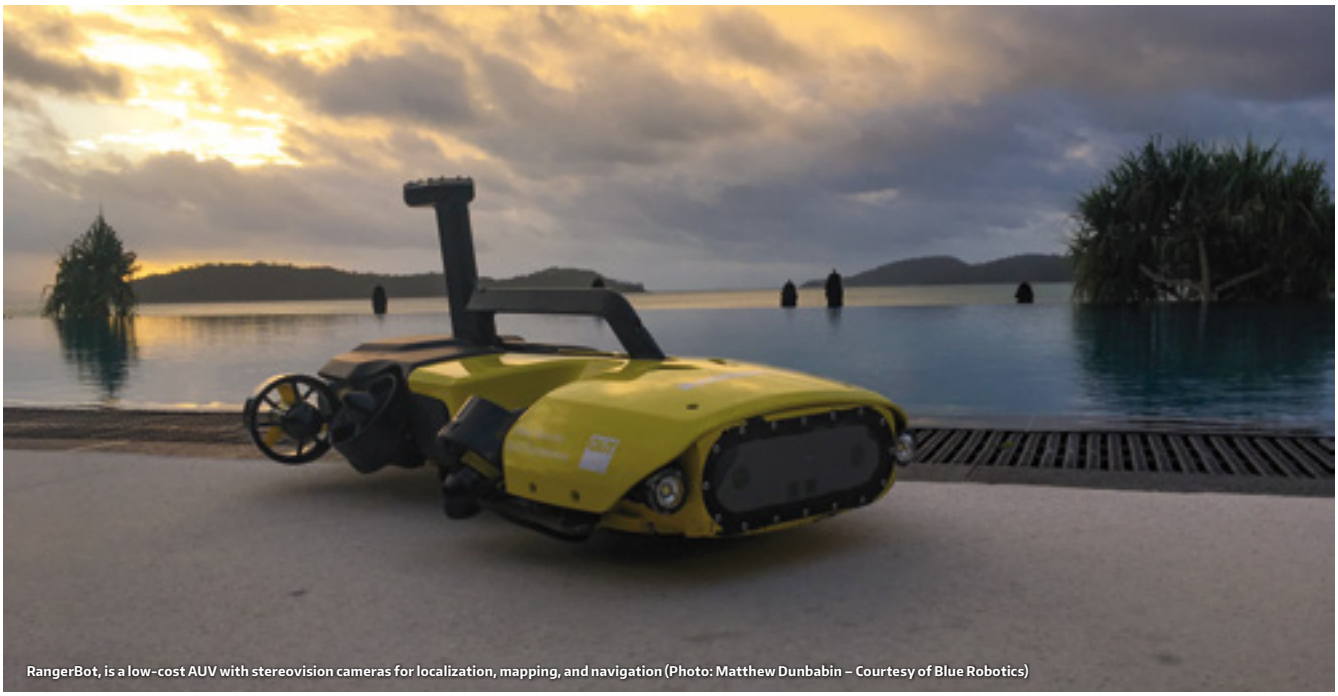
As you page through the latest marine news, it's easy to see why ROVs and other robotic marine vehicles are nearly synonymous with the industrial and commercial world. The value they provide is undeniable and worth a heavy price tag. Less obvious are the many applications where this technology could provide critical value but where there isn't enough funding, or a strong business case to justify investing in such platforms. Conservation is an area that unfortunately falls into this category despite its importance to our planet's future. Since starting Blue Robotics five years ago, our goal has been to create affordable and capable marine robotics components and, through doing so, enable the use of subsea technology in more fields. To us, conservation is one of the most exciting areas in which marine robotics has a significant potential for positive impact.


Rusty Jehangir (Courtesy of Blue Robotics)

By: Rustom Jehangir, Founder, Blue Robotics Inc.

Marine robotics can help researchers bring both public awareness and direct action to environmental and ecological conservation. One person working to bring public awareness is Nick Hawkins, a documentary filmmaker, who is on a quest to film the endangered North Atlantic right whale in Canada's Gulf of Saint Lawrence. There are fewer than 400 of these whales left on the planet, and only about 100 of those are reproducing females. Between boat collisions and fishing net entanglement, the North Atlantic right whale population is dropping at an alarming rate. More than 17 dead whales washed ashore in 2017, spurring outcry from conservationists and a renewed media interest. Despite that attention, the whales have rarely been filmed in action underwater, making it difficult for the public to understand these migratory animals and the importance of taking action to protect the species.


Nick Hawkins built a USV that carries several cameras mounted below the water. (Photo: Nick Hawkins – Courtesy of Blue Robotics)



RangerBot, is a low-cost AUV with stereovision cameras for localization, mapping, and navigation (Photo: Matthew Dunbabin – Courtesy of Blue Robotics)

Hawkins' USV is rapidly deployed from skid system on a small boat. (Photo: Nick Hawkins – Courtesy of Blue Robotics)

Nick Hawkins, a documentary filmmaker, is on a quest to film the endangered North Atlantic right whale. (Photo: Nick Hawkins – Courtesy of Blue Robotics)

