



P L A N E T



07.

The Game Changing  
E-ROV System



12.

Vattenfall's EOWDC leading  
the way in Innovations



17.

Aquanaut – an AUV that  
can work as an ROV



21.

Arggonauts on the Quest  
for Deep Sea Discovery

16

The magazine of choice for Subsea  
Construction and ROV Professionals

ISSUE

Q3 / 2018

# Jupiter IO

## 24 Port Fast Ethernet Switch for Subsea Use

4,000m rated managed switch designed to meet the requirements of a modern subsea network

### Powerful switch management features;

- Comprehensive VLAN functionality
- Link Aggregation (LACP)
- Extensible Authentication Protocol
- Non-blocking switch fabric
- Bandwidth control on ports
- Traffic priority (QoS)



- Optical long distance links via Dual Redundant 1Gb Single-Mode fibres
- Interface to SFP in COTS surface router
- Modular internal construction
- Serial Data to Ethernet Interfaces
- Video Digitiser Interfaces



Tel: +44 (0) 1653 602020  
[www.zetechtics.com](http://www.zetechtics.com)

## Zetechtics Rental

Zetechtics has enhanced its rental fleet with the addition of an advanced technology Subsea Graphical Datalogger, Jupiter Proportional Manipulator Control System and the latest Class 1-4 'smart' Torque Tool.

Fully FAT'd and configured for your application, with a comprehensive documentation pack, quick start guides and 24/7 technical support, Zetechtics rentals offer high quality, cutting edge technology for subsea operation.

For further information and advice, please speak to one of our Zetechtics sales team members or our global representative, Seatronics, who will be happy to help.



Tel: +44 1653 602020/ [www.zetechtics.com](http://www.zetechtics.com)  
Tel: +44 1224 853100/ [www.seatronics-group.com](http://www.seatronics-group.com)



# TABLE OF CONTENTS

- 
- 04** Welcome to ROV Planet
- 
- 07** The Game Changing E-ROV System
- 
- 10** Increased Flexibility and Efficiency for Subsea Operations
- 
- 12** Vattenfall's EOWDC is leading the Way in Innovations for the Energy Industry
- 
- 17** Aquanaut – an AUV that can work as an ROV
- 
- 21** Arggonauts – The Team on the Quest for Deep Sea Discovery
- 
- 22** Poster – The Great Diver AUV
- 
- 29** QSTAR Company Profile
- 
- 33** Teledyne Benthos Acoustic Modems meet NATO'S new JANUS Interoperability Standard
- 
- 35** ECA ROVING BAT ROV the Solution for Hull Cleaning and other UWILD Applications
- 
- 41** SMD Self-fleeting Drum Technology Open Day
- 

## EDITOR-IN-CHIEF

Richie Enzmann

## COPY EDITOR

Will Grant

## CONTRIBUTORS

Richie Enzmann

Gunnar Brink

Marion Seyve

## DESIGN & LAYOUT

Milan Farkas

## SPECIAL THANKS TO

Margo Newcombe, Bill Mallin, Christina Tran, John Benson, Ravi Chandu, Celine Lo, Matt Bates, Willard Balthazar, Karl Scheuermann, James Colebourn, Victor Javier Sepúlveda López, Jose María Sepúlveda López, Julian Lalanne

Oceaneering

Vattenfall

Saab Seaeye

Digital Edge Subsea

Blueprint Subsea

Teledyne Marine

Houston Mechatronics

QSTAR Subsea Solutions

Arggonauts

Sonavision

maxon motor

ECA Group

DWTEK

iXBlue

The BIG Partnership

SMD



# WELCOME TO



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

**Dear Reader,**

The offshore oil and gas industry is surely showing signs of recovery with some analysts even predicting a sharp rise in the price of oil towards the end of the year – some even go as far to call it a super spike. Whatever happens, it's good to remember that it is a volatile industry where things can change quickly and it's wise for companies to diversify the project portfolio in the future to always include some offshore wind and marine energy projects, despite these projects having lower margins. If you have been in Aberdeen recently, one of the things you would have noticed is the newly built European Wind Deployment Centre by Vattenfall that is very visible from the shore.

Oceaneering International have recently won the OTC Spotlight on New Technology Award with the new E-ROV system that includes an Oceaneering eNovus ROV, along with a subsea garage, an advanced communication system, and a communications buoy that allows for remote piloting. This system also has the potential for costs savings by eliminating the vessel from ROV operations.

Houston Mechatronics, a recent start-up founded by ex-NASA scientists are also planning to eliminate the vessels from ROV operations by introducing the AURV, the autonomous underwater robotic vehicle. This is an AUV that can transform itself into an ROV. The team regard themselves as potential technology disruptors of this industry and have great aspirations for the future.

At Oceanology International in London the 8 finalist teams of the Shell Ocean Discovery XPRIZE were announced. To win the \$7million prize money their task is the mapping and imaging of the ocean floor down at 4,000m depth to cover an area of 500km<sup>2</sup> and achieve this within 24 hours with kit that can fit into a standard 40ft container. One of the contestants are the team Arggonauts aiming to use AUVs and inflatable surface vehicles to achieve this task.

Best regards,  
**Richie Enzmann**

## **UPCOMING EVENTS**

### **17-20 September, 2018 – Gastech – Barcelona, Spain**

The premier event for the World's Gas, LNG, and Energy Industries.

### **25-28 September, 2018 – WindEnergy – Hamburg, Germany**

The Global on & offshore wind energy conference and exhibition.

### **22-25 October, 2018 – OCEANS'18 – Charleston, SC, USA**

The annual joint conference of the MTS and the IEEE with the theme of Healthy Oceans, Resilient Communities, Robust Commerce.

### **22-24 October, 2018 – Offshore Energy 18 – Amsterdam, The Netherlands**

The annual offshore energy conference of the Netherlands focusing on oil & gas, offshore wind, and marine energy.

### **22-26 October, 2018 – EURONAVAL – Paris, France**

The world meeting of naval technologies for the future.

### **12-15 November, 2018 – ADIPEC Offshore & Marine – Abu Dhabi, UAE**

The annual exhibition for the offshore oil & gas industry in the Middle East.

### **27-29 November, 2018 – OSEA – Singapore**

The largest offshore oil & gas event for Asia that has consistently attracted high international participation.

Please check out our website on:

**[www.ROVPlanet.com](http://www.ROVPlanet.com)**



# OFFSHORE ENERGY18

EXHIBITION & CONFERENCE  
**(22), 23 & 24 OCTOBER 2018**  
AMSTERDAM | THE NETHERLANDS



# Register now!

Offshore Energy attracts a global audience of more than 12,000 offshore energy industry professionals. The three-day event features an exhibition where over 600 companies will showcase their products and services. The accompanying conference addresses current and future issues in the offshore industry, covering developments in oil & gas, offshore wind and marine energy. See you in Amsterdam!

Diamond Sponsor

**ela[container]**

Supported by





**OCEANEERING**<sup>®</sup>

Connecting What's Needed with What's Next™

Visit us at WindEnergy Hamburg  
Stand B7.550



**EMPOWER YOUR  
PROJECT, REDUCE  
YOUR COSTS**

Copyright © 2018 Oceaneering International, Inc. All rights reserved.

As your trusted partner, Oceaneering does things differently, creatively, and smarter. Our unmatched experience and innovative technologies and solutions enable us to adapt and evolve to meet ever-changing needs.

By working together, we will safely and reliably shape the future of the offshore wind energy industry.

■ Connect with what's next at [oceaneering.com](http://oceaneering.com)

# POWERING THE NEW SUBSEA WITH THE GAME-CHANGING E-ROV SYSTEM

With the recent World Oil and OTC Spotlight on New Technology Award wins, the buzz surrounding the Oceaneering® E-ROV system continues to increase. As global operators search for innovative, cost-saving solutions, projects like the E-ROV system are taking off and proving that deviating from the norm has enormous potential.

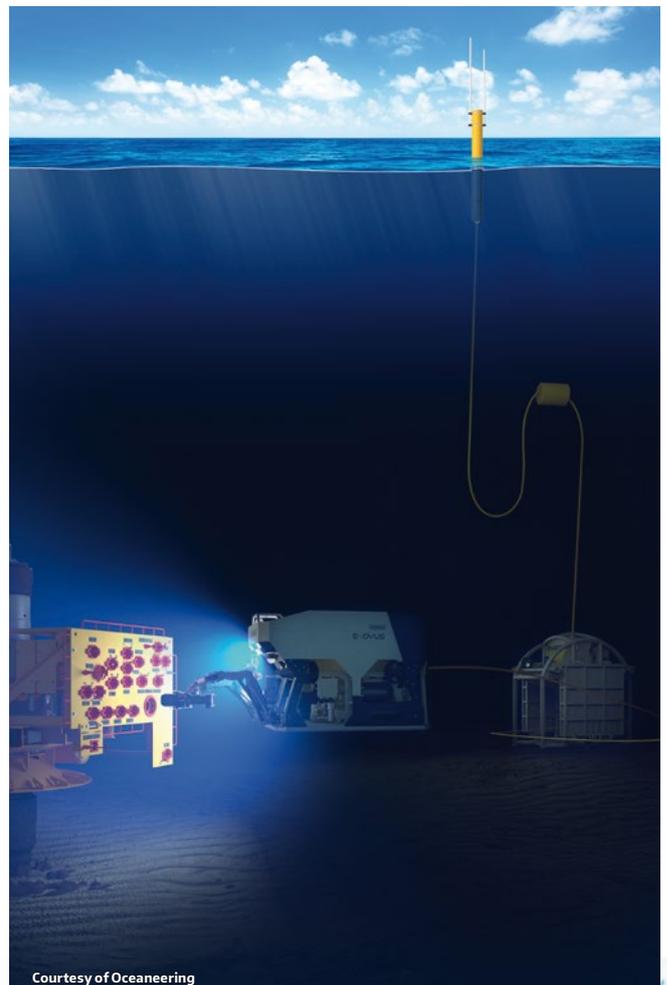
## THE DRIVE FOR OPERATIONAL COST SAVINGS

A contract award from Equinor ASA (formerly Statoil) in early 2017 enabled Oceaneering to develop, manufacture, test, and mobilize a self-contained, battery-powered remotely operated vehicle (E-ROV) system. Recognizing the potential cost savings associated with eliminating vessel- and rig-based ROV operations, Equinor was interested in confirming the viability of such a system and found a true partner in Oceaneering.

Oceaneering President and CEO Rod Larson stated, “We are excited to develop a revolutionary, battery-powered work class E-ROV system – an example of how we are thinking of ‘what’s next’ with regard to delivering safe and cost-effective technology solutions.”

## LAYING A SOLID ROV FOUNDATION

As a global leader in ROV technology development, Oceaneering operates the industry’s largest ROV fleet. This extensive experience in ROV technology ensured that the E-ROV project began with a solid foundation. The E-ROV system includes an Oceaneering® eNovus ROV, along with a subsea garage, an advanced communication system, and a communications buoy. Both the cage and ROV include advanced battery technology optimized to handle peak power consumption. The availability of a mature 4G network on the Norwegian Continental Shelf enabled the system to take advantage of Oceaneering remote piloting and automated control technology (RPACT). With low latency and advanced systems in place, pilots could be positioned onshore at one of the globally located Oceaneering Mission Support Center facilities.



Courtesy of Oceaneering



Courtesy of Oceaneering

### PROVING THE CONCEPT THROUGH A SUCCESSFUL PILOT PROGRAM

E-ROV system development, manufacturing, and pool testing were completed in early 2017 at Oceaneering facilities in Stavanger, Norway. An offshore pilot test was completed in June 2017 in the North Sea. The E-ROV system was deployed using an inspection, maintenance, and repair (IMR) vessel, and was stationed subsea for three weeks, in which time it performed various maintenance operations while Oceaneering maintained continuous, uninterrupted control.

Following this successful pilot operation in June, the E-ROV system was later put to work, assisting a drilling rig during tophole drilling. Deployed for one month, the E-ROV system completed this initial scope of work without incident.

