

OCEAN NEWS

December 2016 www.oceannews.com

35
YEARS

& TECHNOLOGY

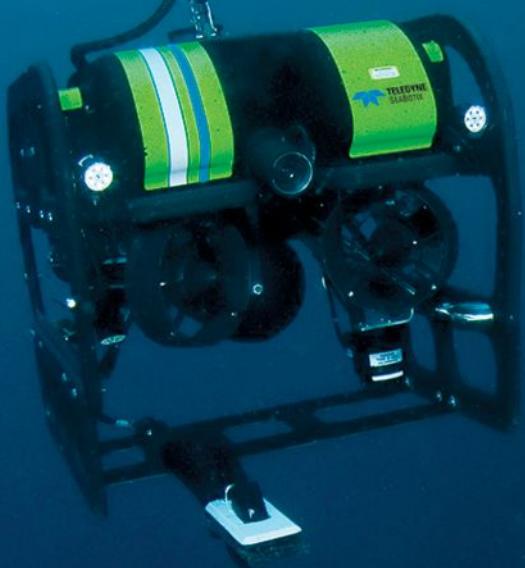
News for the Ocean Industry

Revolutionary New
Technique Demonstrated
for FPSO Hull Inspection

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Year in Review

Page 28





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December 2016

Ocean News & Technology

Ocean Industry



Offshore Industry



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Teledyne SeaBotix vLBV-300 Remotely Operated Vehicle performing an inspection and biological sampling in the Coral Sea Conservation Zone in Australia

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& TECHNOLOGY

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TSC Technology Systems Corp.

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By Ladd Borne



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So Long, and Thanks for all the Fish*

For the past five years, I have published Ocean News & Technology Magazine, which is currently celebrating its 35th year anniversary. In 1992, Dan White purchased Waves magazine from former publisher and friend Deam Given and founded Technology Systems Corporation (TSC). Ocean News & Technology was then edited and published by White for 20 years. In 2012, Dan retired from TSC and I took over the editing and publishing duties.

With mixed emotions, I am moving on from editor and publisher of Ocean News & Technology and as president of TSC. Starting with the January 2017 issue, the managing editor will be the editor-in-chief of ECO Magazine, Greg Leatherman. Working with Greg as editor will be Rhonda Moniz.

Having worked 20 years as an engineer and program/project manager at Harbor Branch Oceanographic Institute, I was skeptical that I would be capable of running a publishing company and the Subsea Survey IRM conference. Even if I was able to pull it off—or fake it ‘til I made it—would I enjoy it? And how would I deal with publishing deadlines? Sure I had deadlines in the engineering world, but they are always changing and never come at you in an incessantly steady march, month after month, year after year. I envisioned nights of stale coffee, blood-shot eyes, and the frantic yells of “Stop the presses.” But Dan White, an engineer himself, spent plenty of time showing me the ropes and convincing me that it was a rewarding endeavor. Plus, there was a very capable staff to support me and help me find my way. Don’t ever underestimate the value of employees that are willing to confront you when you’ve made a mistake.

So now with hindsight (being 60/40 even with prescription bi-focals), I realize Dan was right; I really did enjoy running a publishing company and creating ON&T every month.

But the best part of my job was not creating the magazine or even managing TSC. The best part was working with and getting to know the amazing and interesting people in our industry. We are a fairly small group, but very diverse and with so many interesting stories to share.

In addition to being thankful to Dan for giving me this opportunity, a big Thank You goes out to all of you—our readers. It has been great meeting many of you at conferences such as OTC, Oceans, Oceanology, Ocean Business and Underwater Intervention. And I appreciated hearing from you over the years. Typically, one would expect that I would get 100 complaints or criticisms for every positive comment regarding ON&T. But surprisingly, it has been just the opposite. I often hear “great article” or “I read your magazine from cover to cover” and similar comments, which really added to the pleasure I got from working on each and every issue.

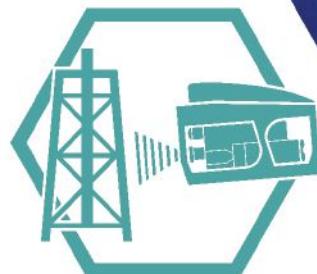
Working on the magazine has allowed me to keep close tabs on the ocean industry. I’ve reported on great events such as the 50th anniversary of Sea Lab II, the technology behind DeepSea Challenger—James Cameron’s deep-diving submersible, and the many advancements in autonomous vehicle technology. Unfortunately, I’ve also reported on the negative news, such as how the fall in oil prices has impacted the industry. When I started in September 2011, Brent crude was about \$119 bbl. Today as I write this, it is at \$48 bbl. But I didn’t need to tell you that.

I hope the hard work and sheer fun I had creating each issue showed in its pages—and I hope it has become a useful tool for you or, if not, at least an interesting read while killing time offshore.

* If you don’t understand the title reference, I highly recommend the four-part trilogy *The Hitchhiker’s Guide to The Galaxy*.



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REVOLUTIONARY NEW TECHNIQUE DEMONSTRATED FOR FPSO HULL INSPECTION

December 2016

10

Ocean News & Technology



The mission specialist ready for deployment.

The need for and difficulties of external inspections of giant Floating Production, Storage, and Offloading (FPSO) units might not be obvious. The most important aspect of the inspection of the hull and underwater parts of the vessel is that it is—indeed—a vessel. As such, it is required to undergo regulatory inspections as specified by the governing classification society and must have similar inspections on the same schedule as any other oceangoing vessel. However, there are two serious challenges that other vessels do not have to face.

First and foremost is that an FPSO is moored and services an oilfield for years at a time. This means that it cannot be sent to dry dock without significant expense. As a result, coral and bio growth on the hull can be much more significant than on a vessel that moves regularly. For the kind of close visual inspection (CVI) required of weld seams and other critical areas, bio growth must be removed.

The second challenge is the nature of the operations conducted—many nonstop—on the FPSO as it receives, processes, stores, and offloads product. There are very serious economic and operational challenges if the inspection process interrupts these processes or challenges the safety of the ship.

“Purpose-built portable ROV uses cavitation to save time and money, increase safety, and allow for uninterrupted FPSO operations.”

Using ROVs for UWILD Surveys to Date

Using an inspection class ROV for underwater inspection in lieu of dry docking (UWILD) was pioneered by VideoRay LLC of Pottstown, Pennsylvania more than 10 years ago. Classification societies such as ABS and DNV and regulatory enforcement agencies like the U.S. Coast Guard have approved VideoRay equipment for this purpose. The process is demonstrably faster, more efficient, more effective, and safer than the alternative of using divers to collect information. The increase in safety is obvious—the risk of an injury with divers is significant, and the risk with ROV operators is negligible.

The increase in efficiency is the result of two distinct advantages that the ROV operation has over a diver solution. The first is more obvious—the inspector has real-time control over what is inspected so he/she can more easily be satisfied and move on, resulting in faster inspections with less time out of service. The second advantage, however, is often far more important. For many vessels, water intakes and outflows and other moving parts such as rudders need to be tagged out before a diver can get into the water. ROV operations require far less logistical support and do not require formal tag outs to operate, which ultimately saves time and money by keeping the vessel in service during the inspection.

For these types of inspection operations, the VideoRay Pro 4 is overwhelmingly the ROV model of choice.

FPSO UWILD Survey with VideoRay

For this particular FPSO, the task was to perform the 5-year special inspection. About 2.5 years ago, the special inspection was performed with divers for a total cost of approximately US\$3,500,000. The primary methodology was to use a dive spread from a supply vessel. Hard coral removal was performed by divers with hammers, increasing the risk of coating damage to the hull coating, a major problem since coating damage can lead to a shorter field life.

It can be demonstrated that the most effective technique for removing marine fouling is cavitation. During cavitation cleaning, an intense shockwave of microscopic bubbles quickly and effectively removes fouling material without damaging the surface being cleaned, particularly painted or coated vessel hulls.

For many years, VideoRay operators have attempted to mount cavitation cleaners on VideoRay Pro Series Ultra-compact ROVs with limited success. Most of these operations were severely challenged by the mass and thrust of the 3-thruster vehicle that is, for the most part, incapable of maneuvering the cavitation cleaner lance and stiff high pressure water hose.

Other, off-the-shelf light work class vehicles are capable of doing this kind of job, but their weight, size, cost, and deployment issues are prohibitive in an FPSO environment (as well as most other UWILD situations). Since they are too heavy and bulky to transport to the FPSO, they require their own vessel, which requires a separate anchor, mooring, or liveboating operation and adds expense and difficulty as well as potential conflicts with FPS operations. That is why much of the cleaning required for FPSO UWILD CVI is done by divers removing marine fouling using hand tools as described above.



Show the relative size of the Mission Specialist submersible compared with the Pro 4 - The new Mission Specialist vehicle (top) and VideoRay Pro 4 (bottom).

FEATURE STORY

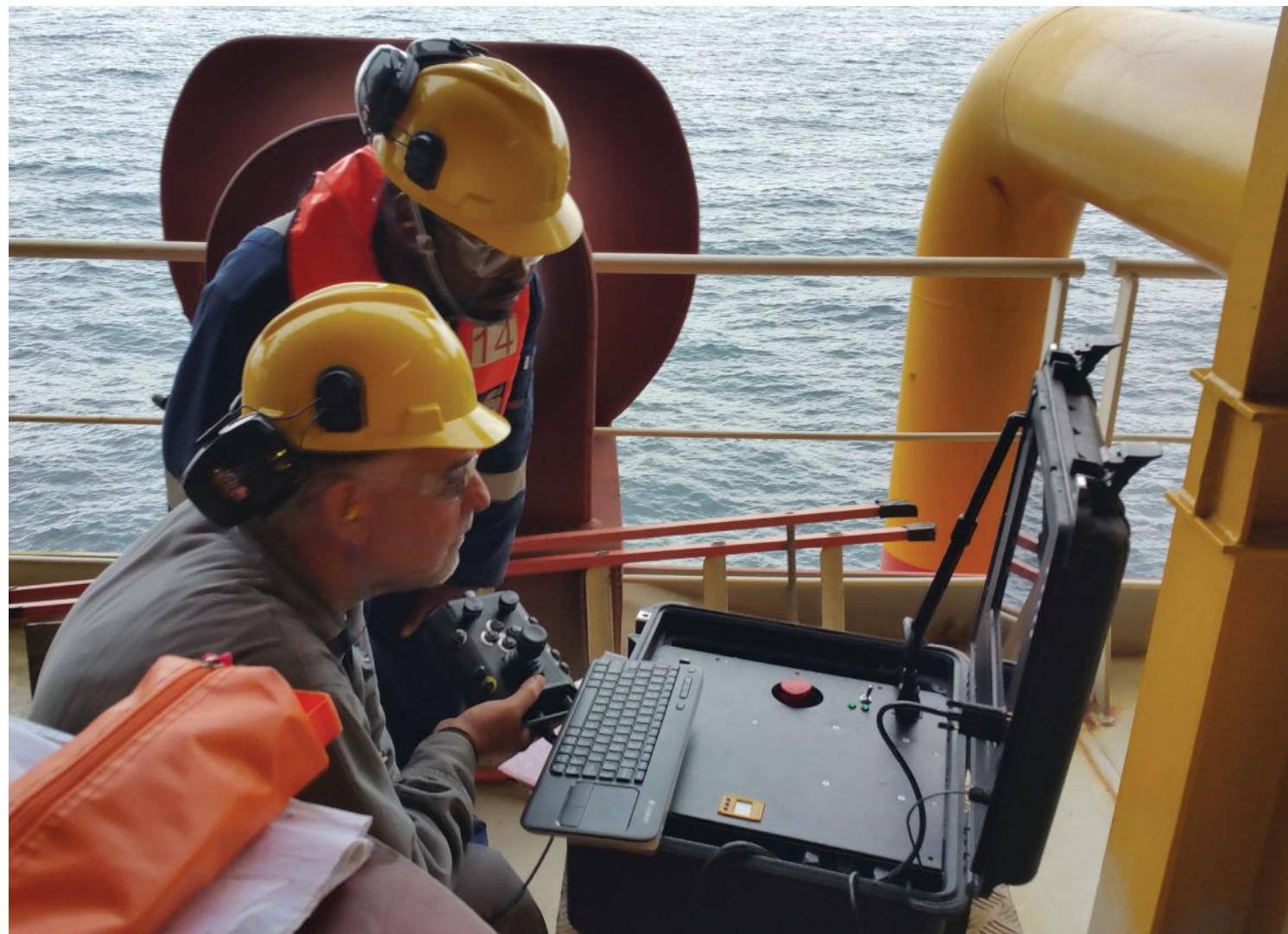
Recent Advances in ROV Design

Until recently, all ROV manufacturers based their vehicle deliveries on a few distinct models, each with their own set of thrusters, cameras, and control systems. A limited number of accessories or sensors could be bolted onto the payload area. VideoRay, for example, allows for a wide variety of instruments and accessories to be added in the field, as required, by the end user. But even VideoRay users have had only one basic set of thrusters, power system, data transmission, and standard camera with which to work.