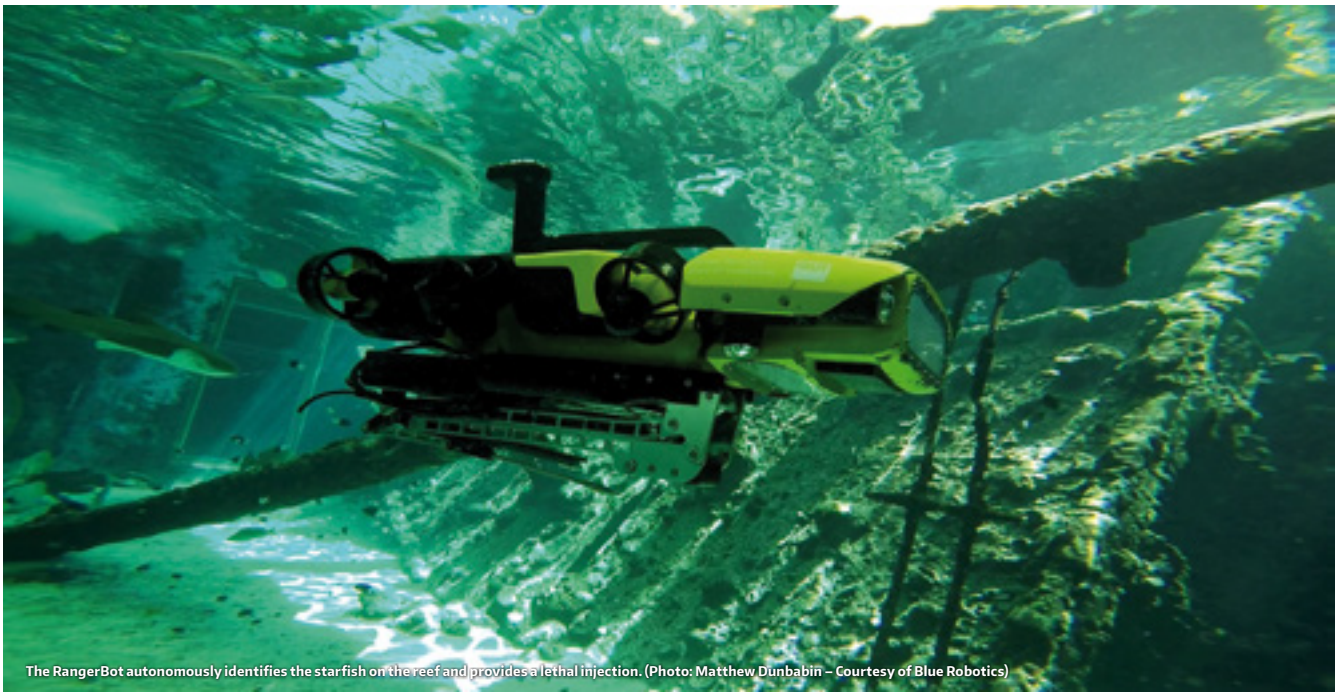
"One of the main challenges in making underwater imagery is the low visibility of the water where the whales feed, making it unsafe for a diver to enter the water," says Hawkins. Rather than sending in a diver with a camera he built a small unmanned surface vessel (USV) that can be launched quickly from a small boat. The USV carries a number of cameras mounted below the water and controlled through a CamRanger that produces a live feed directly to a tablet back on the boat. On a tight budget to film a documentary pilot, Hawkins was able to build the USV with low-cost components including Blue Robotics thrusters and enclosures, a remote control radio, and a modular hull.

Hawkins' work on right whales was featured in National Geographic earlier this year and he hopes to be able to share a lot more underwater footage in the future, building public awareness and compelling action among conservationists and policy makers.

On the opposite side of the world is a roboticist who is taking direct action with marine robotics, Matthew Dunbabin. Dunbabin is a professor of Robotics and Autonomous Systems at the Queensland University of Technology in Australia (QUT). He and his team have spent the last few years building autonomous subsea systems with an emphasis on conservation and have made some impressive accomplishments.

Their primary platform, the RangerBot, is a low-cost AUV with stereovision cameras for localization, mapping, and navigation. In addition to a number of specially built parts, the RangerBot uses Blue Robotics thrusters, lights, sensors, and sonar. Built as a multipurpose platform, the RangerBot has completed some unusual missions compared to the average ROV or AUV.

In 2016, Dunbabin and team demonstrated the vehicle as a way to mitigate the overpopulation of crown-of-thorns starfish on the Great Barrier Reef. Using a robotic arm equipped with a syringe full of a specially formulated toxin, the RangerBot autonomously identifies the starfish on the reef and provides a lethal injection. This can also be done by human divers, but the low-cost robotic system is more effective, scalable, and safer.



The RangerBot autonomously identifies the starfish on the reef and provides a lethal injection. (Photo: Matthew Dunbabin – Courtesy of Blue Robotics)

In addition to reducing harmful populations, the RangerBot also demonstrates an ability to repopulate the reef with the right species. In 2019, the QUT team and their robot, rebranded as the "LarvalBot", distributed baby corals across a reef in a process called larval restoration. Using a selection of corals with a high resistance to bleaching in increased ocean temperatures, this process will likely provide a method for repopulating the reef with sustainable species. Larval restoration can be performed by hand with divers, but the robot is able to work much faster, covering over 30,000 square meters in six hours in their most recent tests. Within the next few months, QUT will attempt to restore a 1,000,000 square meter area using the LarvalBot.

"The availability of low-cost and reliable underwater vehicle components are essential to the scaling of our autonomous monitoring, management, and conservation activities," says Dunbabin. "They allow us to rapidly develop and demonstrate advanced robotic systems targeted for on-the-ground action by citizen scientists and community groups, researchers, and government agencies.

"We want to let the marine scientists do what they do best, which is assessing conditions," says Dunbabin. "We just want to provide tools for them to really upscale the activities that they're doing."

The RangerBot has a lot of new missions on its to-do list and may someday be used for everything from population surveys to real-time water quality monitoring. The possibilities seem nearly endless and the impact on wide-ranging conservation efforts could be substantial.

These two projects represent just a glimpse of the way that marine robotics can be used to multiply the effect of conservation efforts. Inspired by their work, we at Blue Robotics will continue to focus on providing affordable components and systems that enable and accelerate conservation efforts and other applications that become feasible with affordable costs. We hope to expand the scope of marine robotics' impact on the world and to spur growth of the overall marine robotics industry. We're thrilled to see a little bit of that happening already and we're optimistic that we'll see much more in the future!

In 2019, the QUT team rebranded their robot as the "LarvalBot. (Photo: Peter Harrison – Courtesy of Blue Robotics)

RangerBot, is a low-cost AUV with stereovision cameras for localization, mapping, and navigation (Photo: Matthew Dunbabin – Courtesy of Blue Robotics)

SPARSE-LBL: A COST EFFICIENT AND FLEXIBLE SOLUTION FOR ENHANCED SUBSEA AUTONOMY

Nowadays, various positioning techniques are available for companies and institutes that need valuable navigation information to operate undersea. And while LBL usually remains the preferred solution for the highly accurate positioning of ROVs and AUVs, this method remains costly as it requires the use of many transponders to produce a single position. Operators are thus now looking for new ways that are more efficient, flexible and less costly to conduct their operations.

To do so, they can now rely on sparse-LBL, a method that uses the INS equipping subsea vehicles, and that achieves similar or better performance than traditional LBL, while using less transponders. This is indeed made possible by fixing potential INS drift using the measured ranges to the seabed transponders while at the same time filtering acoustic ranges using INS data.

This method, that brings increased performance and flexibility, and that reduces deployment costs, has recently been used and evaluated by the Ifremer oceanographic institute, using iXblue's new Canopus LBL subsea positioning solution.