### E-ROV SYSTEM OFFERS INCREASED BENEFITS

The successful development of the E-ROV system represents a significant step change in how ROV operations can be completed. With this innovative ROV technology, the dependency on a surface vessel to complete intervention and maintenance operations has been dramatically reduced. This not only lightens the financial burden of operational activities, but also addresses a key concern for operators worldwide: safety.

“This innovation challenges operators to think differently and creatively, and to ultimately deviate from the traditional vessel-controlled operations on which they have previously relied,” said Arve Iversen, Oceaneering ROV Operations Manager: Special Projects. “By combining our decades of ROV experience, our proprietary remote piloting and automated control technology, and our purpose-built Mission Support Center facilities, customers will not only see cost benefits, but also operational benefits.”

Increasing the efficiency of operations; supporting regular interaction between pilots, customer personnel, and subject matter experts at dedicated Mission Support Center facilities; and reducing the number of mobilizations required for equipment and personnel forces operators to rethink their traditional ways of working and to give serious thought to resident systems like the Oceaneering E-ROV system. Risk is reduced as mobilizations decrease. A resident system enables emergency interventions to be completed expeditiously. It also decreases personnel on board requirements, enables safer working conditions through a smaller topside footprint, and, in general, decreases exposure to risks.

Industry leaders across the board have a vested interest in solutions that increase efficiency, reduce costs, and improve safety. Demonstrating the feasibility and efficiency of the E-ROV system’s capability to safely execute subsea intervention tasks encourages operators to consider incorporating the E-ROV system into their operations.



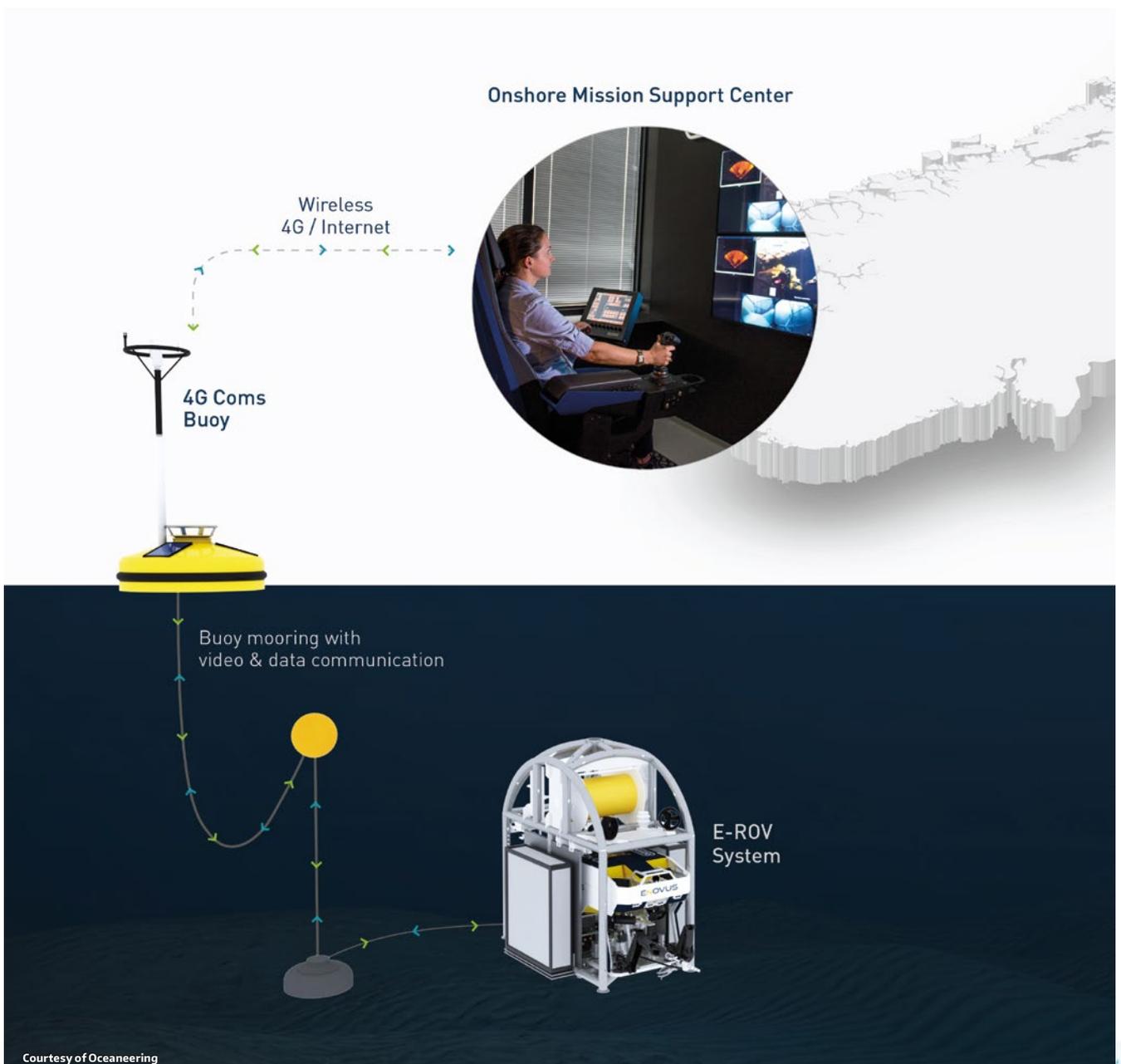
Courtesy of Oceaneering

## LOOKING TO THE FUTURE: INCREASED SUBSEA CAPABILITIES

Remotely operated systems enable operators to intervene faster, keep production online more effectively, and perform routine tasks with fewer deployments. The ability for the ROV to work on the seafloor for extended periods of time while being supported from a remote, onshore location revolutionizes the environmental impact and safety associated with ROV operations.

“We have extensive experience delivering subsea applications worldwide, along with our broader services and product offerings and lower costs for our customers,” Larson said. “The Oceaneering E-ROV system highlights the latest and most advanced technologies that are leading our industry, and this system is an example of one of our newest game-changing technologies.”

Through its global expertise and experience in ROV technologies, Oceaneering will continue to increase subsea efficiencies through the use of advanced piloting, communication, and tooling offerings. By introducing new ROV-based capabilities and improving on existing technologies, Oceaneering is redefining the role of ROVs in today's industries – including being the first in the industry to provide high-definition (HD) video in subsea operations. With the success of the E-ROV system, Oceaneering is confident that this innovative technology will further the development of more advanced and highly capable resident ROV systems that will continue to reshape the marketplace.



Courtesy of Oceaneering

# INCREASED FLEXIBILITY AND EFFICIENCY FOR SUBSEA OPERATIONS

## THANKS TO IXBLUE'S INS

### A COMPLETE RANGE OF FIELD-PROVEN INS

Leveraging state-of-the-art expertise in inertial navigation technologies, iXblue, a global leader in the design and manufacturing of state-of-the-art navigation and subsea positioning solutions, is constantly striving to think of new innovative systems and develops cutting-edge technologies to meet its customers' ever evolving demanding requirements in terms of operations efficiency.

iXblue has thus developed a complete range of field-proven subsea inertial navigation products that are recognized for their reliability and unrivaled performance and that offer a very flexible solution, suited for a wide range of subsea operations.

Since the introduction of the Phins INS at the turn of the century, new products have been developed by iXblue in order to offer a comprehensive range of products covering the full spectrum of subsea operations. Striving to be at the forefront of navigation technology, iXblue has kept developing its expertise and iXblue's devices and algorithms technology has been constantly pushed further to improve the overall performance of the products.



iXblue's Rovins Nano has been especially designed to suit the challenging needs of ROVs experts performing subsea operations (Courtesy of iXblue)



## IMPROVED INS PERFORMANCE

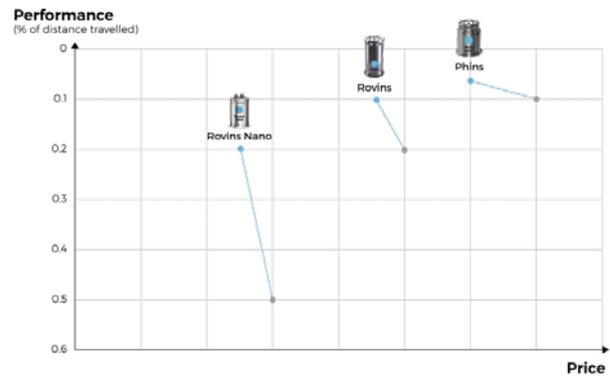
The Phins and Rovins INS have thus had their performance analysed based on a large history of DVL calibrations. For Phins, the specification for drift when DVL aided has thus changed from 0.1% distance travelled to 0.05%, while Rovins goes from 0.2% distance travelled to 0.1%.

iXblue's Rovins Nano specification changes also now include improvements in the accelerometers used within the product which allows for various improvements such as heading specifications that are now of 0.15° instead of 0.5°, a pitch and roll of 0.05 compared to 0.1 previously, as well as a DVL aided drift of 0.2% distance travelled instead of previous 0.5%.

## FOCUS ON ROVINS NANO, A COMPACT AND COST-EFFECTIVE INS FOR ROV NAVIGATION

The entry level product in iXblue complete range of inertial navigation products is Rovins Nano, dedicated to ROV navigation. Offering attitude stability, it provides accurate positioning of the ROV (with a drift of 0.2% of the travelled distance) and can go to depths reaching 4,000 meters. With a heading accuracy of 0.15 degree secant latitude, iXblue's Rovins Nano offers a competitive advantage to its users with an entry class focus.

Compact and light-weight, Rovins Nano allows for precious space savings onto ROVs, enabling them to accommodate various heavy ROV tooling. iXblue's entry level INS

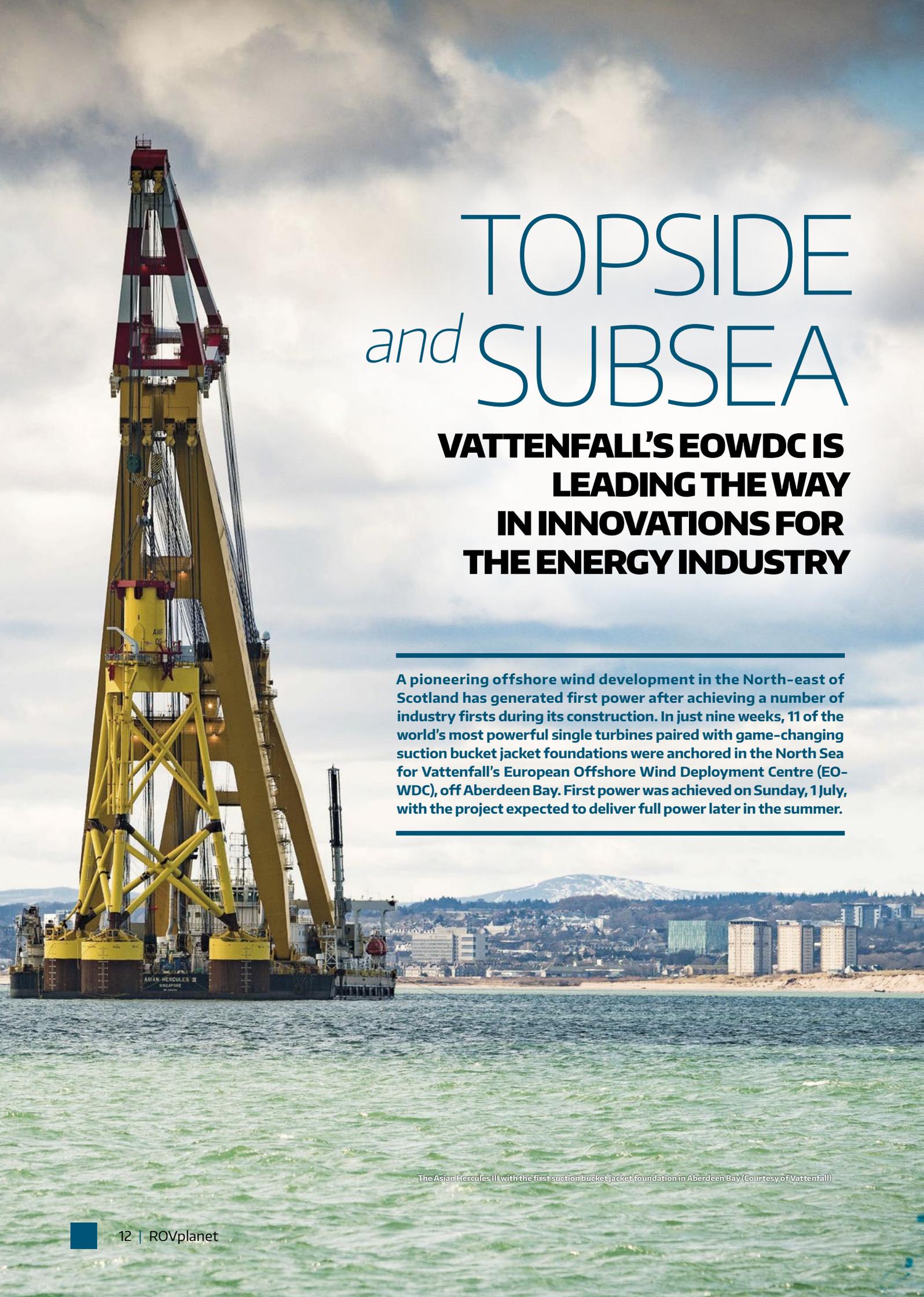


iXblue's devices and algorithms technology has been constantly pushed further to improve the overall performance of the products

thus allows for more responsiveness and flexibility during subsea operations as ROVs can conduct various operations without having to be recovered on deck between each task, saving precious vessel time and allowing for important productivity and costs reduction.