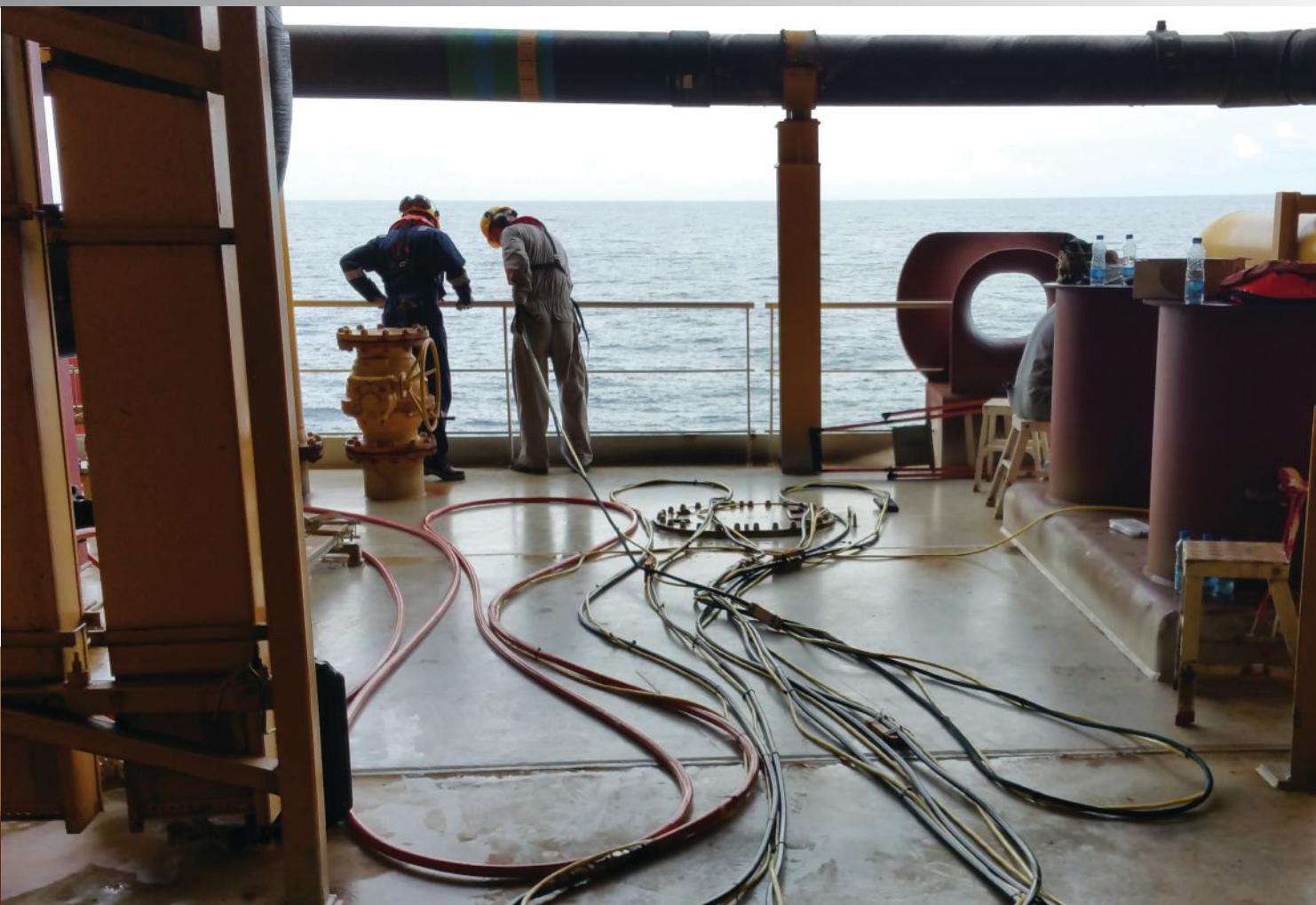
VideoRay engineers have developed the latest generation of underwater technology that allows any aspect of an ROV to be altered—the frame, power system, communication system, thrusters, cameras, manipulator, and lights—in addition to all the sensors and tools currently available as Pro 4 accessories. All of these modules work together through a standard connector so they can be mixed and matched as and where needed to a frame (that itself can be customized for a solution). Since each component is produced in quantity and used across a wide range of ROVs, the availability and cost are reduced and, more importantly, the reliability and performance are to the same high standard that VideoRay users expect.

When applying this approach to the task of cleaning and inspecting an FPSO for a UWILD, all of the requirements and constraints for an optimal solution can be considered:

- Cleaning Requirements – Each weld seam to be inspected must have bio growth completely and effectively removed to inspect the seam and coating.
- Depth requirement – Only 30 m or so.
- Thrust – Fairly high; the system must be able to work against strong seasonal currents and pull the stiff, high-pressure cavitation cleaner hose to the designated areas to be cleaned. The system must also be able to handle the recoil of the cavitation cleaner, holding steady to clean the identified areas.
- Maneuverability – Must be able to position the cleaning lance and hold it at the appropriate position and angle to find and follow a weld seam.
- Deployment – The ROV system must be able to be deployed over the side of the FPSO.
- Portability – Must be as light and small as possible so it can be maneuvered to and deployed from FPSO deck.
- Durability – Much more critical than normal as repairs are limited to module replacement or a similar task that can be done rapidly on site.



Mission Specialist Operation on FPSO deck; note the small space requirement.



Mission Specialist is over the side, on deck is tether married to stiff high pressure hose for cavitation cleaning.

- Tether length – Medium; 150 m should allow for operation from any convenient location and still reach the entire hull.
- Cameras and documentation – Cameras are needed to observe the cavitation cleaning and inspection identified areas. All video should be recorded. Audio from the inspector and pilot are important to generating report documentation. Cameras should record high resolution for both video and stills.
- Lights are needed to illuminate the work area for cleaning and all inspection areas for stills and video.

Two of the inspection requirements deserve special attention: portability and durability.

• Durability – One of the most vexing problems for the cavitation cleaner system is the need to harden it from the constant scouring it receives from marine debris that is propelled away from the hull by the cleaning action. Much of this consists of extremely hard shards of coral and the like. This kind of effluent can, in the space of a few hours, completely destroy fiberglass-reinforced Delrin props, for example. Tethers also take a severe beating.

• System portability and deployment – A unique aspect of the VideoRay approach is developing a system that can be safely operated and deployed from the platform instead of from another vessel. This is a significant advantage,

allowing the cleaning and inspection to be performed in sea states where safety guidelines prohibit deployment from another vessel. And, of course, the expense of a support ship is eliminated.

While meeting these requirements, the vehicle needs to be deployable from available deck space on the FPSO. In addition, safety considerations for deck deployment and handling require the vehicle to be carried by one man with one hand, maintaining 3-point contact when on steps or when stepping over and around platform infrastructure.

Results

This operation demonstrated an effective and efficient way to conduct FPSO inspections required by classification societies. Not only was the job done faster, with less damage, using the new system did not affect ongoing operations of the FPSO. The total cost was less than \$300,000—less than 10% of the cost of the previous inspection that caused coating damage.

By using an ROV cleaning system specifically designed for this purpose and operators trained to use it, the process of conducting the inspection can be done more rapidly, easily, and at far less cost than by using existing techniques. While further developments are sure to make the process more effective, it has already demonstrated that it is the best practice for FPSO inspection.

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MTS/IEEE Oceans '16 conference in Monterey a success



MTS member and Ocean News and Technology Editor-in-Chief Ladd Borne, and MTS president Ray Toll present Jeremy Stuhr with the Ocean News and Technology Young Professionals Award (Photo Stan Chamberlain).

The 2016 MTS/IEEE Oceans Conference was held in beautiful Monterey, California from 19 to 23 September. The conference was honored to have Congressman Sam Farr as Honorary Chair and Jill Zande and Bill Kirkwood as General Co-Chairs.

This year's conference had a record number 510 technical presentations, over 130 exhibitors, 11 tutorials, 8 workshops, and nearly 20 student posters. In attendance were over 2,000 industry leaders, technical professionals, researchers, scientists, policy makers, educators, and students.

The event gala was held at the amazing, world-famous Monterey Bay Aquarium where attendees dined while admiring our living breathing ocean.

During the event, MTS held its annual meeting and awards presentation:

- The highest accolade a member can receive within the Society is to be designated an MTS Fellow. This year, Dr. Thomas Curtain was recognized, joining the 120 honored by this recognition since its inception in 1975.

- The Ocean News and Technology Young Professional's Award recognizes a member of our next generation who has already demonstrated excellence in their profession and made significant contributions to MTS. This year, the award recognized Jeremy Stuhr, regional sales manager at iXBlue.

- The Compass (Publications) Distinguished Achievement Award was presented to Dr. Kathryn D. Sullivan, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, recognized for her many years of service in the area of Ocean Science.

- The Compass (Publications) International Award given for outstanding contributions to the advancement of the science and engineering of oceanography and marine technology was presented to Dr. Lian Lian.

- The Compass (Publications) Industrial Award, also for outstanding contributions to the advancement of the science and engineering of oceanography and marine technology, recognized Teledyne Marine. Accepting for Teledyne Marine was John Flynn, vice president, global marketing and sales, Teledyne Oil & Gas.

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MTS Cables, Connectors and Imaging Systems Tech Surge brings Navy, industry and academia together

The joint Navy Industry and University 3-day workshop on underwater cables, connectors, and imaging systems took place 26-28 October 2016. The event was hosted at the waterfront ocean technology cluster comprising SeaTech (the joint Naval Surface Warfare Center [NSWC] and Florida Atlantic University's R&D Laboratory) and Nova Southeastern University's new waterfront Oceanographic Center. These modern research and development facilities are located on the ocean side of Port Everglades.

Organized by the MTS cables and connectors committee and the MTS underwater imaging committee, the event was a working meeting during which key Navy (NAVSEA, NSWC, NUWC, NAVFAC, SPAWAR, NAWC, ONR, NRL, APL, and other FFRDCs) discussed recent and current programs in addition to funded, planned activities. Developers and suppliers from industry presented their existing wares as well as proposed solutions. University researchers in these areas were also on hand to display and discuss some of their recent developments, discoveries, and forward-thinking ideas. During the first 2 days of the workshop, over 28 talks were given by Navy, industry, and university presenters, followed by a third day of on-vessel and dockside in-water demonstrations.

Workshop participants were also treated to a tour of the NSWC-FAU SeaTech Labs led by students and a presentation on the facility given by Professor Manhar Dhanak, the SeaTech director. In addition, guest speaker Professor John R. Delaney, University of Washington, gave a stirring presentation titled "Cultural and Economic Impacts of Living on an Ocean Planet."

Event sponsors and exhibitors included Teledyne Marine, Leidos, Harris, EdgeTech, NOVA Southeastern University, Florida Atlantic University, NAVSEA, and the Bramer Group.

For more information, please visit www.mtsociety.org.



• The Lockheed Martin Award for Oceans Science and Engineering was presented to Tyler Schilling, founder of Schilling Robotics, for his technical accomplishments including the wildly successful Schilling ROV manipulator.

Other awards presented at the meeting were the MTS Outstanding Service Award presented to Dr. Robert Randall, the MTS Outstanding Committee Award given to the Dynamic Positioning Committee, the MTS Outstanding Sections award given to the Washington DC section, and the MTS Outstanding Student Section Award presented to the University of Southern Mississippi section.

Also during the event, the 2016 IEEE Oceanic Engineering Society awards were presented:

- The Distinguished Technical Achievement Award went to Dr. John E. Ehrenberg for his invention of the dual-beam and split-beam scientific echo sounders and contributions to the use of miniature acoustic tags in fisheries research.