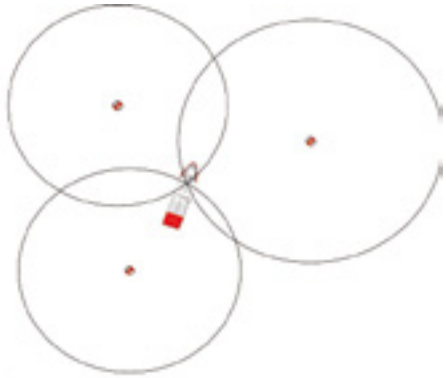
INTRODUCTION TO SPARSE-LBL

Although the Canopus solution enables various techniques such as SLAM (Simultaneous Localization and Mapping) and traditional LBL (Long BaseLine), it has been especially designed for sparse-array applications.

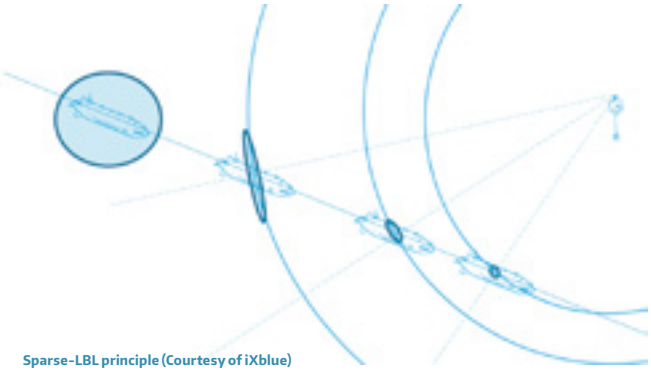
Using fewer transponders than conventional LBL systems, the sparse array technique reaches the same accuracy as traditional LBL systems, while optimizing transponders' battery power consumption. iXblue's Canopus transponders can incidentally be deployed on the seabed for multiple years thanks to their extremely low power consumption, both during operation and in standby mode.

"The Canopus solution concept, procedures and performance are all based on one basic principle: the ability to merge precise range measurements to an acoustic transponder with the very precise short-term movements from an INS in order to optimize navigation accuracy." Explains James Titcomb, Offshore Technical Manager at iXblue.

"Contrary to classical LBL, the optimum real-time fusion is obtained using a Kalman filter, which allows the asynchronous merging of information of various natures, including acoustic range measurements performed by our Ramses transceiver." Adds James.



Classical LBL (Courtesy of iXblue)



Sparse-LBL principle (Courtesy of iXblue)

The preceding "sparse-LBL principle" graphic illustrates this data fusion:

1. Initially the vehicle's INS position has a large error ellipse represented by the blue circle surrounding the AUV.

2. The ellipse error is then updated thanks to Ramses transceiver measurement of the first range to the beacon, and its transmission to the INS. The position is now well known in the axis between the vehicle and the transponder.

3. The vehicle moves along the route, the INS providing precise relative movement between acoustic interrogations.

4. As the vehicle moves relative to the beacon, the error ellipse progressively improves on multiple axis, gradually resulting in a more accurate positioning.

Following this principle, each range measurement helps computing a new position, as opposed to classical triangulation algorithms (for which at least three simultaneous range measurements are required in order to compute a position). It is therefore possible to navigate with fewer transponders (i.e. sparse array), without any compromise made on performance.

CANOPUS INTEGRATION ON AN IFREMER AUV

French oceanographic institute Ifremer recently tested the complete Canopus solution and deployed their "IdefX" AUV from the Europe vessel in the Mediterranean Sea. Conducted in water depth between 1,300 and 1,700 m, those sea trials aimed at evaluating the level of accuracy that could be reached for the navigation of the AUV with only two transponders deployed within a 16 km² area.

Ifremer vessel "Europe" (Courtesy of iXblue)

Integration of Ramses on Ifremer vehicle "IdefX" (Courtesy of iXblue)

iXblue's Canopus solution made use of an INS (Inertial Navigation System), a Ramses transceiver and a DVL (Doppler Velocity Log) mounted within the subsea vehicle. It also made use of the dedicated Canopus transponders, deployed on the seabed and regularly interrogated by the Ramses transceiver.

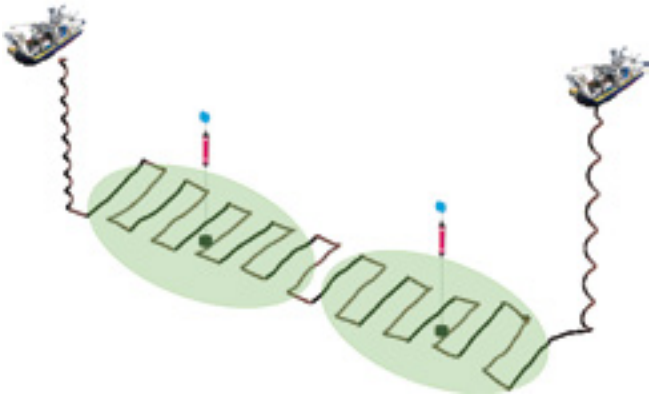
Vehicle system architecture (Courtesy of iXblue)

Within this system, iXblue's Phins INS was at the core of the positioning system. Its role was to gather all measurements (mainly speeds from the DVL and ranges from Ramses to fixed calibrated transponders), merge them with its internal sensor (gyroscopes and accelerometers) and deliver the optimal real time navigation information.

The Canopus transponders used were the latest generation of iXblue smart seabed transponders, with long lasting listening and pinging capability, embedded environmental sensors and storage, acoustic modem and WIFI features.

OPERATING SCENARIO

The Ifremer purpose was to navigate in the largest possible area using a minimum of transponders, while ensuring a high level of positioning accuracy. For these tests, two Canopus transponders were deployed and calibrated, covering a 2 km × 8 km area. Thanks to vertical acoustic propagation, the AUV was able to detect the closest seabed transponder as soon as it started diving and helped the INS navigation. Once the sea bottom reached, the AUV started a preprogrammed survey while maintaining a constant altitude above the seabed. During the whole trajectory, the Ramses transceiver within the AUV detected at least one transponder and a single range aiding navigation was performed.



Deployment scenario (Courtesy of iXblue)

CALIBRATION OF SEABED FIXED TRANSPONDERS

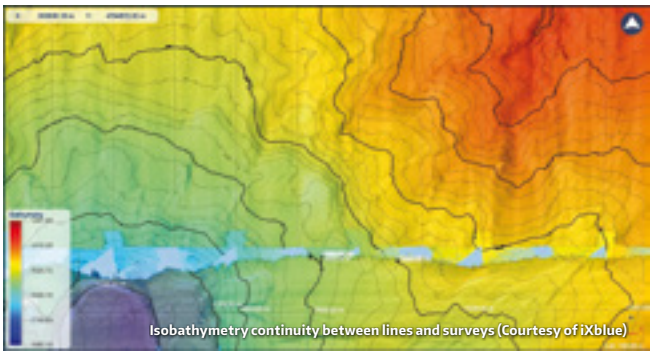
In the same way as with the available positioning modes, Canopus offers great flexibility for the method used for transponder calibration. Both SLAM and LMS (Least Mean Square) based techniques are indeed available, and calibration may be conducted using either iXblue's Gaps USBL system, or Ramses transceiver, as the acoustic interface to the array. If available, inter-beacon ranges are employed and the calibration may be conducted from a surface vessel or a subsea vehicle.