iXblue's Rovins Nano, compatible with both iXblue and third-party acoustic positioning products offers customers operating on the challenging offshore market with a versatile inertial navigation solution that can be suited for any subsea construction operation. User-friendly, it offers valuable time savings in terms of configuration, installation and operational use and provides flexibility and efficiency for successful subsea operations.

PERFORMANCE TABLE	ROVINS NANO	ROVINS	PHINS
Position accuracy with DVL	0.2% travelled distance	0.1% travelled distance	0.5% travelled distance
Heading accuracy (with USBL and/or DVL)	0.15 deg	0.05 deg	0.02 deg (0.01 with GPS)
Pitch and roll dynamic accuracy	0.05 deg	0.01 deg	0.01 deg



# TOPSIDE *and* SUBSEA

## **VATTENFALL'S EOWDC IS LEADING THE WAY IN INNOVATIONS FOR THE ENERGY INDUSTRY**

---

A pioneering offshore wind development in the North-east of Scotland has generated first power after achieving a number of industry firsts during its construction. In just nine weeks, 11 of the world's most powerful single turbines paired with game-changing suction bucket jacket foundations were anchored in the North Sea for Vattenfall's European Offshore Wind Deployment Centre (EO-WDC), off Aberdeen Bay. First power was achieved on Sunday, 1 July, with the project expected to deliver full power later in the summer.

---

The Asian Hercules III with the first suction bucket jacket foundation in Aberdeen Bay (Courtesy of Vattenfall)



Boskalis was the contractor responsible for the design, fabrication and installation of the wind turbine foundations and offshore cabling, as well as the installation of the wind turbine generators produced by MHI Vestas. This scope therefore includes the subsea scope of work, together with their Subsea Cables & Flexibles division who were responsible for the cable installation.

Achieving the construction success was not without its challenges. In order to overcome the relatively shallow waters of between 19 and 30m and the difficult seabed environment to allow the project team to work around, foundation prototype and full-size installation trials were conducted. In September 2016 and January 2017, trials were undertaken to prove suction buckets could be installed in the low water depth.

ROVs were used in both trial experiments, Edda Fonn/ Reach Subsea performed the prototype campaign, and Edda Freya and Deepocean for the full-size trial campaign. The pump used on the prototype campaign required an ROV to monitor subsea pressures. All jackets were installed with an out of verticality of <0.01 degrees and the suction time for each installation was less than three hours.

For the 2018 installation work itself, the Construction Support Vessels and ROV scope were sub contracted to the EDT Jane and EDT Hercules. ROVs performed surveys, visual installation monitoring and visualisation of the rock bag installation.

For the subsea cabling work, Boskalis Subsea Cables & Flexibles used two in-house owned burial/trenching ROVs – the Trenchformer and CT-107 – while ROVOP, an independent operator of ROVs, supported as the main contractor. Cabling of 66kV was chosen for both Export and Array cables rather than the industry standard of 33kV – a first in Scotland. This reduced the number of cables and from it 132kV onshore substation at Blackdog is transmitted to the Dyce substation for further transformation to 275kV and connection to the National Grid network.

The Trenchformer was set up in both jetting and chain-cutting configuration and was deployed from the Boskalis vessel Ndurance. The CT-107 is a jetting TROV and was de-

ployed from the Boskalis vessel, Ndeavor. The cutting was primarily used in the harder geology of the site, with the jetting used in the sand layers and soft clays.

Leopard ROVs assisted with laying operations and carrying out touchdown monitoring. They were also involved with cable pull-in works, where the ROV was used for visual monitoring and assistance for tasks such as grabs for line attachment.

No ROV intervention work was required during the suction bucket installation operations as the pumps were remotely controlled from the HLV deck with no pump failures experienced across the works. There were no reports of noise disturbance from the pumps even though the closest turbines to shore were only 2.4km away.

Michael Waddle, Package Manager, said: “The shallow water meant that the achievable differential pressure was right on the limit to install the suction buckets.

“The nearshore section had difficult geology which required a lot of planning and engineering for the subsea cable installation. Some of the site area had restricted visibility, particularly around spring tides, and were at times enough to delay operations.”

Scotland’s largest test and demonstration facility will generate enough electricity to meet the equivalent annual demand of 79,209 homes and annually displace 134,128 tonnes of CO<sup>2</sup>.

The 77 metre-high, 1,800 tonne steel jacket foundations – as heavy as almost ten Boeing 747s – were installed by two of the world’s largest floating cranes, namely Boskalis’ Asian Hercules 3 and Heerema Marine Contractors’ Aegir (as sub-contractor of Boskalis). The foundations can each be installed with a single offshore lift, virtually without noise and within a matter of hours. They were lowered into the water and the upturned buckets rapidly anchored into the seabed to create a secure foundation for the turbine installation. One of the structures was installed in two hours and 40 minutes from the time the installation vessel entered the offshore site until deployment was complete.



By enabling faster and smarter installation, the technology will drive down offshore wind costs considerably, provide a further foundation option at challenging sites, whilst also allowing easier decommissioning as the installation process is reversed.

Adam Ezzamel, EOWDC project director at Vattenfall, said: "This is a magnificent offshore engineering feat for a project that involves industry-first technology and innovative approaches to the design and construction.

"What makes this even more significant is that the EOWDC is the first offshore wind project to deploy this kind of foundation at commercial scale while it's also the first to pair them with the world's most powerful turbines. By the same token, this technology has enabled a faster installation process.

"We've embraced a wide range of innovations including successfully transferring oil & gas technology in to renewables. As such, the EOWDC will help lead the industry drive towards generating clean and competitive wind energy power, and reinforces Vattenfall's vision to be fossil fuel free within one generation.

"It has not all been plain sailing, however. Throughout construction, the project team and our contractors have encountered, tackled and resolved a number of challenges, particularly with inhospitable seabed conditions and inclement weather. It is therefore full credit to their expertise and engineering know-how, as well as working collaboratively and vigorously, that this remarkable milestone has been achieved in such a short timescale."

Vattenfall has invested more than £300million in the cutting-edge EOWDC which was first conceived by Aberdeen Renewable Energy Group (AREG) in 2003. The project was awarded up to €40 million of European funding prior to

planning consent. Delays caused by legal challenges, including well-publicised opposition from the now US President Donald Trump, allowed Vattenfall to further explore new technologies and innovations.

As a result, the 92.4MW scheme evolved into a 93.2MW facility because having already commissioned the world's most powerful single turbines of 8.4MW – which saw MHI Vestas enhance its V164-8.0 MW models with internal power modes for the first time – a further advancement was made. Two of the EOWDC turbines that have further been significantly enhanced to 8.8MW, representing the first time a model of this capacity has been deployed commercially in the offshore wind sector.

Originally, the windfarm comprised approximately 33 three-bladed wind turbines with an individual capacity of up to 5MW with a tip height of 150m initially proposed. Today's project has a third of the number of turbines but these stand at 191m and are substantially more powerful. Just one rotation of a blade can power the average UK home for a day.

Another aspect of the project saw construction of a 30 metre-long, purpose-built floating crew transfer pontoon at Aberdeen Harbour – heralding a new gateway for renewables at the port. The 180m<sup>2</sup> pontoon, which is the only one of its kind at the harbour, was initially used to support construction of the EOWDC and will become a marine support base for its on-going operations and maintenance (O&M) programme.

From concept to construction, the EOWDC has successfully navigated a number of challenges. The ability to deliver innovative engineering solutions, new technologies and a number of industry firsts will benefit the renewable industry and Scotland's North-east. In addition, these breakthroughs will inform future green energy projects worldwide.

# EMPOWERING



WORLD LEADER IN UNDERWATER e-ROBOTIC SYSTEMS



**SAAB**

**SAAB SEAEYE**

THE FUTURE IS ELECTRIC

# Digital Edge Subsea



Digital Video Recording  
and Inspection Systems



Diving  
Workclass & Inspection ROV  
Platform & Pipeline Inspections  
Construction and Decommissioning

[www.digitaledgesubsea.com](http://www.digitaledgesubsea.com)

**bp** blueprint  
subsea

[enquiries@blueprintsubsea.com](mailto:enquiries@blueprintsubsea.com)  
sound by design

**oculus**

Multibeam Imaging Sonars  
Single and Dual Frequency - 375kHz to 2100kHz



**seatrac**

Micro-USBL Tracking Beacons  
Bidirectional Acoustic Data Modems



find out more [www.blueprintsubsea.com](http://www.blueprintsubsea.com)

# AQUANAUT AN AUV THAT CAN WORK AS AN ROV BY USING MOUSE-CLICKS INSTEAD OF JOYSTICKS

---

The visitors to this year's OTC in Houston may have been surprised by a humanoid ROV displayed on one of the booths that looked like one of the robot characters from the Transformers movie. However, this was not a publicity stunt by some clever PR agency, but in fact a real life product designed by a group of tech savvy ex-NASA scientists including CTO Nicolaus Radford.

---

Houston Mechatronics (HMI) was started back in 2014 by a group of people sharing a like minded vision that left NASA because they didn't want to see the robotic revolution pass by while they were sitting in a government lab. The team were responsible for the big flagship robot projects of the space agency such as Robonaut, the humanoid flown to the International Space Station and Valkyrie, the bipedal walking robot. They also did a lot of self driving car applications and were pretty instrumental when it came to the development of electrical platforms. The common theme in these projects were that NASA was interested to put robots into



Courtesy of Houston Mechatronics



Courtesy of Houston Mechatronics

remote locations and get them to do work, so they researched ways to do that both on the platform side and on the command & control side. This has a very strong analogy to working underwater.

Although none of the original core group came from the oil industry, they were still welcomed in 2014 as this was a time when the industry was really struggling and everyone was looking for ways to improve efficiency, reduce costs, and increase safety. The industry thought, and still thinks, that this can be accomplished with the use of robotics.

In 2015 Schlumberger invested into the company (and so did Transocean in 2018 recently), as they recognized the benefits of having a group of robotics experts whom are experienced in very complicated engineering in very harsh conditions and doing it in a way where you can realize the benefits of robotic assets. After doing some projects for Schlumberger the assumption was reinforced that the team's skills are best applied underwater and that is when the idea was conceived to build this autonomous underwater robotics vehicle called the Aquanaut.

Aquanaut is based on the premise that for most of the tasks performed underwater a tether is not needed. With the skill and the technology that HMI has, being able to remotely command and control robots in very remote locations, and in low communication environments. In space it is very tough to communicate with things.

"As far as I know, no-one has successfully tethered anything to Space from the Earth", joked Nicolaus Radford.