- The Distinguished Service Award went to Harumi Sugimatsu for outstanding support of the Society through organization of international conferences, symposia, and workshops.

- The Presidential Award was presented to Dr. M.A. Atmanand for his outstanding service to the Society as a volunteer.

- The IEEE/OES Emeritus Award went to Frederick H. Maltz for 20 years of service as editor of the Society Newsletter.

Next year's MTS/IEEE Oceans 2017 conference is being held 18-21 September 2017 in Anchorage, Alaska.

For more information, visit www.oceansconference.org.

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Ocean News & Technology

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WOC Sustainable Ocean Summit (SOS) to deliver global overview of ocean industry activity to 2030

The WOC Sustainable Ocean Summit (SOS) is the only international ocean business event to provide a global review of ocean economic activity for all the principle areas of ocean industrial activity—and to link this analysis to the 2030 Sustainable Development Goals (SDGs).

The “Ocean 2030” sessions at SOS 2016, chaired by Tom Boardley (executive vice president, corporate and external affairs, Lloyd’s Register), will feature authoritative presentations on a diverse range of ocean business sectors:

- Shipping: Peter Hinchliffe, secretary general, International Chamber of Shipping

- Oil and Gas: Jérôme Ferrier, president, International Gas Union (IGU).

- Aquaculture: Arne Fredheim, professor, Centre for Autonomous Marine Operations and Systems, Department of Marine Technology, NTNU; SINTEF Fisheries and Aquaculture.

- Offshore Wind: Martin Volker Gerhardt, global head of strategy, wind power and renewables, Siemens AG.

- Dredging: René Kolman, secretary general, International Association of Dredging Contractors (IADC).

- Cruise Tourism: Bud Darr, senior vice president of technical and regulatory affairs, Cruise Line International Association (CLIA).

- Ocean Renewable Energy: Rémi Gruet, CEO, Ocean Energy Europe.

- Ports: Maurice Jansen, senior manager, innovation, research and development, STC-Group.

- Super Yachts: Vienna Eleuteri, sustainability manager,

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Viareggio Superyachts (VSY); chair, Sustainability Committee, Super Yacht Building Association (SYBASS).

- Desalination: Miriam Balaban, secretary general, European Desalination Society.

Presenters are being finalized for additional sectors, (e.g. submarine cables, fisheries, seabed mining).

The SOS 2016 will link this unprecedented collation of information on ocean economic activity to the WOC efforts to work with the ocean business community to develop SDG targets and indicators.

The Ocean 2030 sessions at SOS 2016 will consider the opportunities and risks that future ocean use create for each sector, for the collective ocean business community, for the ocean economy overall, and for the ocean itself. Sustainable development of the global ocean commons cannot be achieved without understanding and engaging ocean users, and without leadership and collaboration on the part of responsible ocean companies.

For more information, visit www.oceanouncil.org.

Tracking flights with FloatRadar24

LiquidRobotics partner Maritime Robotics is testing a Wave Glider® with FlightRadar24 to potentially improve the coverage of flights over the ocean.

The Wave Glider, dubbed "FloatRadar24" by an internet vote, was equipped with an ADS-B receiver, that communicates directly with airplanes. After swimming out to a test area in the Atlantic Ocean, the Wave Glider held position and helped bridge the coverage gap between Norway and Iceland.

Throughout September, FloatRadar24 tracked hundreds of flights and provided additional coverage beyond

FlightRadar24's terrestrial receivers. The hope is that by expanding their coverage over our oceans we will no longer have disappearing flights like MH370.

For more information, visit www.liquid-robotics.com.

Thales joins NOC's Marine Robotics Innovation Center

Thales, a global technology leader for the Aerospace, transport, defense and security markets, announced that it will be taking space in the Marine Robotics Innovation Centre at the National Oceanography Centre (NOC) in Southampton to facilitate its ongoing partnership with the NOC on marine autonomy projects.

Thales and the NOC are currently working together on the regulatory, environmental risk, policies and laws associated with Marine Autonomous Systems.

Eddie Awang, Thales's VP of the intelligence, surveillance & reconnaissance business, and defense mission systems in the UK, says, "This is an exciting business partnership for Thales, which will increase our engagement with the growing Marine Autonomy community and support our involvement in collaborative research and technology projects. Maritime Autonomy is vital in transforming the capability we can offer our customers."

Adam Schink, Marine Robotics Innovation Centre manager at the NOC said, "Thales is currently working with the NOC and many of the innovation center partners on marine autonomous systems. We are particularly pleased to be partnered with Thales developing the next generation of marine robotic systems."

For more information, visit www.thalesgroup.com.

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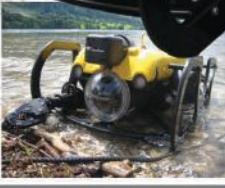


BARRACUDA

The Barracuda is a new breed of ROV, designed to work in high current. Small, Streamlined, Extremely Powerful and loaded with Advanced Capabilities.

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Shark Marine Technologies Inc. www.sharkmarine.com sales@sharkmarine.com Ph: (905) 687 6672

McDermott opens new 300-person office in Kingdom of Saudi Arabia

McDermott International, Inc. announced it has opened a new office in Al Khobar, Saudi Arabia, with the ability to add 300 staff to its existing workforce in the Kingdom.

The new office expands McDermott's engineering capacity in the region and will enhance its offering in Saudi Arabia.

"The opening of our new office further solidifies our leadership in the area and our commitment to Saudi Arabia," said Linh Austin, vice president, Middle East and Caspian. "This new office expands our current capability in Kingdom and for the region and increases support to our customers, particularly in brownfield work."

"This is just one of several initiatives demonstrating McDermott's continued commitment to the Saudi market and the In-Kingdom Total Value Add (IKTVA) Program," added Austin.

The office opening follows McDermott's recent Dammam yard inauguration and recruitment drive in Al-Khobar, where the Company interviewed and assessed more than 600 Saudi craftsmen to support IKTVA localization objectives.

McDermott has an extensive history of executing complex EPCI projects offshore Saudi Arabia and is committed to supporting the continued growth of oil and gas production in the Kingdom. Through decades of regional experience and intimate knowledge gained of field conditions, McDermott's Saudi operation has been established as a brownfield center of excellence.

For more information, visit www.mcdermott.com.

GE's Marine Solutions strengthens its presence in ASEAN and China

GE's Marine Solutions has appointed Jason Electronics Pte. Ltd. as its value-added reseller for SeaStream dynamic positioning (DP) systems in the ASEAN region and China.

Through this appointment, Jason Electronics will have reselling rights of GE products in the aforementioned regions. With expansive regional presence in all key ASEAN markets and a strong customer base, Jason Electronics will help GE provide proven system solutions to more customers.

"The collaboration between GE and Jason Electronics ensures that GE will acquire a long-term reliable partner in key regions. It also provides Jason Electronics with one of GE's latest digital marine innovations in the quest to further expand the offshore marine coverage in the market," said Tim Schweikert, president and CEO, GE's Marine Solutions. "This partnership is a first of its kind and will allow GE to expand its customer base, meaning more customers will benefit from the advanced digital marine solutions provided by GE."

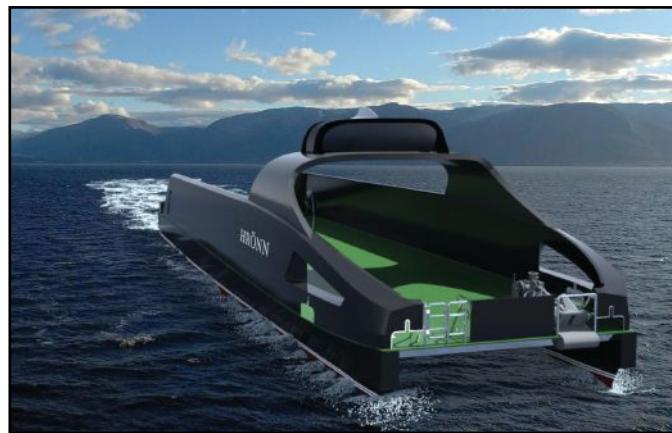
Jason Electronics is a listed company with over four decades of industry experience, offering a wide range of technologies in the navigational and communications equipment solutions. It shares GE's value when it comes to integrity and compliance. Jason Electronics will also enhance the package by adding region-oriented features, allowing the products to cater for local customers' needs.

Thanks to the formed partnership, more salesforces as well as skilled field service engineers will be added to GE's sales and services portfolio in these regions.

GE's latest SeaStream DP system is a mariner-focused solution, enhancing situational awareness and rebalancing attention from system management to true seamanship. Its user-friendly, human machine interface provides unprecedented flexibility for effective maritime operations. The system incorporates an energy-efficient mode, which allows operators to optimize fuel consumption, therefore helping to reduce operational costs and emissions. The system uses predictive software to anticipate position variation and uses advanced algorithms to optimize vessel heading to further reduce power consumption.

For more information, visit www.ge.com.

Automated Ships Ltd and Kongsberg to build first unmanned and fully-automated vessel for offshore operations



The UK's Automated Ships Ltd (an M Subs Ltd subsidiary) and Norway's Kongsberg Maritime have signed a memorandum of understanding to build the world's first unmanned and fully-automated vessel for offshore operations. In January 2017, Automated Ships Ltd will contract the Hrø nn, which will be designed and built in Norway in cooperation with Kongsberg. Sea trials will take place in Norway's newly designated automated vessel test bed in the Trondheim fjord and will be conducted under the auspices of DNV GL and the Norwegian Maritime Authority (NMA). The Hrø nn will ultimately be classed and flagged, respectively.

Currently, only small unmanned boats are being utilised for nearshore operations but there are no technical limitations to constructing large, unmanned and automated systems. The only impediments are regulatory, but with the participation of DNV GL and the NMA and Norwegian and UK companies and institutions, it will be possible to rapidly and at low-cost be the first to market with a full-size unmanned ship.

Hrø nn is a light-duty, offshore utility ship servicing the offshore energy, scientific/hydrographic and offshore fishing industries. Its intended uses include but are not limited to Survey, ROV and AUV launch & recovery, light intermodal cargo delivery and delivery to offshore installations, and open-water fish farm support. The vessel can also be utilised as a standby vessel, able to provide firefighting support to an offshore platform working in cooperation with manned vessels. Automated Ships Ltd is currently in discussion with several end-users that will act as early-adopters and to establish a base-rate for operations and secure contracts for Hrø nn offshore, in the near future.

Hrø nn will initially operate and function primarily as a remotely piloted ship, in Man-in-the-Loop Control mode, but will transition to fully automated, and ultimately autonomous operations as the control algorithms are developed concurrently during remotely piloted operations.

For more information, visit www.km.kongsberg.com.

Damen wins order from Edison Chouest Offshore for 13 tugs

Leading marine transportation provider and the USA's largest operator of OSVs, Edison Chouest Offshore (ECO), has teamed up with Damen to build a total of 13 heavy duty mooring assistance and escort tugs. These will be deployed on

two major maritime projects for which ECO has recently won contracts, based in part on the use of well-proven Damen tug designs. The vessels will be built using ECO's highly regarded network of five shipyards and Damen's support and expertise.

The first of these is a contract that ECO won earlier this year with a new Corpus Christi-based LNG export terminal. The agreement is for the supply of four escort tugs with a bollard pull of 80 tonnes to operate at this new LNG terminal in Texas, which is currently under construction. The Damen tugs will be of the well proven escort/mooring ASD 3212 design.

More recently, ECO has won a high profile, long-term contract in Alaska. ECO is taking over the ship escort-response duties out of Valdez, Prince William Sound, from July 2018, for which it will require nine high-powered escort tugs. For this highly environmentally sensitive project, Damen and ECO will work together to deliver four more ASD 3212 tugs with a bollard pull of 70 tonnes each and five of the most powerful ASD tugs ever built; the ASD 4517 with a bollard pull of 150+ tonnes is a

joint Damen and ECO developed escort tug specifically designed for the sometimes challenging weather conditions in the Prince William Sound.

For more information, visit www.damen.com.