For these trials, the Ifremer chose to use Gaps USBL system to perform the box-in operation. The surface vessel thus circled the transponder location in real time and the Ramses transceiver measured the range to the Canopus transponder and used a LMS, reporting the results and giving an estimate of quality (standard deviation and residuals).

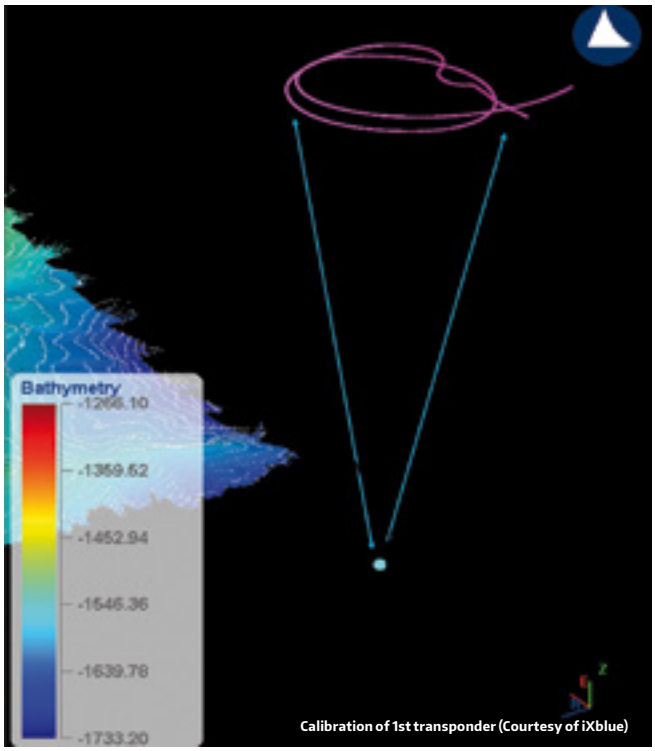
NAVIGATION IN THE FIELD OF FIXED TRANSPONDERS

Once calibration of the transponder was done, the AUV was deployed and started its mission. During the survey, the AUV was furthermore tracked from the surface vessel using a Gaps USBL system. After the dive, the direct comparison between USBL tracking and embedded INS/sparse-LBL/DVL navigation could be performed and showed extremely good results. The positionings estimated in the AUV being much more precise than USBL and overall absolute positioning accuracy was estimated around 1 m.

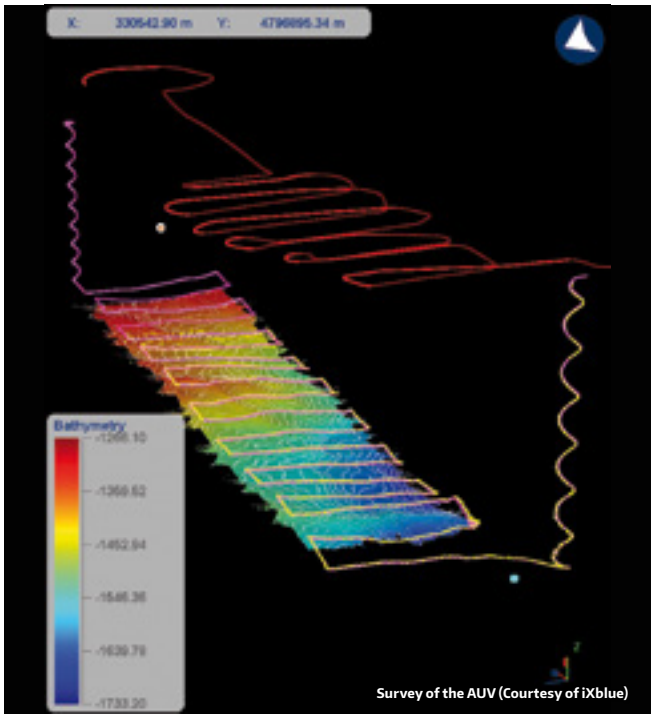
Finally, bathymetry data was extracted and geo referenced using the INS/sparse-LBL/DVL navigation. Below graphic shows a correct continuity between the different isobathymetry curves and confirms the quality of the positioning.



Isobathymetry continuity between lines and surveys (Courtesy of iXblue)



Calibration of 1st transponder (Courtesy of iXblue)



Survey of the AUV (Courtesy of iXblue)

This simple and straightforward real grid survey example demonstrates the efficiency of iXblue's Canopus solution used in Sparse Array navigation mode:

- To gain the full benefit of Canopus sparse array navigation, it is only necessary to add a Ramses transceiver to a ROV already equipped with an iXblue INS & any DVL.
- The system is made extremely redundant and tolerant to data outages (transponder out of range, DVL bottom tracking loss, etc...).
- While the Canopus supervision software can be used for configuring and monitoring the system, it is also possible to directly connect the Ramses transceiver to the existing INS & ROV power, the use of a topside system not being mandatory.

The above test conducted by the Ifremer thus shows that excellent positioning can be achieved, even at extreme ranges outside of the conventional LBL array. This leads to the possibility of greatly improving the positioning information for significant distances along field routes, and outside of conventional coverage.

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HYDRAMEC DELIVERS FIRST ELECTRIC AHC LARS

TO THE ROYAL NEW ZEALAND NAVY DIVE AND HYDROGRAPHIC SHIP.

Hydramec Offshore are pleased to have completed the supply, integration and operational testing of a fully Active Heave compensated Launch and Recovery System for a Saab Seaeye Cougar XT ROV to the New Zealand Navy.