"So we had to come up with very novel and successful techniques to control remote assets where the commands are delayed or lost. Therefore we felt unconstrained on what the actual robot platform would look like. When you remove the boat, remove the tether, and you're thinking, then things don't have to look like refrigerators and dishwashers."

"The main cost driver when doing work offshore and underwater are the vessel related costs where it can cost upwards in the order of \$100,000 a day to run a boat and that doesn't include mobilization and demobilization costs. Therefore AUVs are fairly inexpensive to run compared to ROVs when you look at how many people are needed to run them, etc."

"So if we build an AUV that can do the work of an ROV, wouldn't that be the best?" concluded Nicolaus Radford.

The Aquanaut is an AUV that does work like an ROV. It has all the benefits of an AUV for data collection; it scans, inspects, and takes images. But if you want to deploy manipulators, then you can. And when you want to have an onshore operator to control them, you also can. It does this through HMI's proprietary command, control and data visualisation techniques that were developed where very

high definition video was not needed for the operator to do tasks. This could be a fundamental change for the industry.

So how does HMI achieve all of that with taking latency into account? The company has a 3D data visualization technique that allows an operator enough situational awareness to do his job; to turn that valve, to take measurements, to collect data even when there is latency involved when operating from a distance.

The Aquanaut can perform 80-90% of the tasks of a work class ROV at a depth of up to 3,000 m initially. However, this all-electric platform and the manipulator operations are different from the conventional ROVs. There are ways in which you can handle latency much easier when not directly tele-operating the robot, by giving commands to the electrical manipulators. When you are controlling a computer controlled device, it is easier to work with the robot by issuing high level commands to it, instead of using direct drive. HMI have coined the following phrase: "Mouse-Clicks, not Joysticks".

Nicolaus Radford also had some thoughts about the industry and its future: "We have been told on many occasions that this might be the most exciting thing going on in the oil & gas industry and it is a breath of fresh air and it is a perfect thing for a start-up to do to take some good risks. And I will tell you what is special about our company. It is that we don't talk about things for many years and years, we just do it. We have a good vision and we just make things happen.

"Many of the main players in the ROV industry are clearly phenomenal in what they do, but there comes a time for big businesses where they get really good at what they do because it makes them a lot of money and then it is difficult for them to pivot and disrupt themselves. But history is littered with big corporations that get taken over by technological start-ups. Of course we have the most



Courtesy of Houston Mechatronics

tremendous respect for the leading ROV companies of today but that doesn't mean that their places at the top of the food chain are going to stay forever. I mean only 14% of all Fortune 500 companies since 1955 are still here. You need to be better than good. You've got to be phenomenal. We have got big plans as we don't know any other way." shared his opinion Nicolaus.

The vision of HMI is to become a service company to own and operate their assets and to provide Robotics as a Service (RaaS), as it is called in the robotics world. They are going to collect the data, process the data, and perform the service of doing the usual work such as turning valves, doing active inspection, like cathodic protection probing, etc. with the commercialization stage starting in the second half of 2019.

And can the robot really transform itself? Yes, it is exactly how it is! The vehicle has a very hydrodynamic form to transit efficiently through water when in AUV mode. ROVs don't swim through the water very efficiently, but are very good when it comes to close manipulation and station keeping. On the other hand AUVs don't do that particularly well. So the AUV removes the ship and the ROV does the work. That is why it's called an autonomous underwater robotic vehicle, an AURV; a real transforming robot!

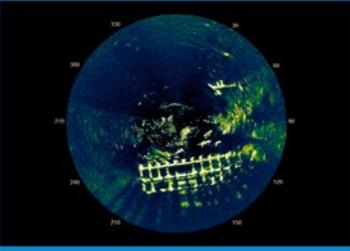


Courtesy of Houston Mechatronics

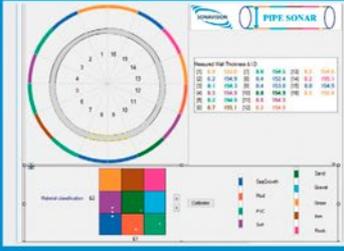


World Class Underwater Technology

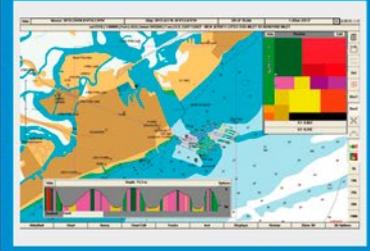
SV Sonars



SV Pipe Sonars

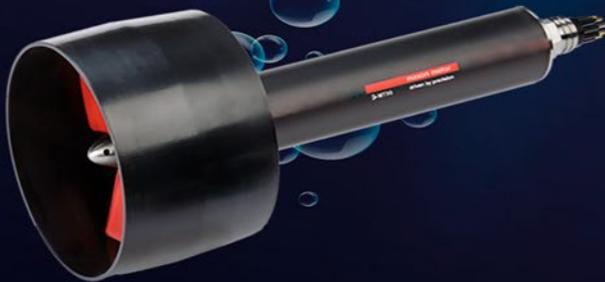


SV RoxAnn



Sonavision Ltd. • Aberdeen, United Kingdom – AB21 0GG • +44 1224 707737 • info@sonavision.co.uk • www.sonavision.co.uk

The maxon thruster.



More information about our maxon thruster can be found on our website:

[aquaticsolutions.maxonmotor.com](http://aquaticsolutions.maxonmotor.com) search



Max. depth limit of up to 6000 meters



High energy efficient of minimum 80 percent



Long service life of up to 1000 operation hours

maxon motor  
driven by precision

# ARGGONAUTS

## THE TEAM ON THE QUEST FOR DEEP SEA DISCOVERY

### USING A FLEET OF UNMANNED SURFACE AND UNDERWATER VEHICLES

Gunnar Brink, Head of Strategy and Innovation Management, Fraunhofer-IOSB  
Richie Enzmann, ROV Planet



The Water Strider USV. (Photo: © Fraunhofer IOSB / Eduard Maydanik)





Please check out our website on:  
[www.ROVPlanet.com](http://www.ROVPlanet.com)



## The Great Diver AUV

(Photo: © Fraunhofer IOSB/Eduard Maydanik)



Five Great Divers at the Fraunhofer base. (Photo: © Fraunhofer IOSB / Eduard Maydanik)

## THE XPRIZE CHALLENGE

The Shell Ocean Discovery XPRIZE is a global competition aimed at exploring and mapping the deep sea with the total prize money of 7 million US dollars. The competition is intended to promote the development of maritime technologies and thus advance deep-sea exploration.

The competition, which started back in 2016, has two rounds with only nine of the original 32 teams getting into the second round to qualify for the finals at the end of 2018. The task is challenging: each team must map at least 250 square kilometres of unexplored seabed, from the overall competition area of 500 square kilometres (this roughly equals to one third of the Greater London area) at a depth of 4,000 metres within 24 hours. In addition to that at least 10 high-resolution photos of interesting archaeological, biological or geological features must be provided. Furthermore, no persons are allowed in the competition area, which means that the drones must be controlled completely autonomously, and all the necessary equipment must fit into a standard 40ft container.

## THE ARGGONAUTS SOLUTION

Team Arggonauts is based in Karlsruhe, Germany and headed by Dr. Gunnar Brink of the Fraunhofer Institute for Systems Engineering, Optronics and Image Analysis (IOSB). It is interesting to note that both Karl von Drais, the inventor of the "two wheeler", and Karl Benz, the inventor of the automobile were born here and two of the main car manufacturers; Porsche and Daimler-Benz also have their headquarters in South West Germany. Thus it is not surprising that Fraunhofer builds on the region's heritage of manufacturing characterised by high quality, large volumes, but at affordable costs. Arggonauts also builds on the expertise of the region and on the over 10 years of experience of the Fraunhofer-IOB in developing underwater vehicles.

The swarm of deep-sea robots developed for the competition is based on two successful pilot projects already completed by the institute. The first project, "TieTek", focused on the basic technologies required to create modular, pressure-tolerant, deep-sea autonomous AUVs. This led to the second project, "DEDAVE", in which scientists created a commercially viable deep-diving AUV and carrier platform. Fraunhofer researchers are now busy modifying and optimizing this technology to create the Arggonauts swarm, paying particular attention to vehicle dimensions, data processing and sensor systems. The carrier system has also undergone a complete transformation: conventional exploration robots require large, expensive mother ships to deploy and recover them at the mission site, but the Arggonauts simply make do with small, autonomous carrier vehicles. "That opens up the perspective of a radically cheaper technology that could be used more widely, potentially allowing it to be deployed on behalf of medium-sized companies, environmental organizations and research institutes", team leader Brink explains.

To tackle the challenges of the XPRIZE, Arggonauts aims to develop unmanned surface vehicles (USV) and autonomous underwater vehicles (AUV) that act as a swarm. This approach of using a swarm of 5 AUVs and 5 USVs makes it possible to cover the entire competition area within 24 hours, because with the currently available sonar technologies it would be impossible to do this using only one vehicle. The Arggonauts have named their AUV the "Great Diver" and their USV the "Water Strider". The Water Striders are inflatable catamarans used as support vehicles for the Great Divers, with the task of pulling them to their location so that their batteries can be minimised.

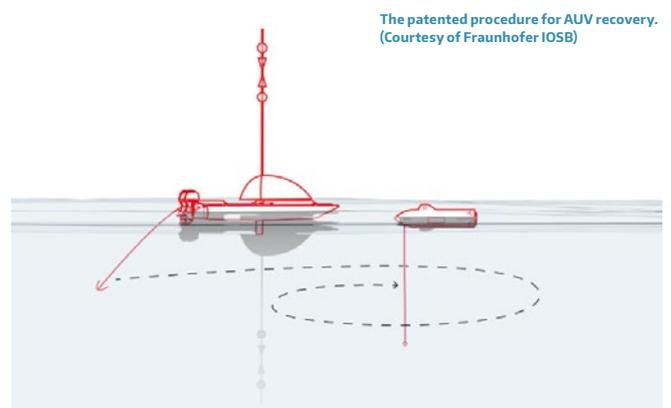
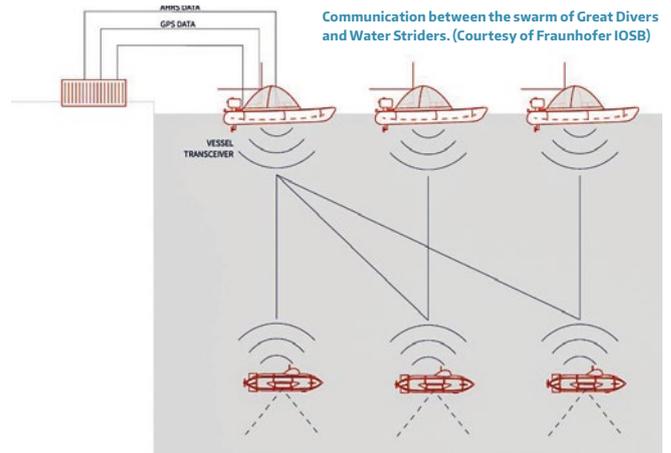
The Great Diver is a relatively small deep-sea vehicle with a length of 2.6 m and weighing only 340 kg. The body is mostly free-flooded with the exception of a titanium pressure enclosure in the body of the vehicle that uses the CANBUS com-

munication system to save on the costs and weight, and to reduce the size of the cable looms. The synthetic foam provides the buoyancy for the body and is propelled by a thruster connected to a pressure neutral drive electric engine with a maximum power of 900W and steered via rudders.

One of the Great Divers is equipped with a powerful, pressure-neutral, flat LED flash system and four special on-board 20 MP cameras. These cameras have lenses that were especially developed by ZEISS for the XPRIZE competition. The use of several cameras allows the capture of 3D images and this enables a so-called spatial filtering during the post-processing of the images. The software removes disturbances, such as "marine snow", which are located between the camera and the object.