MAN Diesel & Turbo signs deal for three new cruise vessels with Fincantieri shipyard

MAN Diesel & Turbo has won the engine-supply contract from Fincantieri for newbuildings ordered by Costa Asia and P&O Cruises, Australia. The two companies are members of Carnival Corporation & plc, the world's largest leisure travel company with a combined fleet of over 100 ships across 10 cruise-line brands.

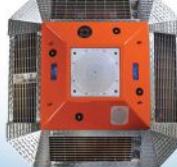
Each vessel will feature 2 × 14V48/60CR + 3 × 8L48/60CR medium-speed MAN engines, providing 62,400 kW installed power. The engines will be delivered to Fincantieri's shipyards in Monfalcone (Trieste) and Marghera (Venice) between August 2017 and September 2019.

Each newbuilding will weigh 133,500 gross tonnes, have a length of 323 m, a passenger capacity of 4,000,



and carry a crew of 1,450 personnel. Lex Nijssen—Head of Four-Stroke Marine—MAN Diesel & Turbo, said: "We are extremely pleased with the continuation of what has been a very positive development for us within the cruise segment since our first breakthrough at Fincantieri and Carnival. Our company's firm approach of the risk-controlled introduction of new technologies to the market over many years is bearing fruit and fully in line with the very high safety, reliability and environmental standards demanded by the cruise business."

For more information, visit www.marine.man.eu.



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Woolpert signs contract with NOAA to map U.S. coastal regions, great lakes

The National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management (OCM) has signed Woolpert to a five-year, multimillion-dollar Coastal Geospatial Services Contract 3 (CGSC 3) to acquire geospatial data of U.S. coastal regions and the Great Lakes. It is part of a \$49 million total capacity contract shared among five prime contract awards.

The contracting vehicle enables the OCM to provide government entities—local, state, and federal—the ability to apply the acquired and developed data and tools for coastal resource management applications.

"The data to be collected includes digital imagery, topographic and bathymetric lidar that will be used as a basis to address coastal inundation, sea level rise, coastal resilience, post-storm assessment, and a host of other research," said John Gerhard, Woolpert project director. "It will provide consistent and accessible geospatial data, while supporting analysis of the data on a national scale."

The data collection for OCM is scheduled to get underway later this year.

For more information, visit www.woolpert.com.

UM Rosenstiel school and Living Oceans Foundation partner

The University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science and the Khaled bin Sultan Living Oceans Foundation (KSLOF) announces a joint science partnership to translate KSLOF's 5-year Global Reef Expedition dataset into insight about the current health of the world's oceans.

UM Rosenstiel School Professor of Marine Geosciences Sam Purkis will serve as the principal investigator for the joint project and as KSLOF's Interim Chief Scientist for the 5-year project funded by KSLOF.

The primary goals of the Global Reef Expedition, which took place from 2011-2015, were to map and characterize global coral reef ecosystems, identify their current status and major threats, and examine factors that enhance their ability to resist, survive, and recover from major disturbance events like bleaching, cyclone damage, or crown of thorns starfish outbreaks.

During the 5-year expedition, the Living Oceans Foundation circumnavigated the globe aboard its 220 ft. research vessel, M/Y Golden Shadow, to survey some of the most remote coral reefs on the planet. The reef expedition generated an unrivaled dataset spanning more than 25 reef provinces across the Atlantic, Pacific and Indian oceans. The data collected were broad—likely the most comprehensive example of “big data” yet compiled for coral reefs. They encompass 95,000 sq. km of state-of-the-art aircraft and satellite imagery processed to seabed and bathymetric maps, surveys of faunal and genetic diversity, water chemistry and sediment samples, geophysical surveys and assessments of ocean climate.

For more information, visit www.rsmas.miami.edu.

NOAA awards \$9.3 million to advance coral reef conservation

The NOAA Coral Reef Conservation program is awarding more than \$9.3 million in grants and cooperative agreements to support conservation projects and studies to benefit coral reef ecosystem management in seven U.S. states and territories, the Caribbean and Micronesia. Recipients will provide nearly \$6 million in additional support.

All projects focus on the three primary threats to coral reefs: global climate change, land-based sources of pollution and unsustainable fishing practices, and highly threatened coral regions and watersheds.

Nearly half of the funds awarded this year directly support coral reef conservation projects led by state and territorial resource management agencies. Other conservation projects are led by non-government organizations, community groups, and academic partners. A limited number of international projects in Micronesia, Central America, and the wider Caribbean region are also supported.

For more information, visit coralreef.noaa.gov.

Scientists assess bleaching damage on Great Barrier Reef



Scientist Andrew Baird surveying healthy reefs between Mackay and Townsville, October 2016. Credit, Tane Sinclair-Taylor.

Scientists are surveying the continuing aftermath of the worst coral bleaching event ever recorded on the Great Barrier Reef.

Six months after the extreme underwater heatwave of 2015/2016, many of the bleached corals have died in the northern third of the Reef. The large-scale devastation is now being compounded by disease infecting the damaged corals and by coral predators.

Teams of researchers from the ARC Centre of Excellence for Coral Reef Studies at James Cook University are returning to the same 83 reefs that they surveyed underwater in March this year at the height of the bleaching event.

“Millions of corals in the north of the Great Barrier Reef died quickly from heat stress in March and since then, many more have died more slowly,” says Dr. Greg Torda whose team recently returned from re-surveying reefs near Lizard Island.

The scientists have released unique footage showing the extent of the bleaching in March and April, which was most severe in the northern 700 km section of the Great Barrier Reef. Reefs in the southern half of the reef were only lightly bleached and remain in good condition.

“Six months after the peak bleaching, the corals now have either regained their algal symbionts and survived or they have slowly starved to death without the nutrition the algae provide to them,” says Torda.

“On the reefs we surveyed close to Lizard Island, the amount of live coral covering the reef has fallen from around 40% in March to under 5% now.”

“In March, we measured a lot of heavily bleached branching corals that were still alive, but we didn’t see many survivors this week,” says Dr. Andrew Hoey, who is currently working from Lizard Island Research Station.

“On top of that, snails that eat live coral are congregating on the survivors, and the weakened corals are more prone to disease. A lot of the survivors are in poor shape.”

“As we expected from the geographic pattern of bleaching, the reefs further south are in much better shape,” says Professor Andrew Baird who led the re-surveys of reefs in the central section of the Great Barrier Reef.

“There is still close to 40% coral cover at most reefs in the central Great Barrier Reef, and the corals that were moderately bleached last summer have nearly all regained their normal colour.”

The final death toll from the bleaching in the north will not be known until all surveys are completed in mid-November, but it is already clear that this event was much more severe than the two previous bleachings in 2002 and 1998.

For more information, visit www.coralcoe.org.au.

The 100,000 year problem

Our planet's ice ages used to occur at intervals of every 40,000 years, which made sense to scientists as the Earth's seasons vary in a predictable way, with colder summers occurring at these intervals. However there was a point, about a million years ago, called the 'Mid-Pleistocene Transition,' in which the ice age intervals changed from every 40,000 years to every 100,000 years.

New research published in the journal *Geology* has suggested the oceans may be responsible for this change, specifically in the way that they suck CO₂ out of the atmosphere.

By studying the chemical make-up of tiny fossils on the ocean floor, the team discovered that there was more CO₂ stored in the deep ocean during the ice age periods at regular intervals every 100,000 years.

This suggests that extra carbon dioxide was being pulled from the atmosphere and into the oceans at this time, subsequently lowering the temperature on Earth and enabling vast ice sheets to engulf the Northern Hemisphere.

Lead author of the research Professor Carrie Lear, from the School of Earth and Ocean Sciences, said: "We can think of the oceans as inhaling and exhaling carbon dioxide, so when the ice sheets are larger, the oceans have inhaled carbon dioxide from the atmosphere, making the planet colder. When the ice sheets are small, the oceans have exhaled carbon dioxide, so there is more in the atmosphere which makes the planet warmer."

"By looking at the fossils of tiny creatures on the ocean floor, we showed that when ice sheets were advancing and retreating every 100,000 years the oceans were inhaling more carbon dioxide in the cold periods, suggesting that there was less left in the atmosphere."

Marine algae play a key role in removing CO₂ from the atmosphere as it is an essential ingredient of photosynthesis.

CO₂ is put back into the atmosphere when deep ocean water rises to the surface through a process called upwelling, but when a vast amount of sea ice is present this prevents the CO₂ from being exhaled, which could make the ice sheets bigger and prolong the ice age.

"If we think of the oceans inhaling and exhaling carbon dioxide, the presence of vast amounts of ice is like a giant gobstopper. It's like a lid on the surface of the ocean," Prof Lear continued.

The Earth's climate is currently in a warm spell between glacial periods. The last ice age ended about 11,000 years ago. Since then, temperatures and sea levels have risen, and ice caps have retreated back to the poles. In addition

to these natural cycles, manmade carbon emissions are also having an effect by warming the climate.

For more information, visit www.cardiff.ac.uk.

Study finds major ocean current is widening as climate warms

A new study by University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science researchers found that the Indian Ocean's Agulhas Current

is getting wider rather than strengthening. The findings, which have important implications for global climate change, suggest that intensifying winds in the region may be increasing the turbulence of the current, rather than increasing its flow rate.

Using measurements collected during three scientific cruises to the Agulhas Current, the Indian Ocean's version of the Gulf Stream, researchers estimated the long-term transport of the

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current, leveraging 22 years of satellite data. They found the Agulhas Current has broadened, not strengthened, since the early 1990s, due to more turbulence from increased eddying and meandering.

One of the strongest currents in the world, the Agulhas Current flows along the east coast of South Africa, transporting warm, salty water away from the tropics toward the poles. The Agulhas, which is hundreds of kilometers long and over 2,000-m deep, transports large amounts of ocean heat and is considered to have an influence not only on the regional climate of Africa, but on global climate as part of the ocean's global overturning circulation.

"Changes in western boundary currents could exacerbate or mitigate future climate change," said Lisa Beal, a UM Rosenstiel School professor of ocean sciences and lead author of the study. "Currently, western boundary current regions are warming at three times the rate of the rest of the world ocean and our research suggests this may be related to a broadening of these current systems."

Previous studies have suggested that accelerated warming rates observed over western boundary current regions, together with ongoing strengthening and expansion of the global wind systems predicted by climate models relate to an intensification and pole-ward shift of western boundary currents as a result of man-made climate change.

"To find decades of broadening, rather than intensification, profoundly impacts our understanding of the Agulhas Current and its future role in climate change," said study co-author Shane Elipot, a UM Rosenstiel School associate scientist. "Increased eddying and meandering could act to decrease poleward heat transport, while increasing coastal upwelling and the exchange of pollutants and larvae across the current from the coast to the open ocean."

This paper analyzed data collected during the "Agulhas Current Times-Series" experiment, led by Beal and funded by the National Science Foundation. The experiment produced continuous measurements of the Agulhas Current to better understand how the oceans are changing due to climate change.

The study, titled "Broadening not strengthening of the Agulhas Current since the early 1990s," was published 9 November in the Advance Online Publication of the journal *Nature*. The authors of the study are Beal and Elipot. DOI: 10.1038/nature19853. Funding was provided the U.S. National Science Foundation, grant OCE-085089.

For more information, visit www.rsmas.miami.edu.

Coastal cities at risk from rapid sea-level rise with warming above two degrees

The first predictions of coastal sea level with warming of two degrees by 2040 show an average rate of increase three times higher than the 20th century rate of sea level rise. These predictions have been published in the *Proceedings of the National Academy of Science of the United States of America (PNAS)* by National Oceanography Centre (NOC) scientists.

According to this research, by 2040 with 2 degrees centigrade warming, more than 90% of coastal areas will experience sea level rise exceeding the global estimate of 20 cm, with up to 40 cm expected along the Atlantic coast of North America and Norway due to ocean dynamics. Furthermore, the impact of this sea level rise will be more pronounced in locations such as Jakarta, where there is subsidence of the land.

Dr. Svetlana Jevrejeva from the NOC, who is the lead author on this paper, said "Coastal cities and vulnerable tropical coastal ecosystems will have very little time to adapt to the fast sea level rise these predictions show, in scenarios with global warming above two degrees."

A worst-case scenario considered involving 5 degrees warming shows that up to 80% of global coastlines could experience changes in sea level of over 1.8 meters by the end of 21st century. This might never happen, but could not be ruled out due to large uncertainties in the contribution of Greenland and Antarctic ice sheets in these sea level rise predictions. As a result, millions of people living by the coast could be displaced and the beaches that attract tourists could be destroyed, particularly in low lying coastal cities in South East Asia and in the U.S., such as Miami."