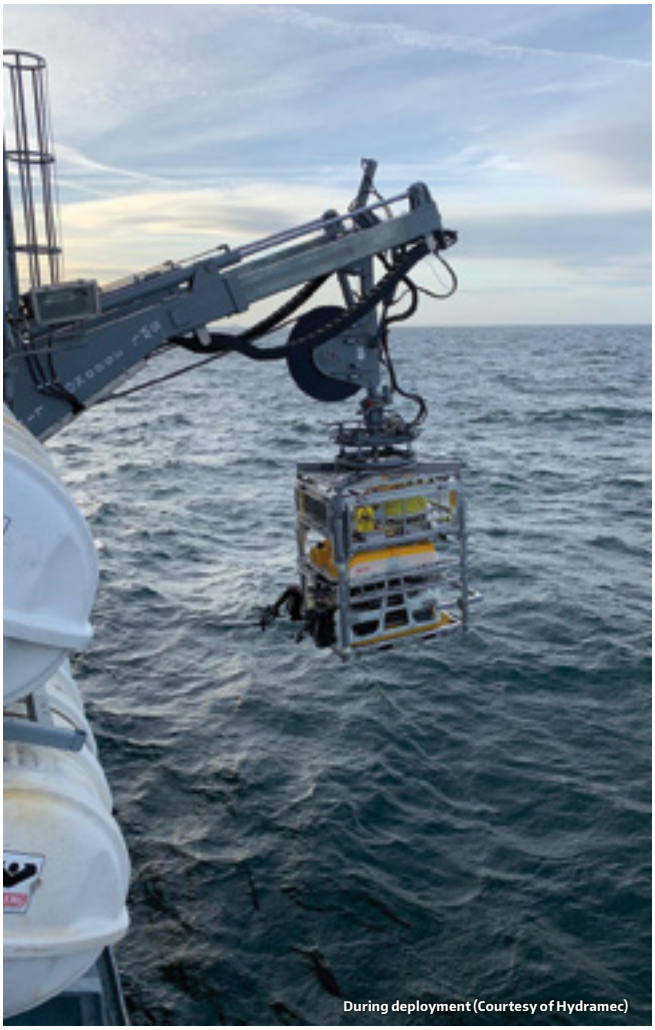
The New Zealand Navy having acquired Ostensjo's EDDA FONN multipurpose vessel for conversion to a diving support vessel required an ROV to assist with Diving support and other operations.

Ostensjo's chose the Saab Seaeye Cougar XT ROV as it fulfilled all the requirements the NZ Navy were looking for.

The Supply Brief for the LARS system was very specific, the winch system had to be Electric Driven and have AHC capability for operations in up to sea state 6. The A-Frame needed to be designed so that it would dip 1.2m below the deck level of the launch hanger to reduce the air gap between the launch point and splashzone. It was also specified that the A-frame must have an outreach of 5m from the vessels side.

The only other challenge was the need for the LARS to be designed, fully Lloyds approved and delivered in 16 weeks from the signing of the contracts to meet Ostensjo's tight schedule for delivery of the vessel.

Short deadlines are no problem for Hydramec's pool of resources with the unique ability to Engineer, fabricate, machine components, followed by applying offshore coatings



During deployment (Courtesy of Hydramec)

The 5m out-reach telescopic dipping A-frame c/w Saab Seaeye Cougar XT ROV (Courtesy of Hydramec)

and assemble all of its products in house under one roof. Giving the ability to control lead time without relying on multiple sub-contractors.

Danny Church Managing Director said "Hydramec prides itself on its ability to deliver bespoke projects on time and on budget. The team at Hydramec have once again proved that any challenge presented to them is achieved. From the project team right through to the shop floor everybody pulls in the same direction to make sure that the customer's needs and deadlines are met.

Hydramec chooses its technical partners very carefully making sure that the companies we use have the same work ethic and desire to fulfil our customer's expectations".

Scantrol AS is Hydramec's chosen supplier of AHC control systems and once again this proved to be an invaluable partnership. Their ability to deliver the exact specification Hydramec require means that Scantrol will always be Hydramec's first port of call when AHC is required.

The twin drive electric AHC winch (Courtesy of Hydramec)

Rolf Hjelmeland Business Development Manager for Scantrol said " We are proud to once again deliver Scantrol AHC to a Hydramec LARS. From our experience we know that the client can operate more cost-efficiently when integrating this functionality by increasing the weather window, reducing the damage of equipment and the burden of the ROV crew. I am glad that Hydramec has built their first electric AHC winch with excellent performance, and I look forward to many more projects like this."

Hydramec have built Electric driven winches in the past and have delivered many Hydraulic AHC winch systems to various customers, combining the two was the next natural step for Hydramec.

Hydramec contracted Brammer AS of Bergen to supply the electric Drive system and invertor controls. Scantrol and Brammer worked closely together with Hydramec's project team to make the integration of the control system and the drive system into the LARS run smoothly and without delay.

The LARS system was very high specification including a tele scoping A-Frame, multi function snubber, bunded deck and separate hpu, all controlled by a full wireless radio remote control fully integrated with the AHC by Scantrol.

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FALCON FOR OCEAN RESEARCH

Falcon deployed on a recent service cruise to the Ocean Observatories Initiative Pioneer Array. (Photo by Rebecca Travis, Woods Hole Oceanographic Institution)

A Saab Seaeye Falcon electric underwater robotic vehicle is to help support a network of oceanographic and atmospheric sensors that are part of the Ocean Observatories Initiative (OOI) transforming ocean research.

Funded by the National Science Foundation, the overall OOI program is managed by Massachusetts-based Woods Hole Oceanographic Institution. The moored, mobile autonomous, and cabled sensors provide real-time data access to address critical issues such as climate change, ecosystem variability, ocean acidification, and carbon cycling. The observatory consists of:

- The Coastal & Global Scale Nodes (CGSN) which include sensor arrays moored off the coast of Massachusetts, Alaska, and Greenland, operated by the Woods Hole Oceanographic Institution,
- The Endurance Array (EA) off the coast of Oregon and Washington, operated by Oregon State University,
- The Regional Cabled Array (RCA), a submarine cable network of sensors and instruments, operated and managed by the University of Washington,
- As well as the Cyberinfrastructure, managed by Rutgers, The State University of New Jersey.

After deploying a third party ROV for several years it was concluded that a dedicated underwater robotic vehicle could be a significant addition to the suite of tools available to the program and provide operational flexibility, as well as scheduling and budget optimisation.

The Falcon, already the most successful vehicle of its class in the world, won a competitive contract against multiple vendors.