With the UW Distagon 2.8/12, we built a lens that can withstand the extreme conditions in the deep ocean," says Till W. Bleibaum, who is responsible for the ARGGONAUTS project at ZEISS. "The lens must be extremely reliable and sturdy, while the individual parts must remain firmly in place." Unlike what you find on standard camera lenses, Bleibaum and his team decided on a fixed aperture and a lens focus that cannot be moved. "This way we ensure that, in the event of abrupt movements and vibrations, no optical element shifts and the lens always delivers the same excellent image quality." ZEISS also tailored the optical design to accommodate the conditions deep below the ocean surface. Development took more than six months. "Our lenses were used during the first moon landing, and now we are pleased to make an important contribution to deep ocean exploration with our optical knowhow," says Bleibaum. "We are very excited to see what our lenses capture down below."

The hydrographic images and maps of the deep sea based on the survey of the seabed are created by the software Qimera from QPS/Saab. As soon as the AUVs and USVs have completed their mission and collected all the sensor information, Qimera is being used. First, the raw data collected by the ITER systems Bathyswath sonar on board the AUV is transferred to the software where it is pre-processed. Then the maps of the seabed are created on a computer. The result can be optimized by the skilful selection of further processing steps into ESRI format. The ESRI ArcGIS



The Great Diver AUV. (Photo: © Fraunhofer IOSB / Eduard Maydanik)





The Great Diver AUV at sea trials. (Photo: © Fraunhofer IOSB / Eduard Maydanik)

online format is required by the XPRIZE foundation. Finally, the result is transferred to a digital card format and made available for other purposes.

Through the surveying process, data from the different imaging, measurement and localization devices – which are all suitable for the deep sea environment – must be combined to achieve a correct and meaningful result. In order to be able to do this, Qimera can process the results through the available sensors. Thus, the software offers a collection of manual and (semi-)automatic tools and algorithms, to make the user's work easier. The functions are constantly expanded and adapted to the current state of research. The team has chosen Qimera because it is more up to date compared to other more traditional hydrographer software, it generates nice DGM, and has good filters for cleaning the data.



Arggonauts team leader Dr. Gunnar Brink (Courtesy of Fraunhofer IOSB)

The Water Strider design is based on the Ducky inflatable foldable sailing catamarans, in simple terms – the yacht from the backpack. This catamaran was further developed by adding propulsion, advanced communications and unmanned capabilities to it to make it suitable for transporting, launching and retrieving the Great Diver and to serve as an air/water transmission station between the AUV and the onshore control station.

### NAVIGATION AND COMMUNICATION

The Great Divers are navigated by means of inertial navigation systems (INS) (with optical ring gyros), USBL and an inverted moving LBL algorithm, which can determine the vehicle's position with an accuracy of up to 0.60 m at a depth of 4,000 m. The SprintNav 300 (INS) from Sonardyne contains the SPRINT INS sensor, Syrinx 600 kHz DVL and a highly accurate pressure sensor in a single enclosure.

The Arggonauts use the Evologics' acoustic modem S2C R 7/17 to establish communication between the Great Diver and the Water Strider. The Great Divers form a formation under water, which is accompanied on the surface by the Water Striders.

This means that the Great Diver is always as directly as possible underneath the associated Water Strider. Acoustic signals are sent with identical modems from the Water Strider to the sea floor and thus to the Great Diver. The Great Diver's acoustic modem can detect these signals and allows the distance between the two vehicles to be calculated and information to be transmitted to the Great Diver. The acoustic underwater modem S2C R 7/17 enables data transfer of up to 6.9 kbit/s over a distance of up to 8,000 meters. The frequency band ranges from 7-17 kHz. The modem of each diving vehicle also includes an atomic clock and thus offers a uniform system time and the possibility to measure the Time of Arrival distance for a one-sided, unreturned transmission.

After completing the mission, the Great Diver begins to send out signals indicating its position. For this, the Automatic Identification System (AIS) is used, a radio system that improves the safety and control of shipping traffic through the exchange of navigation data and other information from the ship, and which has been adopted by the International Maritime Organisation (IMO) as a binding standard. These signals serve as a warning to other ships that may be in the same area, in order to avoid collisions. They also enable the Water Strider to find the Great Diver autonomously – even in high tides – and return to the coast.

### INNOVATIVE RECOVERY APPROACH

When the Great Diver reaches the surface it unrolls a 30m long line with a weight attached to the end of it to make sure it doesn't slack. The Water Strider lowers another line that is 25m long but with an anchor and locking mechanism attached to its end. In order to begin the recovery, the Water Strider begins to circle above

the Great Diver until the anchor catches its vertical line, and when caught, the locking mechanism is activated and the Water Strider can tow the Great Diver back to the base.

### CONCLUSION

The idea of a swarm approach enables the Arggonauts to overcome the challenges of the competition. Despite the relatively small size of the vehicles used, it is now possible to chart very large areas. With the swarm approach, the number of vehicles can be varied as required, depending on the area to be covered. The autonomous return system and the communication system allow an uncomplicated use of the swarm. Due to its small size and low weight, the transport and operation costs are significantly reduced compared to large research vessels. This reduction in costs will hopefully enable further progress of deep-sea developments.

### ACKNOWLEDGMENTS

The authors would like to thank the Fraunhofer Executive Board and our sponsors Evonik, Hays, Zeiss, QPS, Storymaker and Dell.



27 - 29 NOVEMBER  
2018

MARINA BAY SANDS  
SINGAPORE

[www.osea-asia.com](http://www.osea-asia.com)

OSEA is the largest oil & gas event for Asia that has consistently attracted high international participation. New for this year is the Gas Pavilion, dedicated to all movers and shakers in the gas sector. Join more than 1,000 leading exhibitors at OSEA2018 and make use of this well-established platform to reach out to over 12,000 buyers from the region.

Contact our sales team at  
[enquiry@osea-asia.com](mailto:enquiry@osea-asia.com) to find  
out more about exhibiting options.

# THE GATEWAY TO ASIA'S OIL & GAS INDUSTRY

Held alongside:



  #OSEA2018

Organiser:



UBM

Tel: +65 6233 6688  
Fax: +65 6233 6633  
Email: [enquiry@osea-asia.com](mailto:enquiry@osea-asia.com)

Endorsed:



Approved International Fair



Supported by:



SINGAPORE EXHIBITION  
& CONVENTION BUREAU

Held in:



**Singapore**  
Passion Made Possible

# ROV PILOT TECHNICIAN

## Training for professionals

We provide innovative professional training courses for the marine industry that meet the highest standards.



### The features of our TRAINING

Our trainees receive a thorough ROV Pilot education along all over the courses, which includes a professional development module program with experts from across the marine industry to enhance your understanding, achieve and develop the professional skills required for a successful career as a commercial ROV Pilot.

Our training develops part of the ROV practical training Modules on-board a Multipurpose Supply Vessel performing real operations in onshore and Offshore waters found in the industry.

QSTAR is known throughout the world for the high standard of training it provides. Our unique training philosophy aims not only to achieve excellent test's results, but also to build a solid foundation of knowledge that will enable you to progress to basic, intermediate and advanced ROV training – and beyond to an ROV Pilot career..



+34 619 686 473



# COMPANY PROFILE: QSTAR SUBSEA SOLUTIONS

## FULL RANGE OF SERVICES FOR THE MARINE INDUSTRY AND SUBSEA ENGINEERING PROJECTS



15-Ton Anchor Search & Recovery (Courtesy of QSTAR Subsea)

**Founded in 2007, QSTAR - ROV Training & Subsea Solutions, located in Barcelona & the Canary Islands (Spain) is an international marine and subsea services provider that offers effective solutions to the offshore and inshore industries. It has taken part in projects worldwide supplying highly qualified personnel, work vessels, geophysical & hydrographic survey equipments, and a fleet of ROVs with a broad range of tooling/sensors.**

QSTAR operates following a philosophy that is based in the quality of the services provided and in the special attention to safety aspects concerning staff and equipments. Since the very beginning QSTAR has provided the platforms to perform oceanographic research & subsea surveys for government agencies, which have led the company to become a reference point in underwater robotics, including R&D, marine surveys, ROV operations inshore & offshore, and ROV training activities.

The QSTAR team are committed to their projects. They ensure professionalism in all activities they engage in by allocating the right resources responsibly to deliver the successful end result. The highly qualified and experienced team of Subsea Engineers, ROV Instructors, and Supervisors are ready to take on any project requested onsite, related either with ocean research, oil&gas, subsea construction, marine surveys and other industries.

### **QSTAR SUPPORT A VARIETY OF SERVICES, INCLUDING:**

- | ROV Operations
- | Subsea and Surface positioning
- | UWILD Inspections
- | Non-Destructive Testing (NDT)
- | ROV Pilot Training & Commissioning projects
- | Global Communications, Pipe & Cable tracking
- | Marine Surveys (SBP, SSS, MBES)
- | Drill Support, Subsea Construction
- | Mooring & Underwater structures inspections
- | Emergency Intervention & Recovery Operations
- | Subsea Engineering Projects
- | Oceanography and Marine research
- | Support in Salvage & Diving operations
- | Archaeology Projects
- | Underwater Documentary Films
- | Fish Farms & Dams Inspections

# THE PROJECT HIGHLIGHTS OF QSTAR SUBSEA SERVICES



Wind turbine installation and site survey supported by QSTAR on the Esteyco ELICAN Project (Courtesy of QSTAR Subsea Solutions)



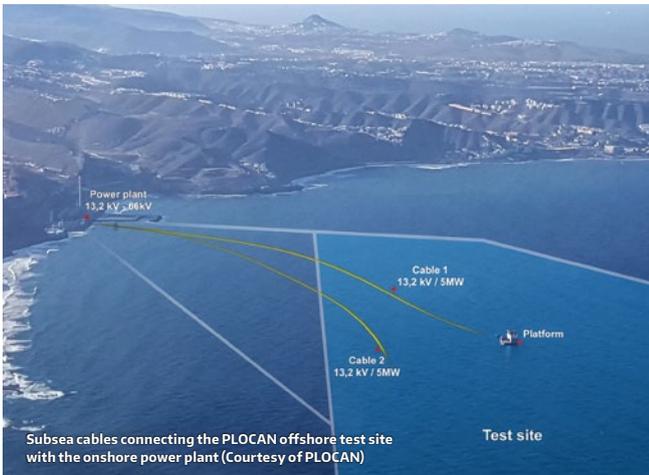
Wind turbine installation and site survey supported by QSTAR on the Esteyco ELICAN Project (Courtesy of QSTAR Subsea Solutions)

## THE ESTEYCO ELICAN PROJECT

The Esteyco ELICAN Project is the first bottom fixed offshore wind turbine in Spain and in all of southern Europe, and indeed the first one in the World ever that was installed without the need to use heavy-lift offshore vessels or cranes. This is a groundbreaking step which paves the way towards new capabilities for low cost deep offshore wind in the future.

After eight years of development, Esteyco moved a step further in the demonstration of its revolutionary substructure system for offshore wind turbines, with the construction of a full-scale operational prototype at Gran Canaria, Canary Islands.

QSTAR supported the project with personnel and ROV equipment to survey the full process of the wind turbine installation onsite. It was a challenge for the QSTAR ROV team as this project required a very good coordination of resources and working together with all the companies involved in the final process.



Subsea cables connecting the PLOCAN offshore test site with the onshore power plant (Courtesy of PLOCAN)

## ROV SURVEY & POSITIONING FOR SUBSEA CABLE INSTALLATION AT PLOCAN

QSTAR supervised the complete installation of the subsea cables for a 15MW subsea electrical and communication infrastructure hub that will allow the connection of further marine technologies testing offshore during their demo stage. This infrastructure is connected via two subsea cables that are berthed and are installed at 40m water depth and located at the PLOCAN Test site approximately 2km offshore. The facility will be a hub between marine devices and the national grid on land. It consists of two submarine medium voltage hybrid cables (a 13.2kVac cable for the distribution of electric power, optical fibre for communications, and a 400Vcc cable for feeding the auxiliary equipments).

The ROV Survey was performed real time to provide high resolution video and accurately geo-referenced positioning data to the client during the cable installation. QSTAR provided a Multipurpose Work Vessel, a Light Work Class ROV with subsea & surface positioning systems, and ROV personnel for the operation.