Professor Ed Hill, executive director of the National Oceanography Centre, commented, "We trust that these findings will help inform coastal sea level adaptation and mitigation strategies. Work of this type forms part of the NOC's ongoing commitment to providing the best possible information to decision makers based on rigorous scientific analysis."

The research is part of the EU funded RISES-AM project, which looks at the impact of sea level rise from a physical, economic and social perspective. The study was carried out by a team with experts from Denmark, the Netherlands, China and the UK.

For more information, visit www.noc.ac.uk.

Culprits behind disappearance of kelp forests revealed

Seaweed-eating fish are becoming increasingly voracious as the ocean warms due to climate change and are responsible for the recent destruction of kelp forests off the NSW north coast near Coffs Harbour, research shows.

The study includes an analysis of underwater video covering a 10 year period between 2002 and 2012 during which the water warmed by 0.6°.

"Kelp forests provide vital habitat for hundreds of marine species, including fish, lobster and abalone" says study first author Dr Adriana Vergé s of UNSW and the Sydney Institute of Marine Science.

"As a result of climate change, warm-water fish species are shifting their range and invading temperate areas. Our results show that over-grazing by these fish can have a profound impact, leading to kelp deforestation and barren reefs."

"This is the first study demonstrating that the effects of warming in kelp forests are two-fold: higher temperatures not only have a direct impact on seaweeds, they also have an indirect impact by increasing the appetite of fish consumers, which can devour these seaweeds to the point of completely denuding the ocean floor."

"Increases in the number of plant-eating fish because of warming poses a significant threat to kelp-dependent ecosystems both in Australia and around the globe," she says.

The study is published in the journal *Proceedings of the National Academy of Sciences*.

The team recorded underwater video around August-time each year at 12 sites along a 25 km stretch of coast adjacent to the Solitary Island Marine Park off northern NSW.

During this period, kelp disappeared completely from all study sites where it was initially present. At the same time the proportion of tropical and sub-tropical seaweed-eating fish swimming in these areas more than tripled. Grazing also intensified, with the proportion of kelp with obvious feeding marks on it increasing by a factor of seven during the decade.

"We also carried out an experiment where we transplanted kelp onto the sea floor. We found that two warm-water species—rabbitfish and drummer fish—were the most voracious, eating fronds within hours at an average rate of 300 bites per hour" says Dr Vergé s.

In Australia, kelp forests support a range of commercial fisheries, tourism ventures, and recreation activities worth more than \$10 billion per year.

For more information, visit www.unsw.edu.au.

Rising To Your Undersea Challenges

DeepWater Buoyancy Inc. is the world's largest producer of subsea buoyancy products for the oceanographic industry and has a vast product line of buoyancy solutions for offshore oil & gas, energy and technology companies. This product portfolio has been built over the course of 35 years serving these industries. Though they offer products for shallow water applications, the company specializes in deepwater, providing solutions to depths of 6000 meters and beyond.

DeepWater Buoyancy's headquarters and manufacturing operations are located in New England, the birthplace of syntactic foam. New England is also where David Cook formed Flotation Technologies (Flotec). Incorporated in 1979, Flotec grew into a recognized world leader in the manufacture of deepwater buoyancy products that included ADCP Buoys, distributed buoyancy modules and drilling riser buoyancy. Flotec was purchased in 2008 by a subsea equipment manufacturer.

In 2013, DeepWater Buoyancy acquired the rights and designs for the legacy Flotec material technology and products when its parent company was in the process of closing the New England facility. Since then, DeepWater Buoyancy has been producing, improving and growing the Flotec product line, which has been the industry standard for decades. DeepWater Buoyancy also stocks parts for these legacy products and provides design and application assistance.



StableMoor® Mooring Buoy being recovered by the University of Washington while conducting a research study on turbulence for the National Renewable Energy Laboratory. Photo credit: Joe Talbert, University of Washington.

The founder of DeepWater Buoyancy is former Flotec President, David Capotosto. Shortly after opening the doors of DeepWater Buoyancy, Mr. Capotosto was joined by three other former members of Flotec's senior management team. This team of four now owns and manages DeepWater Buoyancy. The vision in creating DeepWater Buoyancy was to continue the Flotec commitment to designing and manufacturing the very best buoyancy solutions, and to provide the highest level of support for customers using the products. To that end, one of the first initiatives taken was to re-establish the international network of representatives



Members of the Tasman Tidal Dissipation Experiment Team recover a DeepWater Buoyancy ADCP buoy aboard the R/V Revelle on an exceptionally windy day in the East Tasman Sea. Photo credit: Sonya Legg, Princeton University.

and distributors operating in the oceanographic market. This network provides in-country sales, service, support, and application assistance in over 35 countries.

At the heart of the DeepWater Buoyancy product line are the subsurface ADCP buoys. These buoys, originally developed for Teledyne RD Instruments' ADCPs, are considered the gold standard within the industry. Consisting primarily of both spherical and elliptical buoys, the product line also includes the unique StableMoor® Mooring Buoys. These torpedo-shaped buoys are engineered to house ADCPs and other sensors for high current data collection applications. By design, the StableMoor® reduces drag and increases mooring stability in extreme flow regimes, thereby producing superior data sets.

However, DeepWater Buoyancy's product line goes well beyond ADCP buoys. In the oceanographic market there are bottom mounts, instrument collars, and cable floats. For offshore oil & gas, there are installation blocks, modular buoys, deepwater marker floats and ROV buoyancy. In addition to DeepTec® syntactic foam products and custom-engineered components, there are also polyurethane and fabricated metal products for use subsea.

If a client can't find their ideal solution in the product line, DeepWater Buoyancy will design and produce a custom product. The company's design philosophy is, "A customer should have a product that meets the application, and not be forced to adjust their application to an off-the-shelf product." Whether that is modifying an existing design or starting with a blank sheet of paper, the goal is to produce the finest, most cost-effective solution for any given application.

With a deep understanding of customers' subsea operations, a long history of providing solutions to complex buoyancy applications, and a state of the art manufacturing facility, DeepWater Buoyancy is well-positioned to meet the challenges of this rapidly-evolving technology.

SAL Heavy Lift signs long-term offshore wind contract

SAL Heavy Lift has signed a major contract with Van Oord for a long-term engagement at the Walney Offshore Wind Project. MV Svenja is chartered for 30 voyages for transportation of 87 monopiles from Rostock (D) to Belfast, 47 transition pieces from Aalborg (DK) and 40 from Teesside (UK) to Belfast (UK).

In total, an amount of 87 monopiles with diameter up to 8,40 m and weight up to 970 tons per monopile as well as 87 transition pieces will be transported. The transition pieces are measuring up to 30 m with up to 7 m diameter and are weighing up to 579 tons.

This is the second major contract SAL signed for Offshore support in 2016. With its vessel MV Trina, SAL has just finalized the Veja Mate Offshore Wind Farm project, transporting in total 68 transition pieces in 11 consecutive voyages from Aalborg to Eemshaven.

Trina was engaged from early summer 2016. In 11 consecutive voyages she transported not only 67 transition pieces with a single weight of 365 tons, measuring 22 m x 6 m in diameter, but also 67 air tight platforms and 67 anode cages.

For more information, visit www.sal-heavylift.com.

AWS and Trident Energy collaborate to control pressure in new innovative wave energy device

AWS and Trident Energy have jointly announced the signing of a Memorandum of Understanding (MoU) that will see the two companies working together on an optimised wave energy converter (WEC) design. The improved Archimedes Waveswing™ WEC will be fitted with Trident Energy's optimised PowerPod™ II direct drive linear generator technology.

The Archimedes Waveswing WEC takes a highly efficient sub-sea pressure-differential point-absorber concept and combines it with efficient linear generator technology and advanced control algorithms resulting in maximised yield.

Trident Energy's PowerPod II is a highly scalable and modular Power Take-Off (PTO) system based around a patented tubular linear generator design. The PowerPod II combines Trident's linear generator with proven off-the-shelf solid state power electronics to provide a full 4-quadrant generator control capability. The generator control system enables fully reactive force feedback in real-time on a wave by wave basis, thus maximising efficiency.

The AWS and Trident teams will work together to further develop an advanced control system and share their existing numerical models to develop a complete "wave-to-wire" system model of the full Waveswing WEC.

Wave Energy Scotland (WES) is providing financial support to both AWS and Trident Energy under separate funding calls. AWS secured £285k of funding for its Stage 1 project in the Novel Wave Energy Converter (NWEC) call. Trident has secured £485k of Stage 2 funding for its "WaveDrive" project in the "innovative power take-off systems" call.

For more information, visit www.awscean.com.



CorPower secures EC grant for WaveBoost project



CorPower Ocean AB has been awarded a €4 million grant by the European Commission (EC) for its WaveBoost project. The grant will support a 3-year innovation program targeting significant improvements in the reliability and performance of wave energy converters by using pneumatic components in combination with advanced control technology. The efforts are expected to increase energy production, reduce CAPEX and improve grid integration of wave energy farms, resulting in a reduction in the cost of energy of up to 30%.

The funding follows an extensive review process through the EC's Horizon 2020 call for funding, where businesses were asked to present proposals for demonstrating the next generation of competitive Low Carbon Energy technologies.

The project brings together renewable energy leaders from Sweden, Scotland and Portugal, including the utility company EDP, the European Marine Energy Centre (EMEC), WavEC Offshore Renewables, the University of Edinburgh, SP Technical Research Institute, PMC Cylinders, GS-Hydro and CorPower Ocean.

For more information, visit www.corpowerocean.com.

France inaugurates first marine geothermal power station

Gérard Mestrallet, chairman of ENGIE's board of directors, inaugurated the new marine geothermal power station Thassalia, in Marseille, France, in October. The event took place in the presence of Stéphane Bouillon, prefect of the Provence-Alpes-Côte d'Azur (PACA) region and prefect of the Bouches-du-Rhône region; Renaud Muselier, delegated president of the PACA region and member of the European Parliament; Solange Biaggi, president of the Bouches-du-Rhône departmental council and first vice president of the Greater Aix-Marseille-Provence authority; Laure-Agnès Caradec, president of the Euroméditerranée initiative and deputy mayor of Marseille; and Christine Cabau-Woehrel, president of Marseille Fos Port's board under the high patronage of Jean-Claude Gaudin, president of the Greater Aix-Marseille-Provence authority, mayor of Marseille, and vice president of the senate, and Christian Estrosi, president of the PACA region.

In Marseille, a new solution has been developed to take advantage of the locally available renewable energy: using the calorific energy held in the Mediterranean Sea. The project is a real example of innovation that allows for energy transition and efficiency, therefore consistent with plans to make the Euroméditerranée quarter an example of a sustainable city. Built at the Marseille-Fos Port, the marine

geothermal power station Thassalia is the first in France, and even in Europe, to use the sea's thermal energy to supply linked buildings with power for heating and cooling—over an area that will eventually comprise 500,000 m²—while reducing greenhouse gas emissions by 70%.

ENGIE's innovative solution was brought to life through the expertise of its subsidiaries, ENGIE Cofely for thermal matters, and Climespace for district cooling. All the technical elements of the power station were created by the company's teams: Ineo and Cofely handled electricity, Axima and Cofely covered internal networks, and Axima also provided half of refrigeration units.

A 3 km network will provide energy for the buildings during construction and renovation of the zone, spanning from the CMA-CGM Tower to the Marseille Cathedral. Currently, the connected buildings are the Docks (Constructa), the Calypso and the Hermione (Euromedcenter), and the Golden Tulip. Soon will come the Constructa towers: the Marseillaise, the Floreal (Euromedcenter), Castel, and the Parc Habité d'Arenc, whose main client will be Nexity.

For more information, visit www.engie.com.

Vattenfall wins Kriegers Flak tender

Vattenfall has won the tender to build Kriegers Flak, a 600 MW offshore wind farm in the Baltic Sea. The winning bid was 4.9 euro cent per kWh—the lowest bid in the world. The total investment is expected to be 1.1 to 1.3 billion euros.

Kriegers Flak will be Denmark's largest offshore wind farm and can supply 600,000 Danish households with renewable energy—corresponding to more than one fifth of all households in Denmark. Vattenfall's investment for Kriegers Flak is estimated to be 1.1 to 1.3 billion euros.