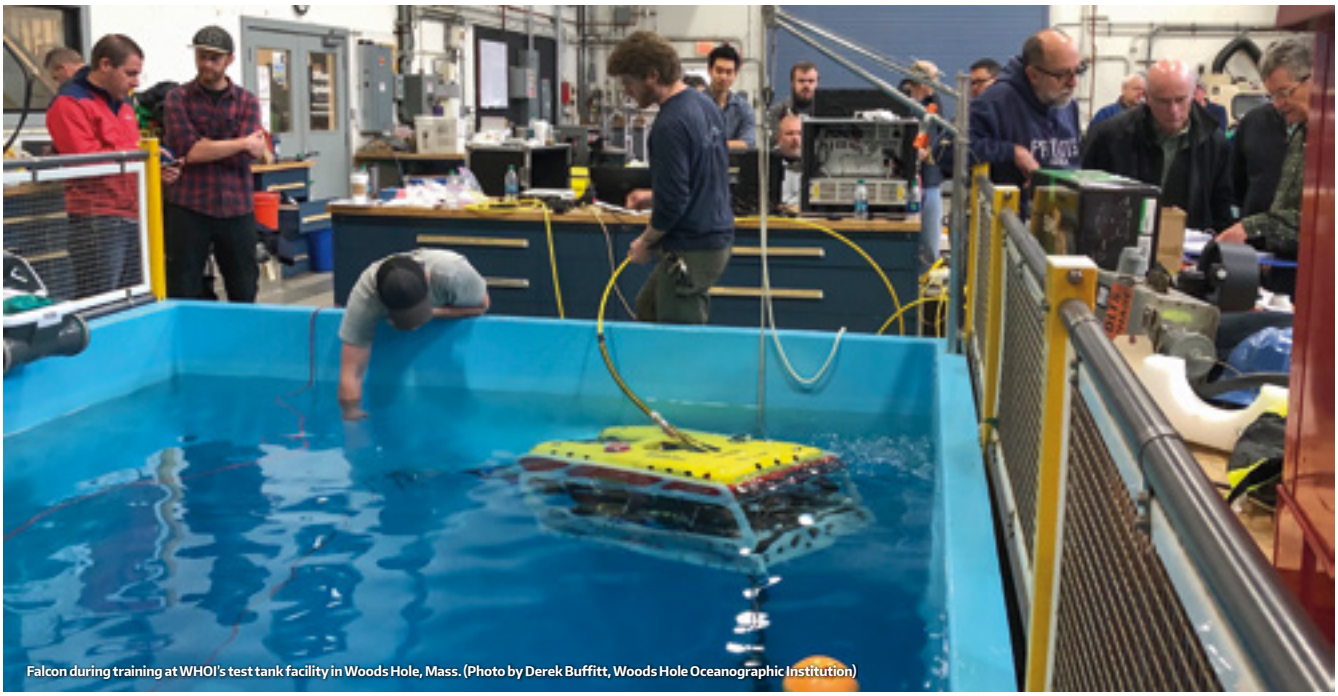
It met the general requirements for a vehicle that can operate in 450m of water, with a 1000m option, has a multi-function manipulator arm and navigation system, and can work from either a dynamic positioning, or non-dynamic positioning vessel.

A 1100m umbilical cable run will not only allow the Falcon to operate from a non-dynamic positioning vessel, but allows multiple re-termination before needing replacement.

The Falcon will conduct operations in support of mooring deployments and recoveries. This would include inspections of instruments and mooring systems, as well as attaching rigging or unfouling instruments to allow recovery of assets.

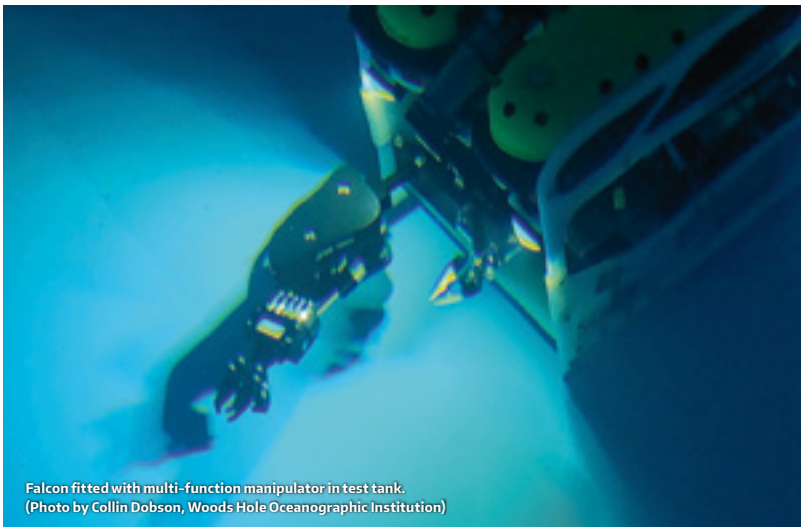
BEST OVERALL CAPABILITIES

Derek Buffitt, the Coastal & Global Scale Node (CGSN) program manager, says the Saab Seaeye Falcon was selected because it provided the best overall capabilities, has a significant tooling and spares package and comes with training and support for new OOI operators. It also met the strict budget and delivery schedule required by the OOI and the National Science Foundation.



Falcon during training at WHOI's test tank facility in Woods Hole, Mass. (Photo by Derek Buffitt, Woods Hole Oceanographic Institution)

Successful anchor recovery at the OOI Pioneer Array aided by the Falcon. (Photo by Rebecca Travis, Woods Hole Oceanographic Institution)



Falcon fitted with multi-function manipulator in test tank. (Photo by Collin Dobson, Woods Hole Oceanographic Institution)

At-sea training was completed in March 2019, along with verification of mobilisation and de-mobilisation requirements, integration of navigational systems, and included operating the vehicle in currents and performing test recoveries of CGSN anchor types.

First project deployment of the Falcon was in April onboard the RV Neil Armstrong. During the multi-leg 21 day cruise, the CGSN team successfully performed mooring inspections and anchor recoveries. Future operations could take place in water depths of up to 450m and will include surveying mooring locations, locating existing anchors, and engaging hooks and lines for recovery of anchors.

The next planned deployment is on the Endurance Array for Oregon State University. The Falcon will be mobilised on the RV Elakha and will support shallow water anchor inspections and recoveries.

Derek Buffitt reports that the OOI team are looking forward to operating the Falcon further and that the small form factor of the vehicle has allowed for efficient mobilisation and quick project turnarounds.

Systems on board the Falcon include front and rear cameras, a Kongsberg HDTV camera, Imagenex sonar, five-function manipulator and single function manipulator with rope cutter.

The Falcon's winning concept comes from packing five powerful thrusters and an intelligent distributed control system into a small, easily handled 1×0.5×0.6 metre-sized vehicle that can adopt different tools and sensors for undertaking numerous intricate and demanding tasks.

For operators a key advantage of the Falcon's intelligent power and control is its high manoeuvrability and mastery of strong crosscurrents whilst undertaking exacting tasks with steadiness and precision.