The QSTAR Subsea Solutions team getting ready to deploy the L3 Perseo GTV ROV to support the subsea cables installation at the PLOCAN offshore test site (Courtesy of QSTAR Subsea Solution)

## 15-TON ANCHOR SEARCH & RECOVERY

A mooring search and recovery was performed by QSTAR with two ROV systems deployed at the depth of 120 meters. First, a Class II multipurpose Light Work Class ROV was used to conduct the seabed search for the mooring anchor location. Once that was found, the second ROV equipped with a hydraulic manipulator started the recovery process passing a guide through the chain shackle in order to start lifting it.

Monitoring and working with both ROVs at the same time was essential for this rescue operation as the sea conditions were not ideal with heavy currents and changing sea-floor sediment being present. However, QSTAR managed to recover the mooring anchor successfully.

### OFFSHORE GEOPHYSICAL & SEABED SURVEY FOR A “RIG MOORING TEST”

A 6x6 km survey area was conducted at around 1,000 meters of water depth. The aim of this study was to obtain seabed information for the anchoring zone of a drilling platform and dynamic positioning tests were also conducted in the area. The most suitable acreage had to be located to deploy the anchor and then to identify other mooring & anchor locations.

There where two different vessels used for the complete survey. One DP vessel was used to perform the geophysical surveys and a second vessel for the ROV survey of the area. The survey consisted of three main steps. First, a multi-beam (MBES) and pinger survey conducted along the entire route centre line to provide initial bathymetric information to the client. Then a geophysical survey was conducted where side-scan sonar (SSS), sub-bottom profiler (SBP), and multibeam data were acquired. Finally, the ROV survey was performed on targets that were detected during the pre-survey and required a closer follow-up inspection.

### ROV COMMISSIONING PROJECT ONSITE IN SUDAN

This ROV commissioning project was successfully delivered by QSTAR following the IMCA guidelines and company requirements. It was assured that the ROV system and components where designed, installed, tested, operated, and maintained according to the operational requirements of the client. This commissioning process was not only applied to a new ROV system but also for existing ROV units the client had and this project included the systems expansion, upgrading or revamping of those systems.

### ONSITE ROV PILOT TECHNICIAN TRAINING COURSES

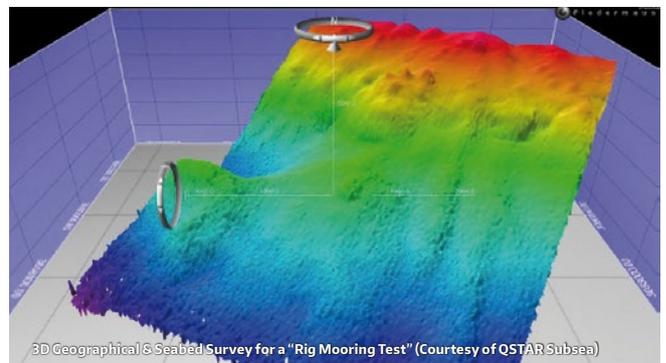
An onsite ROV Pilot Technician training course was delivered successfully for the Diving & Rescue Division of the Colombian Army, which have acquired a complete new ROV system for their projects. Also, recently, another onsite ROV Pilot Technician training program was delivered to INAPESCA, the Oceanographic Research Institute in Mexico, on board their Oceanographic research Vessel that was equipped with a full Work Class ROV system and TMS.



15-Ton Anchor Search & Recovery (Courtesy of QSTAR Subsea)



15-Ton Anchor Search & Recovery (Courtesy of QSTAR Subsea)



3D Geographical & Seabed Survey for a “Rig Mooring Test” (Courtesy of QSTAR Subsea)



Onsite ROV Pilot Technician training program delivered for the Oceanographic Research Institute, INAPESCA, on-board their Oceanographic Research Vessel in Mexican waters (Courtesy of QSTAR Subsea)

For more information about the QSTAR subsea solution services you visit their web site at: [www.qstar.eu](http://www.qstar.eu)



# EURONAVAL

EXHIBITION | PARIS LE BOURGET

23 > 26  
OCTOBER 2018

22 OCT. | CONFERENCE | PARIS



euronaval.fr

50 YEARS

//// Your Sales Contact ////

Tel : +33 (0)1 56 59 15 15 • sales@euronaval.fr

# TELEDYNE BENTHOS ACOUSTIC MODEMS MEET NATO'S NEW JANUS INTEROPERABILITY STANDARD

---

On May 21–25, Teledyne Benthos took part in a 5-day JANUS Interoperability Fest hosted by the NATO STO Centre for Maritime Research and Experimentation (CMRE), based in La Spezia (Italy), at which various vendors tested their JANUS protocol capabilities. The Teledyne Benthos UTS-9400 deck box and ATM-900 Series Modems were tested, and proved their ability to provide an interoperable real-time implementation of the JANUS protocol utilizing commercial-off-the-shelf acoustic communication (ACOMMS) hardware.

---

Subsea ACOMMS technology has come a long way over the past two decades, and is now commonly used as a primary communication and data link to the vast proliferation of autonomous underwater vehicles (AUVs). Although there are a number of commercial communication solutions and protocols available, until recently, there has not been a set standard to ensure the interoperability between equipment from the various ACOMMS manufacturers.

To address this need, over the past ten years the Centre for Maritime Research and Experimentation has been leading the efforts to develop a digital underwater coding standard

aimed at providing a baseline common denominator for underwater acoustic communications. This new standard is called JANUS, named after the Greek God in control of beginnings and transitions. As of March 2017, JANUS is now recognized as a NATO standard referred to as STANAG, a Standardization Agreement by all the NATO Nations.

According to a recent CMRE press release, once adopted globally, JANUS can make military and civilian, NATO and non-NATO devices interoperable, providing them all with a common language with which to communicate and arrange to cooperate. Put simply, JANUS is an interoperable marine radio channel 16 for digital underwater communications devices. Over the past several years, the standard has been extensively tested at sea in exercises involving a number of partners (universities, industries and research institutions) covering a range of application scenarios.

Ken Scussel, Acoustic Communications Engineering Manager, adds: "Teledyne Benthos acoustic modems have been used extensively for many years for defense applications, particularly for underwater wireless communications requiring high reliability. We're incredibly pleased that our collaborative effort to conform to the new JANUS standard has been successful, and we look forward to the potential applications that this new protocol will unlock to further advance the utilization of ACOMMS for critical NATO and non-NATO applications alike."



# THE PREMIER EVENT FOR THE WORLD'S GAS, LNG AND ENERGY INDUSTRIES

**VISIT FOR FREE** AND EXPLORE  
1,000'S OF PRODUCTS, SERVICES  
AND TECHNOLOGIES FROM THE GAS,  
LNG AND ENERGY VALUE CHAIN.



Interact with the products and services on display by the world's leading gas and LNG companies



Network with thousands of strategic & technical professionals across the energy value chain



Visit the poster zone showcasing the smartest innovations and technologies in the gas, LNG and energy sector



Take the opportunity to network with your peers at the many on-floor receptions all week



Participate and interact with the many on-floor demonstrations

# Gastech

EXHIBITION & CONFERENCE

30TH EDITION

17 - 20 SEPTEMBER 2018  
BARCELONA, SPAIN

**30,000**

INTERNATIONAL VISITORS

**15**

EXHIBITING COUNTRY PAVILIONS

**700**

INTERNATIONAL EXHIBITORS

**6**

INDUSTRY ZONES

**50,000**

SQM EXHIBITION SPACE

**11**

NOCs

**3,500+**

STRATEGIC & TECHNICAL DELEGATES

**7**

INDUSTRY IOCs

**350+**

SPEAKERS

**15**

ON - FLOOR RECEPTIONS

**REGISTER FOR YOUR FREE EXHIBITION PASS ONLINE NOW**

[WWW.GASTECHEVENT.COM/ROV1](http://WWW.GASTECHEVENT.COM/ROV1)

Platinum Sponsors



EPCI Partner



Gold Sponsors



Silver Sponsors



Hosted by the Spanish Gastech Consortium



Official Knowledge Partner



Co-located with



In association with



In partnership with



Organised by



# ROVING BAT ROV

## THE RIGHT SOLUTION FOR HULL CLEANING AND OTHER UWILD\* APPLICATIONS

\*UWILD = Underwater inspections in lieu of dry-docking

### SUMMARY

ECA Group, specializing in robotic unmanned systems for over 60 years, has developed the ROVING BAT, a specific ROV solution to meet 100% of hull examination requirements as specified by international classification societies (IMO or IACS). In context of the Oil & Gas business, this solu-

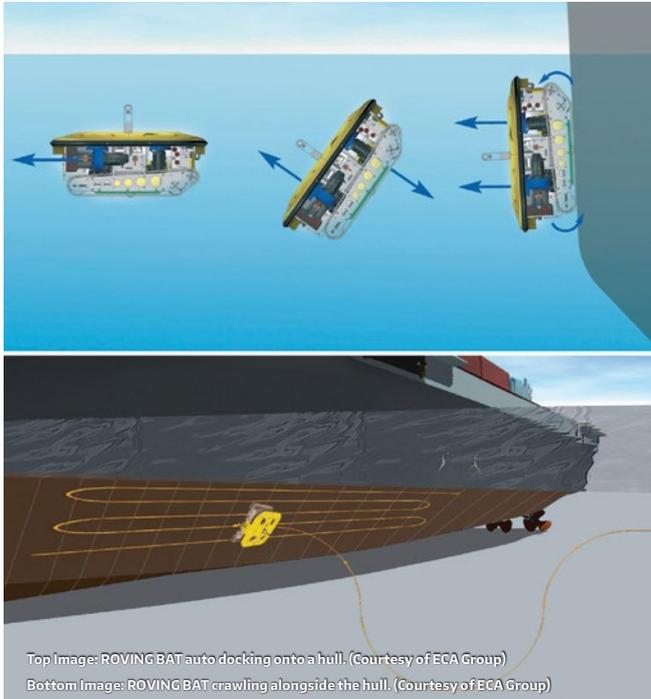
tion is by far more efficient and safe than traditional UWILD methods. Typical interventions are Inspection, NDT measurements and Cleaning. This article will feature a FPSO hull cleaning and inspection operation performed offshore Brazil in early 2018 by Petrus.



The ROVINGBAT. (Courtesy of ECA Group)

## UWILD – A PREVAILING METHOD

UnderWater Inspections In lieu of Dry-docking are now prevailing around the world, for obvious economic reasons. However, they are strictly controlled by international classification societies, since they are required to ensure the structural and operational integrity of any marine asset throughout its operational life span.



## PRESENTATION OF THE ROVING BAT

ROVING BAT is a hybrid Remotely Operated Vehicle combining a traditional ROV with a crawler, providing, with its 8 powerful thrusters (4 horizontal, vectored and 4 vertical), a very strong thrust, and equipped with two sets of motorized tracks.

The roving bat swims from the launching point to its target: the ROV embarked sonar system helps this diving-to-docking process in case of harsh environment and/or turbid waters.

When close to the hull, it automatically tilts/rolls onto the hull thanks to its software guided auto-docking, permitting non-skilled operators to achieve this delicate operation ; it thereafter sticks firmly onto the hull, its 4 vertical thrusters securing a much stronger adherence than that offered by magnetic systems.

Then it crawls along it to perform the close inspection and/or cleaning tasks; when necessary, additional thrust from the 4 vectored thrusters helps manoeuvring.

The current ROVING BAT is the result of a long evolution which started in 2006 on Petrobras request for a ROV that could crawl along its FPSO hulls to run close inspections and UltraSonic measurements, hence the successful design for the first ROVING BAT. Then in 2010 came the increasing

demand for local cleaning of the hull: ECA Group started a study of several cleaning techniques, going from mechanical brushing to water jetting and finally adopted the cavitation, in close cooperation with the Cavidyne company. In 2017, ECA Group upgrades the ROVING BAT by incorporating two additional horizontal thrusters, which are of great help for cleaning operations in strong currents: the combined push from crawler plus thrusters secure an impressive thrust.