In Denmark, winning Kriegers Flak with a historically low price proves the point raised in Danish media for the last couple of months. The minority Danish Government wants to cancel Danish Near Shore, but Vattenfall and several other stakeholders and political parties have stated that with the budget assigned from the Government to Kriegers Flak, it is possible to get both Danish Near Shore and Kriegers Flak within the same budget frame – because Vattenfall has delivered very strong price bids for the two projects.

For more information, visit www.vattenfall.com.

Breakthrough for hybrid wind-wave technology

DP Energy and Floating Power Plant have announced the establishment of a joint venture to evaluate and, dependent on the outcomes of that work, develop two sites for the deployment of a hybrid wind-wave system, one in Scotland the other in Wales. The site(s) could be up and running by 2020.

DP Energy is a leading global developer in renewable energy projects that are both sustainable and environmentally benign.

The new project companies are Dyfed and Katanes Floating Energy Ltd, developing sites in south Wales and north Scotland, respectively.

Established in 2004, Floating Power Plant is a Danish clean-tech company that has designed, developed and patented the P80 technology platform, providing a 5 to 8 MW floating wind turbine combined with a 2 to 3.6 MW wave device.

For more information, visit www.floatingpowerplant.com.

Government support for offshore wind creates massive economic opportunity for Britain

RenewableUK said that last month's government announcement of the next round of competitive auctions to support offshore wind will provide a boost for British industry.

Responding to confirmation of the budget, date and details of the next auction round for Contracts for Difference (CfDs), RenewableUK's Chief Executive Hugh McNeal said, "It's great news that the Government is supporting offshore wind. This will enable our world-leading industry to deliver significant investment to the UK. The competitive auction process is continuing to drive down the cost of offshore wind energy at an unprecedented speed. British supply chain companies are already seizing the massive economic opportunities offered by offshore wind—and there's great potential for further job creation by innovative companies throughout the UK as the industry continues to grow. The Supply Chain Guidance published by Government will help us to make further strides forward on this."

Developers of remote Scottish Island projects, which face higher grid connection costs than those on the mainland, had been awaiting an announcement on a specific Scottish Islands CfD. However, the Government did not set out how this CfD auction would support such projects, announcing instead that a 12-week consultation exercise is being launched.

For more information, visit www.renewableuk.com.

Ultra-Compact Dual Frequency Echosounders

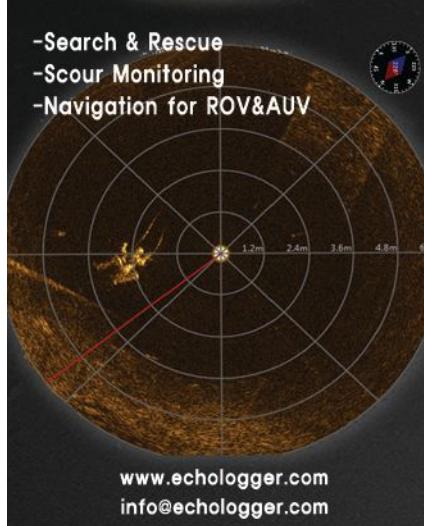


- 200kHz & 450kHz
- Multi-node Network
- Versatile Interface Scheme
- Compact and Easy to Operate
- Accurate Backscatter Data along Water Columns

High Resolution & High Speed Scanning Sonar Systems



- Search & Rescue
- Scour Monitoring
- Navigation for ROV&AUV



Saab acquires Nordic Defence Industries

Saab has acquired the Danish naval company Nordic Defence Industries (NDI). NDI designs and manufactures mine disposal charge systems for the naval defense industry.

The acquisition of NDI develops Saab's market leadership in the unmanned underwater domain when it comes to regional reach, technology and innovative solutions. This means customers can come to Saab for an end-to-end solution to meet their mine counter measures (MCM) needs to detect, classify, identify and dispose of maritime mines.

"With the acquisition we are strengthening our position in the mine counter measures market, building a foundation for continued profitable growth. Our regional footprint will be strengthened as well as our role as a global supplier of mine counter measure solutions," says Görgen Johansson, head of business area Dynamics. "With the high tech solutions for mine disposal provided by NDI we will have a product portfolio that covers the total need among our mine counter measure customers."

One of NDI's products is DAMDIC, a mine disposal charge, carried to the mine by a remotely operated vehicle such as Saab's Double Eagle—the first choice for many navies when it comes to mine counter measures.

The company will be integrated into Saab's business area dynamics within its underwater systems business unit. The combination of Saab's experience and knowledge from the AUV/ROV market and NDI's innovative mine disposal solutions will create a unique MCM house within Saab.

For more information, visit www.saabgroup.com.

Liquid Robotics, Boeing demonstrate autonomous capabilities at 'Unmanned Warrior'

Liquid Robotics® and Boeing® have for the first time used a network of persistent USVs to detect, report and track a live submarine in a naval demonstration.

Four Sensor Hosting Autonomous Remote Craft (SHARCs®) were deployed off the coast of Northern Scotland during the British Royal Navy's Unmanned Warrior 2016 demonstration. The autonomous surface vehicles used advanced Boeing acoustic sensors in the live anti-submarine warfare (ASW) mission.

Over the two-week demonstration, the SHARCs successfully detected and tracked an advancing unmanned underwater vehicle and most significantly—a manned diesel submarine. The SHARCs provided detailed and actionable intelligence to commanders through more than 100 automated contact reports, proving the USVs efficacy to autonomously conduct ASW missions and exchange data in real time.

In addition to the ASW mission, two SHARCs equipped with meteorological and oceanographic sensors were deployed to the North Atlantic to gather data that ultimately contributed to sensor prediction models for Unmanned Warrior and Joint Warrior, a major bi-annual collective training exercise also hosted by the Royal Navy. The SHARCs operated 24/7 in harsh conditions unfavorable for manned operations—waves in excess of 6.6 meters and winds of more than 60 kts—to autonomously provide real-time data on the weather and ocean conditions critical to the safe operation of the Unmanned Warrior systems.

For more information, visit www.liquid-robotics.com.

**Iver3-AUV plays active role in Unmanned Warrior 2016**

OceanServer Technology recently participated in the first ever Unmanned Warrior (UW) in Loch Alsh, Scotland. Part of Joint Warrior, the semiannual, UK-led training exercise is designed to provide NATO and allied forces with a unique multi-warfare setting in which to prepare for global operations. The event also provides a stage for valuable research and training on the latest in autonomous naval technologies while simultaneously strengthening international interoperability. Multiple Iver AUVs were put in active roles by members of the Royal Navy, U.S. Navy and the Defence Research and Development Canada (DRDC). The Iver-3 systems were used in a segment of Unmanned Warrior known as Hell Bay, during which groups of underwater vehicles demonstrate how they collaborate to carry out autonomous tasks like target location and recognition.

Several of the Iver3 AUVs were equipped with SeeByte Neptune, an open architecture enabling autonomous multi-vehicle collaboration. Designed to enhance mine counter-measure (MCM) missions, the system offers launch and recovery software management, water column flight management, static and dynamic exclusion zones, survey and re-acquire tasks, and real-time progress and status monitoring. The Iver3 MCM systems come equipped with high-resolution side-scan sonar, RDI Explorer DVL w/ADCP, WHOI Micro modem, Iridium Communications, and an operator console.

OceanServer Technology, Inc. is a leading manufacturer of man-portable Autonomous Underwater Vehicles (AUVs), three axis digital compasses, and high-efficiency Lithium Ion battery solutions. The Iver3 AUV is an affordable, commercial vehicle used by customers around the globe for sensor development, water quality, general survey work, sub-surface security and research. Systems are capable of operating unattended for up to 7 to 10 hours while carrying a variety of sophisticated payload options.

For more information, visit www.ocean-server.com.

USS Zumwalt commissions in Baltimore

The Navy's newest and most technologically advanced warship USS Zumwalt (DDG 1000) was commissioned into active service 15 October at North Locust Point in Baltimore.

Zumwalt, the lead ship of a class of next-generation multi-mission destroyers, features a state-of-the-art electric propulsion system, wave-piercing tumblehome hull, stealth design, and the latest warfighting technology and weaponry available.

Secretary of the Navy, the Hon. Ray Mabus, delivered the ceremony's principal address.

The ship's co-sponsors, Ann Zumwalt and Mouzetta Zumwalt-Weathers, are daughters of former Chief of Naval Operations Adm. Elmo R. Zumwalt, Jr., after whom the ship is named. The sisters were an integral part of the ceremony, giving the order to "man our ship and bring her to life," in keeping with naval tradition.

The Zumwalt-class destroyer will be capable of performing a range of deterrence, power projection, sea control, and command and control missions while allowing the Navy to evolve with new systems and missions. It does all of this while maintaining its stealth—making this visually imposing ship difficult to find whether close to the shore or far out to sea.

Working with Arleigh Burke-class destroyers, littoral combat ships, and amphibious ships to form adaptive force packages, Zumwalt-class destroyers will use its computing capabilities to make these groups more lethal through increased range, deception, computer integration, and data analysis from various platforms. With its stealth, size, power, and advanced combat systems, this warship will serve as a centerpiece for deterrence and stability in the maritime environment.

For more information, visit www.navy.mil.

SeeByte, the software supporting Unmanned Warrior operators

SeeByte, the global leader in creating smart software for unmanned maritime systems, is pleased to announce successful participation in Unmanned Warrior. SeeByte was involved in four threads: Automatic Target Recognition (ATR), Command and Control, Collaborative Autonomy, and Smart ROV Control.

As part of this exercise, SeeByte supported the U.S. Navy Lab of Naval Surface Warfare Center Panama City Division (NSWC-PCD), Defence Research and Development Canada, an agency of the Canadian Department of National Defence, and the UK's Defence Science and Technology Lab (Dstl).

Together with ASV Global, Bluebear, and QinetiQ, the team was successful in facilitating the collaboration of unmanned vehicles including air, surface, and subsea, on common missions running through Dstl's Maritime Autonomy Framework (MAF) realised through SeeByte's Neptune software. Using vehicles from Hydroid, OceanServer Technology, SeaRobotics, Bluebear and ASV Global, the team networked 10 unmanned systems, from three different countries through a single

command and control station. By running communications through Bluebear's aerial drone Blackstart, this relay link meant that the surface and subsea vehicles were able to operate at a far greater distance from the shore.

Another vital component of this success was the Autonomy Control Exploitation and Realisation (ACER) command and control system. SeeByte partnered with primes including QinetiQ and Thales to demonstrate the ACER project which has integrated and exploited MAF, providing a single command station to manage Unmanned Maritime System (UMS) fleets. Operators were able to define available assets, mission goals and objectives, and no-go areas. Fleet operators were also able to monitor the vehicles in the fleet as they autonomously adapted their paths and behaviours in response to feedback from the environment.

SeeByte software solutions provided ATR systems to aid post-mission data analysis, and smart ROV control systems to assist in intervention operations were also used to complete the full mission profile.

The technologies developed provide the first major steps towards a paradigm shift: a move away from men on the front-line operations towards unmanned over-the-horizon multi-squad operations supported by a shore-side team.

For more information, visit www.seebyte.com.

Royal Navy tests unmanned fleet of the future

In October, Royal Navy led the world's first large-scale demonstration of marine robotic systems, 'Unmanned Warrior 16,' an innovative demonstration of autonomous systems that could transform the Armed Forces of the future. Held off the coast of west Scotland and west Wales in October, Unmanned Warrior 16 brought together 40 industry partners and international allies to showcase the latest in remote technology.

Over 50 aerial, surface and underwater Maritime Autonomous Systems (MAS) took part in a range of demonstrations on the themes of surveillance, intelligence-gathering and mine countermeasures. This collaborative approach is at the heart of the new Defence Innovation Initiative and the £800 million fund that supports the generation of ideas to benefit both defense and British businesses.

For more information, visit www.royalnavy.mod.uk.

Bollinger delivers USCGC Lawrence Lawson

Bollinger Shipyards has delivered the USCGC Lawrence Lawson, the 20th Fast Response Cutter (FRC) to the United States Coast Guard.