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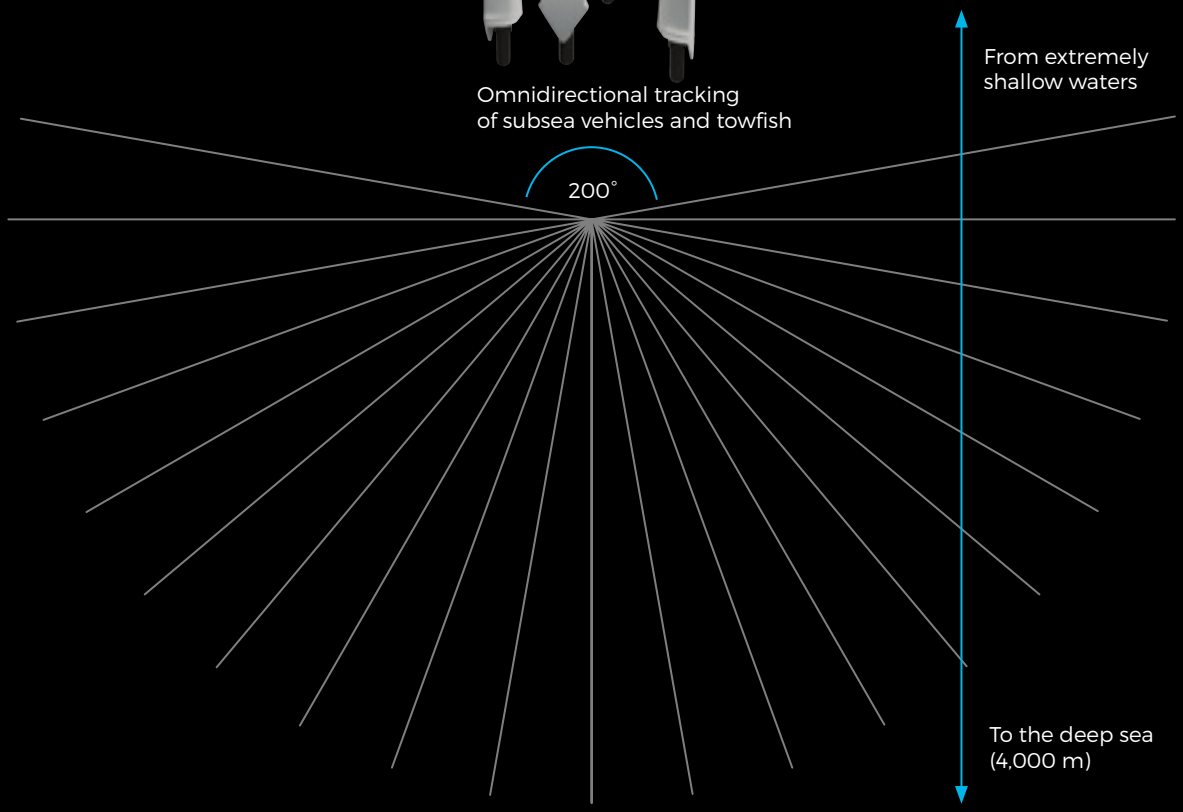

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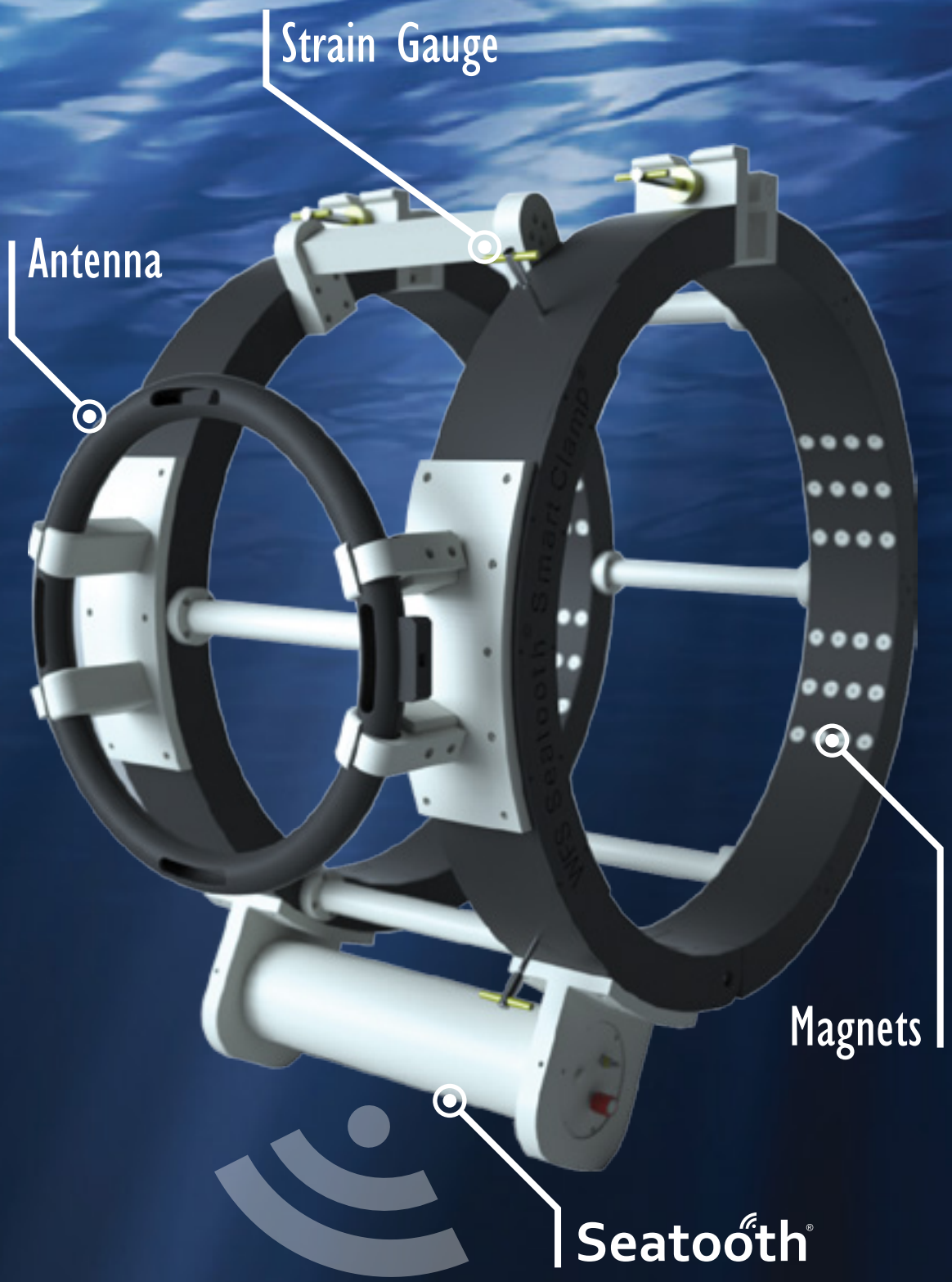

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I-TECH 7 STRENGTHENS SMART SKID TECHNOLOGY TRACK RECORD IN GULF OF MEXICO

i-Tech 7, Subsea 7's Life of Field business unit, has successfully completed a subsea decommissioning and abandonment project for LLOG Exploration Co. in the Gulf of Mexico, using its smart skid technology.