ECA Group assess that the ROVING BAT solution is by far more efficient than other traditional UWILD methods, such as divers, conventional ROVs or magnetic crawlers. Indeed, ECA Group recalls the traditional method drawbacks:

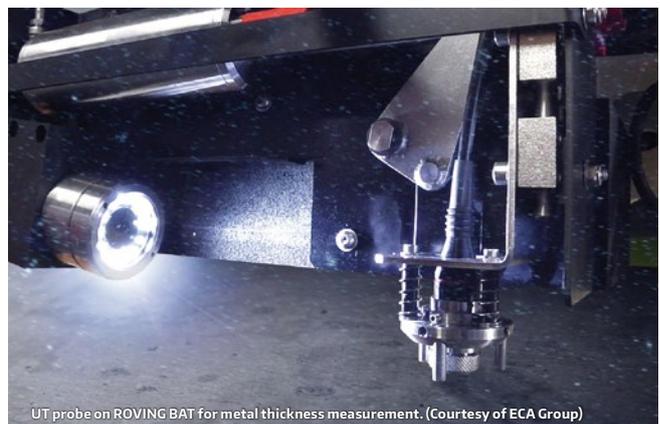
- | The divers can't approach the hull in case of rough or turbid seas, present safety hazards and have poor efficiency, hence they generate high costs.
- | The traditional inspection or work class ROVs can't remain at close contact with the hull and are inoperable in case of rough seas.
- | The magnetic crawlers need manual handling for docking on hull and face possible loss of magnetic adherence in case of significant marine growths and/or hull irregular shape.

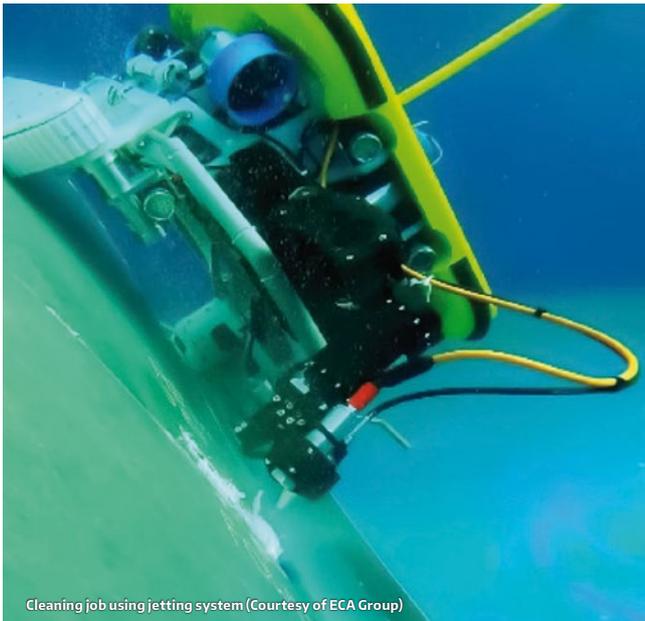
## INSPECTION

ROVING BAT is particularly well equipped in terms of: Viewing system with a colour zoom TV camera with panoramic viewing through a dome, a wide angle B/W- TV camera with built-in LED ring, and two powerful LED headlights. Sensors indicating heading (with auto heading function), pitch & roll, depth gauge (with auto depth function) and odometer for crawling mode. Optionally, it incorporates a sonar and a digital still camera. The main inspection applications are related to the underwater hull and the sea chests.

## NON-DESTRUCTIVE MEASUREMENT

ROVING BAT embarks a NDT unit installed at the back of the vehicle, which incorporates: a cathodic protection measurement probe, a metal thickness measurement UT probe which controls the hull thickness, so as to validate the conformity of the vessel, verify the structural integrity and assess the level of corrosion and wear.





Cleaning job using jetting system (Courtesy of ECA Group)

## CLEANING

There are two cleaning methods proposed as alternatives. One is the traditional jetting system where:

The ROV then incorporates a 5 function electric manipulator arm equipped with a stainless steel cleaning nozzle aside to a micro colour TV camera.

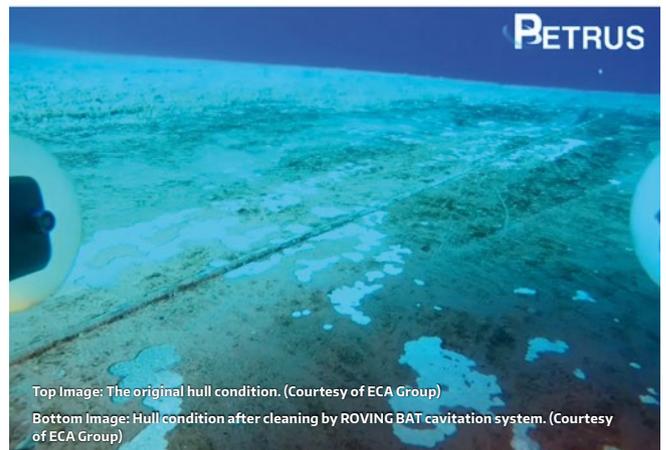
This arm is also extremely useful for access into restricted areas ; it can also be equipped with a laser pointer for 2D measurement.

The optional CaviBlaster Gun can also be installed on the arm in place of the jetting system in order to increase significantly the power and efficiency of cleaning in confined areas. The CaviBlaster gun is then connected to the (here-under described) Double Dome Cavitation HPU connection.

The other solution is the double dome cavitation system, where the ROVING BAT is equipped with a high-pressure water power unit generating cavitation at the end of proprietary nozzles. The system cleans the hull using the energy released by the implosion of the bubbles during the cavitation process, causing the marine growths to be removed from the surface. Each dome incorporates rotation nozzles which, besides performing an excellent cleaning job, create a vortex effect, hence increase the ROV adherence to the hull.



Double dome cavitation system. (Courtesy of ECA Group)



Top Image: The original hull condition. (Courtesy of ECA Group)

Bottom Image: Hull condition after cleaning by ROVING BAT cavitation system. (Courtesy of ECA Group)

## THE PETRUSTECH EXPERIENCE

The Petrus Group is a major service company devoted to Offshore Oil and Gas. It leads the way in provision of key services to support the International Energy Industry. Petrustech Oil & Gas LTDA won a tender for the overall inspection of a FPSO laying off Brazil coasts. For this operation it successfully used a Roving Bat equipped with the double dome cavitation system.

Further to this job, the Petrus Group offers section services/diverless UWILD solution integrating the ROVING BAT Hybrid ROV.

“Our Multi-Purpose Hybrid ROV allows unparalleled flexibility and efficiency in UWILD operations. Able to perform standard ROV observation, fly-by inspection of the hull, hull cleaning, hull thickness gauging and ICCP testing, this is a game changer in diverless solutions, far beyond what the current market has to offer” says Daniel Schmidt, Chairman of Petrus Group.”

“We successfully experienced Roving Bat end 2017 on a comprehensive class related inspection task (i.e. cleaning, inspection and hull gauging, as per IMO requirements) on an FPSO off the coasts of Brazil.”

“The ROV was deployed directly from the FPSO, hence we didn't need any support vessel.”

We particularly appreciated the vehicle efficiency in terms of hull cleaning : we can quote that, including the ROV positioning on the selected spot, the cleaning of marine growths and the thickness measurement: the performance of this hybrid ROV is far above what you can achieve with divers.

“A crew of 4 persons were mobilized for the job, three on the Roving Bat, and one specifically attending the Caviblaster equipment.

“Although I didn't have the chance of comparing, within the same environmental conditions, the Roving Bat with magnetic vehicles, I feel Roving Bat is better, in terms of adherence on the hull and efficiency.

I also want to report that we did beneficiate of a very good technical support from ECA Group.

In conclusion, I assess that Roving Bat is technically the best equipment currently available on the market for hull inspection”

### ABS REQUIREMENTS REGARDING UWILD OPERATIONS

All international classification societies have specified stringent requirements regarding the UWILD operations in terms of hull examination and cleaning.

### Specifically, the ABS requirements are:

1

#### FOR HULL IN WATER INSPECTION

- | A general examination of 100% of underwater hull including rudders, propellers, propeller shaft clearances
- | Close visual examination of critical areas
- | Corrosion protection potentials check and anode survey
- | Splash zone examination

2

#### FOR HULL IN WATER MEASUREMENT

- | the cathodic protection
- | the hull thickness measurements

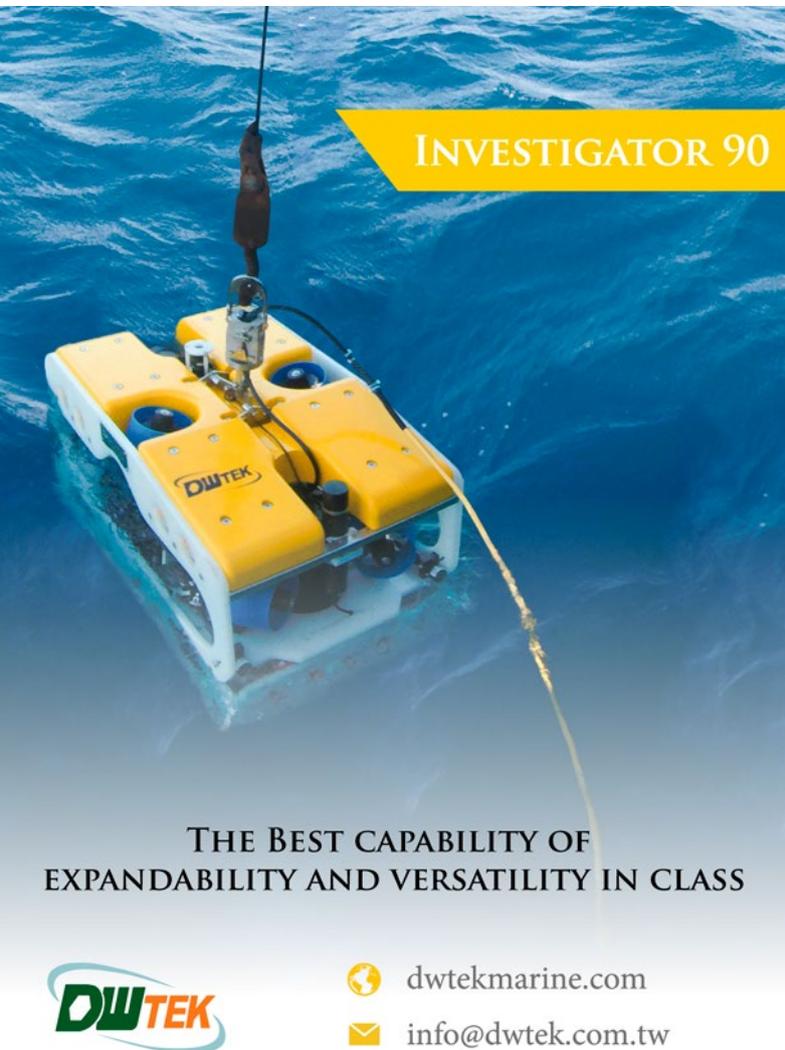
3

#### FOR HULL IN WATER CLEANING

- | spot cleaning
- | or extensive cleaning

### CONCLUSION

As feedback from recent operations conducted on FPSO hulls by our clients with this ROV, ECA Group assesses that Roving Bat meets 100% of ABS requirements for UWILD hull inspection.



THE BEST CAPABILITY OF EXPANDABILITY AND VERSATILITY IN CLASS



[dwtekmarine.com](http://dwtekmarine.com)

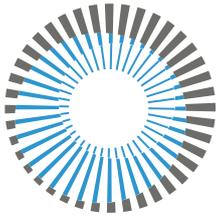
[info@dwtek.com.tw](mailto:info@dwtek.com.tw)



ROV PLANET BUYER'S GUIDE OUT NOW!

تحت رعاية صاحب السمو الشيخ خليفة بن زايد آل نهيان رئيس دولة الإمارات العربية المتحدة  
Under the patronage of H.H. Sheikh Khalifa Bin Zayed Al Nahyan, the President of the United Arab Emirates

Host



# مرافق أديبك البحرية

## ADIPEC OFFSHORE & MARINE

أدنوك  
ADNOC



Co-located with: Abu Dhabi International Petroleum Exhibition & Conference  
12 - 15 November 2018

# BOOK A STAND

[www.adipec.com/bookastand](http://www.adipec.com/bookastand)



NEW FOR 2018  
COMMERCIAL DIVE ZONE

Offshore & Marine strategically co-located with ADIPEC has rapidly become a must-attend event for key players within the offshore and marine sectors. Building on the monumental success of 2016 and 2017, the fourth edition taking place in 2018 is to set to be the largest to date, and deliver an even more comprehensive platform for exhibitors, visitors, conference speakers and delegates.