Ben Bordelon, Bollinger president and CEO said, "We are very pleased to announce the delivery of the USCGC Lawrence Lawson to the U.S. Coast Guard, the latest FRC built by Bollinger Shipyards and the second FRC to be stationed in the 5th Coast Guard District at Cape May, New Jersey. FRCs already in commission have seized multiple tons of narcotics, interdicted thousands of illegal aliens and saved many lives. We are also very proud of the fact that our FRC program has surpassed all historical quality benchmarks resulting in truly exceptional vessels that will serve our nation for many years to come."

The 154-ft patrol craft USCGC Lawrence Lawson is the 20th vessel in the Coast Guard's Sentinel-class FRC program and the second FRC. The decision to homeport these vessels at Cape May is significant because it expands the footprint of FRC operations beyond the Bahamas and the Caribbean. Previous cutters have been stationed in the 7th Coast Guard District in Florida or San Juan, PR. It has a flank speed of 28 kts, state-of-the-art command, control, communications and computer technology, and a stern launch system for the vessel's 26 ft cutter boat. The FRC has been described as an operational "game changer," by senior Coast Guard officials.

The Coast Guard took delivery on the 20 October 2016 in Key West, Florida and is scheduled to commission the vessel in Cape May, New Jersey during early 2017.

This vessel is named after Coast Guard Hero Lawrence Lawson, who was awarded the Gold Lifesaving Medal in 1890 for his leadership skills and heroic efforts in the successful rescue of the 18 member crew of the steam vessel Calumet.

For more information, visit www.bollingershipyards.com.



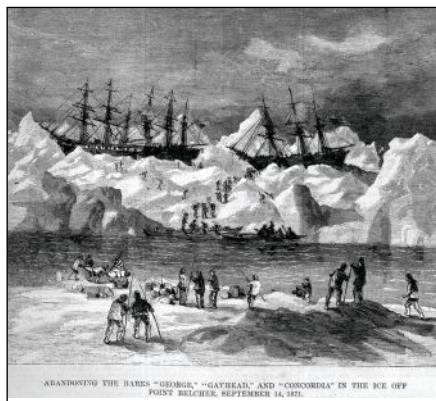
YEAR IN REVIEW

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Remains of lost 1800s whaling fleet discovered off Alaska's Arctic coast

NOAA archaeologists have discovered the battered hulls of two 1800s whaling ships nearly 144 years after they and 31 others sank off the Arctic coast of Alaska in one of the planet's most unexplored ocean regions.

The shipwrecks, and parts of other ships, that were found are most likely the remains of 33 ships trapped by pack ice close to the Alaskan Arctic shore in September 1871. The whaling captains had counted on a wind shift from the east to drive the ice out to sea as it had always done in years past.



introduces a paradigm shift in salmon farming now, and other fish types in the future and is a significant step in Norway's efforts to deliver technical solutions to address the impending global food gap challenge.

El Niño warming causes significant coral damage in central Pacific



El Niño conditions in the Pacific Ocean have created high water temperatures that are seriously damaging coral reefs, including those on Christmas Island, which may be the epicenter for what could become a global coral bleaching event.

Coast Guard leaders from Arctic nations sign historic joint statement

A joint statement, officially establishing the Arctic Coast Guard Forum (ACGF), was signed by leaders representing all eight coast guard agencies of the Arctic nations.

The ACGF is an operationally focused, consensus-based organization with the purpose of leveraging collective resources to foster safe, secure, and environmentally responsible maritime activity in the Arctic. Membership includes Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation, and the U.S.

WHOI assists in locating El Faro voyage data recorder

A team of scientists and engineers from the NTSB, Coast Guard and Woods Hole Oceanographic Institution (WHOI) located the voyage data recorder of the sunken El Faro cargo ship.

U.S. fisheries rebuilding

The number of domestic fish stocks listed as overfished or subject to overfishing remain near all-time lows, according to the 2015 Status of U.S. Fisheries report to Congress.

The 2015 report highlights the U.S.' continued progress towards managing fish stocks sustainably. This is a result of the combined efforts of NOAA Fisheries, commercial and recreational fishermen, the regional fishery management councils, states, and other partners.

World's first offshore aquaculture development project gets green light

The Norwegian Ministry of Trade and Fisheries has approved Norway's first development concession enabling Ocean Farming AS, supported by Kongsberg Maritime AS, to build the world's first automated 'exposed' aquaculture facility. Situated outside of Trondheim, this innovative new facility

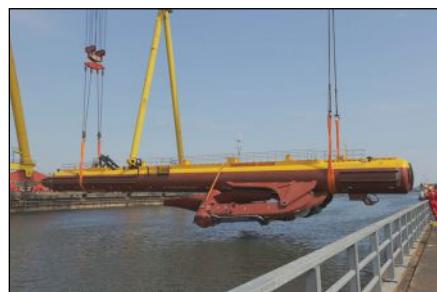
America's first offshore wind farm on track



Installation of the Block Island Wind Farm's turbine towers, blades and nacelles began in early August at the project site, roughly 3 mi off the coast of Block Island, Rhode Island.

The Block Island Wind Farm remains on-schedule to be fully constructed and commissioned in late 2016.

Scotrenewables launches world's largest tidal turbine



Scotrenewables Tidal Power has launched its 2-MW SR2000, the world's largest energy-generating tidal turbine. The company, which is at the forefront of the floating tidal technology sector, launched the 550-ton machine at Harland & Wolff Heavy Industries Ltd in Belfast.

Innovative wave energy device lands in Australia

BioPower Systems (BPS) completed the deployment of its 250-kW bioWAVE pilot demonstration unit off the coast near Port Fairy, Victoria. The \$21 million project has been in development by BPS for 3 years, with \$11 million funding from the Australian



IOOS awards \$31M for ocean observing

U.S. IOOS is proud to announce the awarding of over \$31 million in grants to support ocean, coastal and Great Lakes observing efforts throughout the U.S., Caribbean and Pacific.

Renewable Energy Agency (ARENA) and \$5 million funding from the Victorian Government.

Inauguration of expanded Panama Canal ushers in new era of global trade



During the official inauguration ceremony, Panamanian President Juan Carlos Varela and Panama Canal Administrator and CEO Jorge L. Quijano spoke to a crowd of more than 25,000 jubilant Panamanians, canal employees, heads of state and dignitaries from around the world, canal customers, shipping and trade executives, and nearly 1,000 journalists. This is the first expansion of the waterway since its original construction.

The inaugural transit began with the passage of neopanamax vessel COSCO Shipping Panama through the Agua Clara Locks on the Atlantic side of the country and concluded with its transit through the Cocoli Locks on the Pacific side.

Northrop Grumman Sperry Marine launches CompassNet at SMM 2016

Northrop Grumman Corporation's Sperry Marine business unit announced the launch of CompassNet, a network-connected ship heading management system that allows for the deployment of different configurations that can be upgraded easily and affordably.

CompassNet allows multiple ship heading management controls through the groundbreaking use of standard Ethernet connectivity to link the heading sensors and the distribution portion of the heading management system. As a fully type-approved system, it provides improved efficiency for a wide range of sensor and control configurations from a basic setup to more complex arrangements with redundant monitoring stations. CompassNet will benefit a wide range of vessels including high-end commercial ships, cruise liners, and survey vessels as well as military support and control vessels.

DONG to build new record-size offshore wind farm

DONG Energy has made a final investment decision to build the giant Hornsea Project One offshore wind farm in the UK. With a capacity of 1.2 GW, Hornsea will on completion be the world's first offshore wind farm to exceed 1,000 MW in capacity and by a large margin become the world's largest offshore wind farm. It will be able to meet the electricity needs of well over one million UK homes.

GE enters the container ship industry



GE's Marine Solutions announces the expansion of its offering with the signing of a key contract to provide the latest in auxiliary electric systems to Maersk Line, the world's leading container ship operator. GE's Power Take Off/Power Take In (PTO/PTI) technology consists of two drives, two induction motors and a power management system. It is a smart solution that provides excess power on demand while reducing fuel consumption. When not being used to propel the vessel, the PTO/PTI technology uses the surplus energy to power onboard systems and equipment.

U.S. Coast Guard approves official electronic charts

The U.S. Coast Guard published guidance that allows mariners to use electronic charts and publications instead of paper charts, maps and publications.

Deputy Assistant Secretary of the Navy named for Unmanned Systems

Navy Secretary Ray Mabus has named retired Brig. Gen. Frank Kelley to be Deputy Assistant Secretary of the Navy for Unmanned Systems.

"General Kelley's superb operational experience as a U.S. Marine as well as his professional expertise in the field of electronic warfare and unmanned technology make him perfectly qualified to lead this new enterprise in the Department of the Navy, and I look forward to the great work he and his team will be spearheading," said Mabus.

U.S. Coast Guard expands AIS requirements

The U.S. Coast Guard expanded Automatic Identification System (AIS) requirements to include additional commercial vessels.

The change, which applies to U.S.-flag and foreign-flag vessels that are 300 gross tons or less, went into effect in April 2016.

Austal awarded LCS support contract

Austal USA has been awarded a contract for US\$51,684,797 to its 11-ship \$3.5 billion Littoral Combat Ship (LCS) contract for the U.S. Navy. This contract modification is expected to increase to US\$198,385,545 over 3 years if options are exercised. This work includes design services for upgrades to the LCS and preliminary design for the U.S. Navy's future Frigate.

Lockheed Martin conducts first underwater UAV launch from AUV



Lockheed Martin successfully launched Vector Hawk, a small UAV, on command from the Marlin MK2 AUV during a cross-domain command and control event hosted by the U.S. Navy.

API files suit against EPA's final oil and natural gas sector rule

API filed a lawsuit with the D.C. Circuit Court challenging the EPA's final oil and natural gas sector rule calling for emission standards for new, reconstructed, and modified sources. Specifically, API challenges the EPA's failure to adhere to the specific limitations provided by the Clean Air Act on the way the agency can develop regulations.

ExxonMobil starts production at the Julia oilfield in Gulf of Mexico

Oil production has started under budget and ahead of schedule at the Julia oilfield in the Gulf of Mexico, Exxon Mobil Corporation announced.

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Statoil exits Alaska

Statoil is optimizing its exploration portfolio and has decided to exit Alaska following recent exploration results in neighboring leases.

Halliburton and Baker Hughes announce termination of merger agreement

Halliburton Company and Baker Hughes Incorporated announced that the companies have terminated the merger agreement they entered into in November 2014.

Bibby Offshore secures multimillion pound subsea project with BP

Bibby Offshore, a leading subsea services provider to the oil and gas industry, has been awarded a multimillion pound contract by BP to replace subsea infrastructure in the Central North Sea.

The work is part of the \$1 billion Eastern Trough Area Project (ETAP) Life Extension Project announced by BP. ETAP is one of the largest and most complex developments in the North Sea, comprising nine oil and gas reservoirs, six of which are operated by BP. The ETAP Life Extension Project (ELXP) will help secure the future of the fields until 2030 and beyond.

Researchers look to bring Internet to offshore regions

A cutting-edge project hopes to provide broadband, low-cost Internet access in remote ocean areas, more than 100 km off the coast, using standard access technologies, such as Wi-Fi and 4G, to support the Blue Economy, including fisheries and maritime transportation.

The goal of the BLUECOM+ project, which is being developed by a group of Portuguese and Norwegian researchers, is to facilitate activities such as the exploitation of mineral resources on the ocean bed, environmental monitoring, or other traditional activities like fisheries and maritime transportation, which increasingly require access to communications at sea.

Marlink, Inmarsat enter strategic alliance for Fleet Xpress broadband services

Marlink has signed a strategic alliance with Inmarsat that will see Inmarsat's new Fleet Xpress service integrated into Marlink's existing service portfolio. Through the agreement, Marlink will bring more than 2,000 vessels to Inmarsat's new Fleet Xpress service over a 5-year period.

Global Marine re-enters power market

Global Marine Systems Limited is re-entering the submarine power cable market after a brief absence. Global Marine will once again be available to offshore renewables and power market customers, bringing power and fiber optic connectivity to their systems.

Companies successfully trial Fleet Xpress in challenging Antarctic conditions



Inmarsat together with Global Marine Networks and Network Innovations, announced the successful trial and subsequent commercial order for Fleet Xpress in Antarctic waters. Fleet Xpress, installed on board the adventure cruise ship Ocean Nova, delivered robust communications in one of the most hostile environments on the planet.