LLOG Exploration Co. was seeking better ways to flush three flowlines and two umbilicals as part of the workscope to abandon the G1 115 platform. Instead of using the conventional method of coil tubing, i-Tech 7 developed a subsea high-flow flushing skid solution to flush the flowlines.

For the umbilicals, i-Tech 7 used its field-proven hydrate remediation skid (HRS) solution to remove blockages within the tubing of two umbilicals. The system delivered significant cost savings to LLOG Exploration Co. by facilitating the decommissioning of the umbilicals in place, rather than the costly option of full recovery and disposal onshore.

Courtesy of i-Tech 7

Edward Galloway, i-Tech 7's Region Director for the Gulf of Mexico, said: "This is another great project example that showcases our engineering capabilities and ability to deliver a rapid-response technology solution that saves our clients' money and exceeds their expectations.

"We are building a successful track record for our HRS technology globally and have recently increased our fleet in order to meet client demand."

Julian Williams, Subsea Construction Manager, LLOG Exploration Co. said: "Due to the financial burden of decommissioning, we were looking for a robust, reliable and low-cost solution that would deliver. We have continued to be impressed by i-Tech 7 and their can-do approach to solving project and engineering challenges."

The next generation HRS incorporates smart, real-time software to efficiently remediate and prevent the potentially harmful build-up of hydrate in subsea production facilities.

Successfully trialled in the Gulf of Mexico during 2018, the HRS is suitable for deepwater operations up to 3,000m (10,000ft). Designed to interface with both work and heavy-duty work class ROVs, it can be integrated with any ROV on the market.

MODUS PERFORMS DECOMMISSIONING SURVEY WITH HYBRID AUV

Modus Ltd, a North East UK based subsea specialist, has recently completed a high-speed decommissioning survey for Rever Offshore in the North Sea using one of its HAUV's (Hybrid Autonomous Underwater Vehicle). The objective of the survey was to locate any items of debris that remained at the sites after the decommissioning of Fairfield assets in the Northern North Sea, including work performed within the 500m zone, and the scope further included survey of pipeline routes between additional platforms.

The surveys were successfully performed at speeds of up to 4.6km/hr in water depths of approximately 150m. For this scope, the flexible HAUV was equipped with dual head multi beam sonars and high-resolution Side Scan Sonar. Utilisation of the HAUV spread increased operational efficiency in relation to the speed of data acquisition and improved data quality.

Philip Strettle-Brown, Survey Manager at Rever Offshore commented "The use of the HAUV allowed us to significantly reduce the timescales of obtaining the required survey data and improve the overall efficiency of the produced surveys. By implementing new technology, the data obtained was of significantly higher quality and resolution when compared to alternative methods"

Nigel Ward, Chief Commercial Officer at Modus Seabed Intervention, said "We are very pleased with the positive impact and clear benefits that the Modus HAUV has had on this decommissioning project. Modus have been able to significantly reduce the survey time infield while delivering class leading data quality in combination with Rever Offshore's processing expertise. We feel that this methodology has created a new efficiency benchmark for future decommissioning surveys in the North Sea."

Courtesy of Modus

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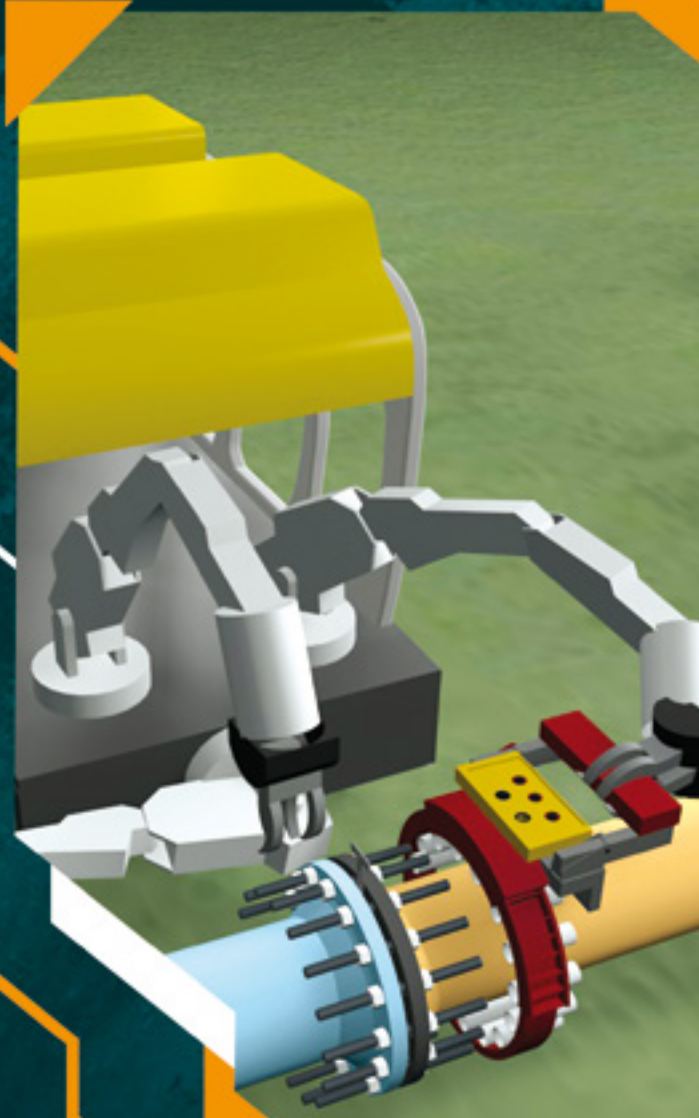

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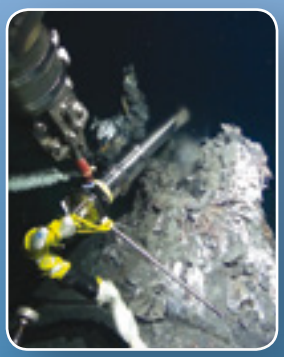

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