The Offshore & Marine Exhibition and Conference will bring a large and loyal audience of NOCs and IOCs face-to-face with the owners and operators of work boats, drilling rigs and offshore support providers. Whilst the conference will focus on marine logistics, field development, drilling, emerging and advanced technology, asset integrity, subsea pipelines and flow assurance.

### Offshore & Marine In Numbers:

11,000  
GROSS SQM SPACE

15,000  
OFFSHORE & MARINE  
ATTENDEES

150+  
EXHIBITING COMPANIES

250+  
CONFERENCE DELEGATES

### Why Participate?

**Capitalise** on US\$25bn worth of offshore investments in the region. Network and do business with an international offshore and marine audience from 45+ countries.

**Generate** direct sales, boost your brand image and become part of the world's largest energy event outside of North America.

**Gain** cutting-edge knowledge and share best practices at the Offshore and Marine Conference in the venue's unique waterfront location in Hall 15.

**Showcase** your products and services to 15,000+ marine and offshore industry professionals.

**Join** one of the region's largest congregations of offshore vessel owners, operators and charterers including OSV, Barges, AHTS, Seismic, Jack up rigs and many more.

**Launch** new products, build prospect databases and maintain relationships with existing customers.

**Meet** with key departments from NOC's, IOC's, EPC's and service companies to discuss projects, updates and an exchange of industry knowledge.

## BOOK YOUR STAND TODAY

[adipec.sales@dmgeventsme.com](mailto:adipec.sales@dmgeventsme.com) +971 2 4444 909

### Offshore & Marine Exhibitors Includes:

[www.adipec.com/offshore-marine](http://www.adipec.com/offshore-marine)





# OCEANS

CONFERENCE & EXPOSITION



## Healthy Oceans, Resilient Communities, Robust Commerce... Strong Nations

**OCEANS 2018 Charleston** is the annual joint conference of MTS and IEEE, and will be held October 22-25, 2018. The theme – *Healthy Oceans, Resilient Communities, Robust Commerce... Strong Nations* – will draw strongly on local and regional to international issues of interest, including how science and technology must inform and enable the challenges of a 21st Century where environment, society, and economics are highly interconnected.

### In addition to the regular technical topics, Local Technical Sessions will include:

- Enhancing Coastal Resiliency with New Technologies and Community Design
- Maritime and Port Logistics, Resilience and Security in an Era of Ever-Bigger Ships, Deeper Ports, Increased Commerce, and Stronger Storms
- Building Coastal Resilience In The Face Of Rising Seas and Intense Storms
- Tools and Technologies for Better Assessing Ocean, Community and Human Health
- Social Challenges Intensified with a Changing Climate
- Educating a Workforce Ready for Future Technologies
- Special Sessions:
  - Measuring and growing your Blue Tech Economy
  - Tsunami Warning Systems

Patron  
& Exhibitor  
Opportunities are  
Available!

Visit our website  
for more info.

### Important Dates:

- June 12: Notification to Authors
- June 19: Student Poster Notifications
- July 31: Final Paper Submission Due

Register  
Today!

### Introducing the Exhibitor Track:

For the first year ever, you'll have the opportunity to hear interactive presentations from the industry's top vendors and suppliers – as well as participate in themed roundtables, all in the middle of the action in the exhibit hall. Build and/or deepen your relationships with these vital industry companies.



**SOIL MACHINE DYNAMICS SHOWCASES**

# NEW SELF-FLEETING

Courtesy of SMD

## **DRUM TECHNOLOGY IN NEWCASTLE**

**World leading subsea and deck equipment design and manufacturing specialist Soil Machine Dynamics Ltd (SMD) recently welcomed a host of international customers to its UK HQ to unveil its new self-fleeting drum engine.**

The technology was designed and developed to provide an innovative solution for cable lay and repair operations for use with a variety of products, including fibre optic and power cables, ROV umbilicals and fibre ropes.

SMD's second generation self-fleeting drum technology combines the ability to lay cable at high speed and provides a high tension capability for repair operations or use with heavier products. The design takes up less deck space than traditional linear tensioner modules, which makes it ideal for use on smaller vessels whilst still providing a full multi-mode system.

SMD's dedicated Deck Equipment business unit - which specialises in the design and manufacture of cable handling solutions, launch and recovery systems and winch packages - designed and built the new system for KCS (Kokusai Cable Ship Co), to replace an original cable laying system first manufactured by SMD in 2000.

Matthew Woodward, SMD business development manager for Deck Equipment, said: "Our Deck Equipment business has been addressing the needs of the global offshore industry for over 40 years. Every day our innovative launch

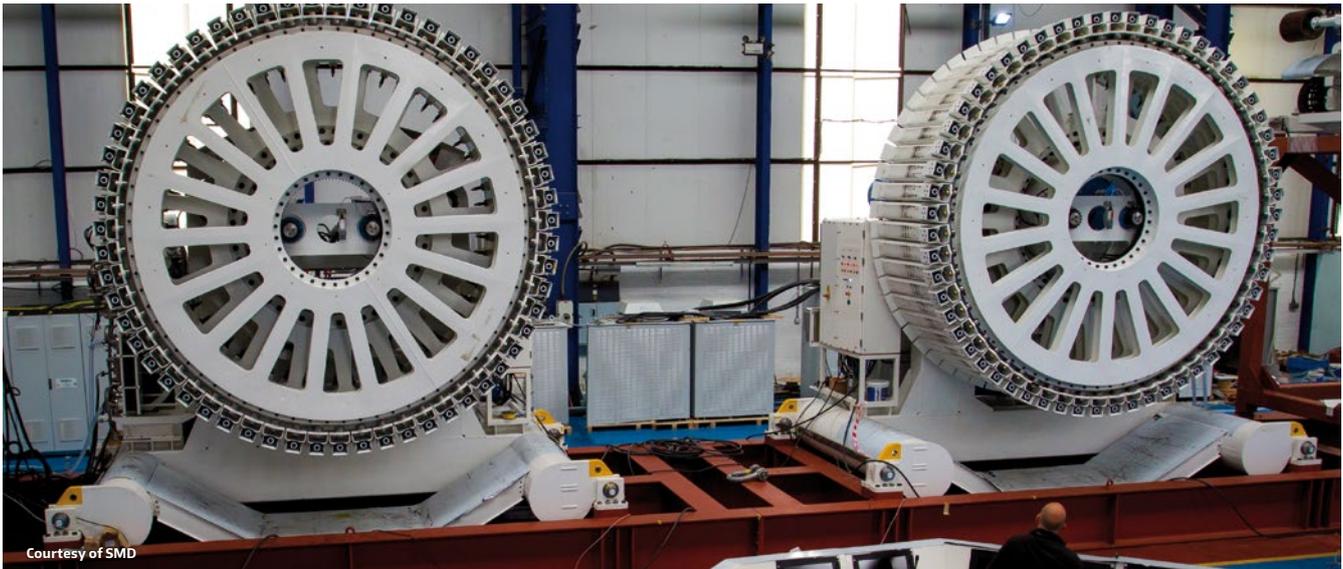
and recovery solutions facilitate subsea operations around the world in the most harsh and challenging environments.

"This has been another significant engineering project for us and we are delighted to share it with the industry. The benefits of our second generation cable lay system are multiple. The new self-fleeting drum allows one machine to be an effective high speed lay system which can also hold high tensions for use in repair operations or handling heavier products in deep water. It is accurate and operationally efficient, saving time and money for customers."

### **OLD VS. NEW**

SMD's second generation self-fleeting drum technology works on a capstan loading principle, which uses multiple wraps of product on the drum to provide low tension entry and high tension exit. The load is spread over a long length of cable, making it gentler on the product and prevents excessive clamping forces.

The self-fleeting drum has an active surface with numerous moving staves that effectively control the position of the wraps on the drum core without imparting any side load into the product.



The staves are controlled by an internal cam ring which when stationary holds a steady formation of wraps on the drum. The cam can also be driven in the same or opposite direction to the main drum which varies the spacing between the coils on the drum.

This is particularly advantageous in handling products with in-line objects, such as repeaters, which can be passed at full operating speed and also brings benefits when handling rigging during repair operations.

Traditional solutions for controlling the wrap spacing on a drum such as cable knives require a great degree of skill to operate, and dramatically slow down lay operations when in-line objects are required to pass. During lay operations, the knife is also in constant contact with the product creating unwanted side loads, friction and crushing forces for most products, which also slows lay speeds.

Cable knives are generally used in repair operations but can easily tangle or snag on rigging which is being used to

haul the cable. Due to the speed limitations for a lay system using cable knives, linear tensioners are used. Modules usually based around 4 wheel pairs are joined together to provide sufficient back tension for lay operations.

The disadvantage of linear systems is that the more modules are added, the more deck space the system occupies. Tensions that are achievable on a drum are not practical to replicate with linear systems. Another potential drawback is that when the cable is held in a linear orientation, the cable can slip if care is not taken. In-line objects also pass through wheel pairs in an unstable equilibrium, which means there's a higher risk of cable control being lost.

The self-fleeting drum therefore combines the ability to lay cable at high speed even with in line objects and provides a high tension capability for repair operations or use with heavier products.

SMD have a range of cable handling solutions which can be tailored to your fleet requirements or project needs.

## ABOUT

With approximately 14,500 email distributions and 2,000 printed copies delivered to the offices of ROV & subsea construction related companies, oil majors and also distributed at trade shows – ROV Planet aims to become the leading publication, online news portal, and forum of the ROV & subsea construction industries.

ISSUE NO.17: **OCTOBER 2018**

ISSUE NO.18: **JANUARY 2019**

## ADVERTISING

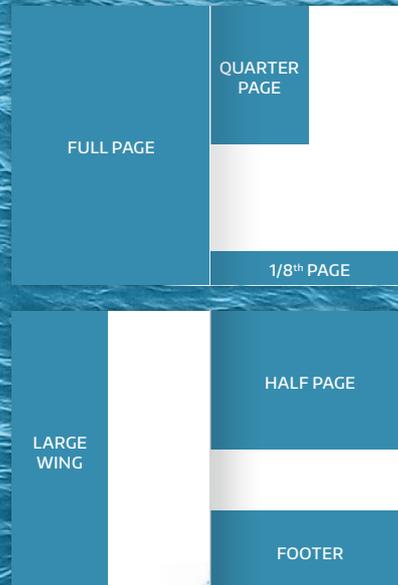
If you would like to advertise in our magazine please send enquiries to: [ADS@ROVPlanet.com](mailto:ADS@ROVPlanet.com)

### MAGAZINE FORMAT

A4 (210×297 mm), saddle-stitched, 4-colour throughout.

### ADVERTISEMENT SIZES

AD SIZE	WIDTH	HEIGHT	BLEED
Full Page	210 mm	297 mm	3 mm
Half Page	210 mm	147 mm	3 mm
Quarter Page	103.5 mm	147 mm	3 mm
1/8th Page	210 mm	36 mm	3 mm
Footer	210 mm	84.5 mm	3 mm
Large Wing	101.5 mm	297 mm	3 mm
Small Wing	56.5 mm	147 mm	3 mm



## NEWS

If you have any company news you would like us to share on our website and news portal please send it to: [NEWS@ROVPlanet.com](mailto:NEWS@ROVPlanet.com)

## DESIGN WORK

If you would like any kind of design work done (full corporate branding, magazines, flyers, posters and advertisements, flash/html5 banners, bus banners, etc.) please send enquiries to our talented design team: [DESIGN@ROVPlanet.com](mailto:DESIGN@ROVPlanet.com)

# When you need LBL but not the expense.



## Rovins Nano

COMPACT AND  
COST-EFFECTIVE INS  
FOR ROV NAVIGATION



## Ramses

LBL AND SPARSE LBL  
TRANSCIVER