Microsoft, Facebook to build transatlantic cable

Microsoft and Facebook announced an agreement to build a new, state-of-the-art subsea cable across the Atlantic. The new "MAREA" cable will help meet the growing customer demand for high speed, reliable connections for cloud and online services for Microsoft, Facebook and their customers. The parties have cleared conditions to go Contract-In-Force with their plans, and completion is expected in October 2017.

Oceaneering demonstrates innovative remote piloting and automated control



Oceaneering demonstrated two new technologies that will greatly increase ROV operational efficiency and reduce costs for its customers.

During the demonstration, the NEXXUS ROV on the Oceaneering Olympic Intervention IV vessel was successfully piloted via a satellite link from an Oceaneering onshore base. The innovative data/video communications technology that enables this capability was originally developed to aid in diagnosing faults offshore by technical support personnel onshore. The technology has been further developed to include the ability to remotely pilot the ROV.

The demonstration also included an essentially hands-free operation method of piloting, whereby the pilot was able to "fly" the ROV with a command-based system involving automated steps, instead of using the traditional joystick.

SMD delivers world's first deep sea mining vehicles



In late 2007, SMD was awarded with a contract to design and build the world's first deep sea mining vehicles for Canadian listed company Nautilus Minerals. Eight years on, having worked in close partnership with the customer, this massive feat of engineering is complete. The seafloor production tools and associated equipment, totalling over 1,000 tonnes will undergo further testing.

Schmidt Ocean Systems new SuBastian ROV completes tests

After a month of completing rigorous tests in the open ocean off the island of Guam in the western Pacific, the new ROV SuBastian is returning to shore. Schmidt Ocean Institute has been working this summer, testing and integrating its new ROV from aboard its 272 ft oceanographic research vessel Falkor.

The 25-day testing placed ROV SuBastian in real-world conditions, demonstrating its functionality as a modern research tool with innovative systems. The ROV tests and trials included 22 dives and more than 100 hours underwater. Now that the vehicle has been tested, the team is working on making tweaks and improvements so that SuBastian is ready for its first research cruise later this year, visiting the Mariana Back-Arc in Guam. The



4K high-resolution video footage collected with SuBastian will be openly shared with scientists and interested public around the world.

Hydroid introduces the New Generation REMUS 100 AUV



Hydroid, Inc. has announced its release of the New Generation REMUS 100 AUV. The AUV features advanced technology and capabilities that are the first of their kind in the industry, enabling customers to have increased autonomy and creativity during missions.

The New Generation REMUS 100 AUV combines the reliability of the original REMUS 100 AUV that customers know and trust with new features and capabilities, such as advanced core electronics, a flexible navigation suite with an exclusive conformal DVL and an open architecture platform for advanced autonomy. The vehicle was created over a period of 2 years and is designed based on feedback from the world's largest AUV user community.

SAAB demos AUV/ROV hybrid Seaeye Sabertooth at NASA laboratory

Saab attended a subsea industry symposium led by OneSubsea and held at NASA's Neutral Buoyancy Laboratory (NBL) in Houston, Texas. The symposium featured demos and a seminar around one of Saab's key underwater vehicles, the Seaeye Sabertooth.

The demos at NBL displayed how the Seaeye Sabertooth can remotely execute subsea intervention tasks, such as



closing a subsea valve. To make performing these duties possible, the Seaeye Sabertooth was fitted with an electric torque tool from Seanic Ocean Systems. This allowed the Seaeye Sabertooth to be operated via a free space optics link. The link was connected to the subsea valve, where the torque tool was engaged with the torque bucket.

ROV Jason upgraded



A major, \$2.4 million upgrade funded by the National Science Foundation has made the ROV Jason more capable than ever. This 12-month-long project, conducted by engineers at WHOI, which designed and built the vehicle, has increased the vehicle payload and range of activities and streamlined the vehicle operation.

General Dynamics acquires Bluefin Robotics

General Dynamics Mission Systems has acquired Bluefin Robotics, a manufacturer of unmanned undersea vehicles that perform a wide range of missions for the U.S. military and commercial customers.

Okeanus acquires Sound Ocean Systems

Okeanus Science & Technology LLC (Okeanus) announced that it has acquired the business assets of Sound Ocean Systems, Inc. (SOSI). This business combination will allow it to offer SOSI's full catalog of equipment and engineering services to Okeanus customers and give the combined company a local presence in the Gulf of Mexico and Pacific Northwest.

Teledyne acquires CARIS

Teledyne Technologies Incorporated and CARIS jointly announced that the CARIS business and its international affiliates have agreed to be acquired by a wholly-owned subsidiary of Teledyne. CARIS, headquartered in Fredericton, New Brunswick, is the leading developer of geospatial software designed for the hydrographic and marine community.

Delmar Systems acquires InterOcean Systems

Delmar Systems, Inc., a worldwide supplier of offshore mooring and subsea services, announces an expansion of products and services with the acquisition of privately owned InterOcean Systems, Inc. InterOcean will be operated as an affiliated entity of Delmar.

Mitcham Industries acquires L-3 Communications Klein Associates

Mitcham Industries, Inc. has acquired L-3 Communications Klein Associates, Inc., a designer, manufacturer and worldwide distributor of sonar and waterside security systems to military and commercial customers. Klein was a wholly-owned subsidiary of L-3 Communications Corporation.

Saab Seaeye consolidates Hydro-Lek

Following their acquisition of tooling maker, Hydro-Lek, Saab Seaeye has consolidated the business into their own facilities at Fareham.

Airbus Group to sell commercial satellite communication business

Airbus Group SE has signed with French private equity firm, Apax Partners, a share purchase agreement for the sale of 100% of the share capital of the legal entities comprising the commercial satellite communication business.

MTS announces Kevin Traver as new executive director

The Marine Technology Society (MTS) announced Kevin Traver as its executive director. In this position Traver will lead the organization in its mission to promote awareness, understanding, advancement and application of marine technology.

Traver joins MTS from the Navy League of the United States, where as vice president for corporate affairs he grew successful programs, partnerships and campaigns by developing strong relationships with key decision makers in the business community as well as the Navy, Coast Guard, Marine Corps, Maritime Administration and Merchant Marines.



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OFFSHORE INDUSTRY

Bibby Offshore secures second subsea inspection contract with Shell



Bibby Offshore, the leading subsea services provider to the oil and gas industry, has this year been awarded two contracts from Shell to provide inspection services on assets in the Corrib Natural Gas field in the North Atlantic Ocean.

The first contract, completed in June this year, saw Bibby Offshore's construction support vessel Olympic Ares—equipped with Quantum Work Class and SeaEye Cougar Inspection Class ROVs—perform subsea inspections 83 km off the northwest coast of Ireland, in water depths of approximately 360 m.

The 40-day campaign involved pipeline survey inspection work on an 83-km long 20-in. gas pipeline, as well as internal wellhead and manifold fault diagnostics, structural inspection and cathodic protection measurements to ensure optimum levels of productivity were achieved.

Bibby Offshore's successful completion of this scope of work resulted in Shell awarding the company a second contract at its West Ireland assets. The project commenced in July and is set for completion by the end of this year.

Barry Macleod, managing director at Bibby Offshore, said: "These contracts are very important for Bibby Offshore, and our relationship with Shell is continuing to strengthen. Securing the second scope of work off the back of our success in June is testament to the skill and dedication of our team to deliver for our clients."

The second contract will see Bibby Offshore also utilise its construction support vessel Olympic Ares—equipped with two Quantum Work Class ROVs.

The 3 week campaign involves Bibby Offshore installing an electrical distribution unit and several replacement control jumpers. The company will also perform inspection, repair and maintenance services in water depths of 400 m.

Bibby Offshore successfully provided riser replacement services on Shell's Pierce project in 2014 and supported work on its Curlew in early 2015.

For more information, visit www.bibbyoffshore.com.

Global Maritime signs master services agreement with Statoil

Global Maritime Consultancy & Engineering, a provider of marine warranty, dynamic positioning and engineering services to the offshore sector, has been awarded a master services agreement (MSA) by Norwegian operator Statoil. Services covered in the global agreement include platform technology studies, safety studies, marine verification, and warranty surveys. The MSA replaces several previous frame agreements between Statoil and Global Maritime.

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ExxonMobil announces significant oil discovery offshore Nigeria

Exxon Mobil Corporation has announced a significant discovery with a potential recoverable resource of between 500 million and 1 billion barrels of oil on the Owowo field offshore Nigeria.

The Owowo-3 well, which was spud on 23 September, encountered about 460 ft (140 m) of oil-bearing sandstone reservoir. Owowo-3 extends the resource discovered by the Owowo-2 well, which encountered about 515 ft (157 m) of oil-bearing sandstone reservoir.

Owowo-3 was safely drilled to 10,410 ft (3,173 m) in 1,890 ft (576 meters) of water. The Owowo field spans portions of the contract areas of Oil Prospecting License 223 (OPL 223) and Oil Mining License 139 (OML 139). The well was drilled by ExxonMobil affiliate Esso Exploration and Production Nigeria (Deepwater Ventures) Limited and proved additional resource in deeper reservoirs.

ExxonMobil holds 27% interest and is the operator for OPL 223 and OML 139. Joint venture partners include Chevron Nigeria Deepwater G Limited (27% interest), Total E&P Nigeria Limited (18% interest), Nexen Petroleum Deepwater Nigeria Limited (18% interest), and the Nigeria Petroleum Development Company Limited (10% interest).

For more information, visit <http://corporate.exxonmobil.com>.

Oceaneering announces BP Angola 2-year contract extension

Oceaneering International, Inc. announces that a unit of BP p.l.c. has agreed to a 2-year extension through January 2019 under the field support vessel services contract that was entered into with the company for work offshore Angola on Blocks 18 and 31.

Under this contract term extension, the Ocean Intervention III will remain chartered through April 2017, with five option periods for further extension of 1-month each. Additional vessels and services, if any, would be provided during the remaining period of the contract, on as-needed basis.

M. Kevin McEvoy, chief executive officer of Oceaneering, said, "We are pleased to have secured this contract extension with BP. In support of this contract, we are also providing a wide range of vessel-related subsea services, including remotely operated vehicles, tooling, asset integrity, and diving services. This extension strengthens our long-term commitment in Angola, which we see as a vital deepwater market for Oceaneering's services and products."

For more information, visit www.oceaneering.com.

OFFSHORE INDUSTRY HEADLINES

Research & Development • Environmental Assessment • Discovery

David Sutton, CEO of Global Maritime Consultancy & Engineering, said: "This is an endorsement of the work Global Maritime has carried out for Statoil over the last few years. It is also testament to the strength of our relationship and our focus on innovation, operational excellence and delivery."

He continues: "We look forward to continuing to leverage our global knowledge and expertise to provide Statoil with the best possible service."

Global Maritime has a long-standing relationship with Statoil and has provided services on many of the operator's fields on the Norwegian Continental Shelf (NCS) and globally. The most recent work was the successful disconnection and towing of the Njord A semi-submersible floating production platform from the Njord field to an onshore maintenance facility. Other recent projects include Marine Warranty Surveys for the Hywind Scotland and Dudgeon Wind Farms.

For more information, visit www.globalmaritime.com.

N-Sea increases capabilities with addition of new vessel

Subsea IMR provider N-Sea has increased its fleet through the long-term charter of Siem Offshore's offshore subsea construction vessel, the Siem Barracuda.

The vessel is equipped specifically for subsea IMR, Survey and construction operations, featuring twin WROVs, moonpool deployed, a 250T AHC crane and accommodation for 110 personnel.

Roddy James, chief operating officer at N-Sea, said: "The Siem Barracuda has added another highly efficient dive support and survey vessel to the N-Sea fleet. Its technical specifications not only increase our capabilities across the subsea IRM field, but also build upon the safe, efficient ethos for which N-Sea is renowned."

"This is a state-of-the-art subsea vessel, which increases our ability to operate within greater parameters of harsh weather. Additional bed space, a large active heave compensation crane and the option for simultaneous moonpool deployment of ROVs and air nitrox diving all illustrate N-Sea's capacity for safe, sound and swift operability within oil and gas and renewables markets. This is further reinforced by the addition of a permanent air nitrox daughter craft."

N-Sea is known for its innovative work as an independent offshore subsea contractor, specialising in IMR services for the oil and gas, renewable and telecom/utility industries as well as for civil contracting communities. N-Sea provides nearshore, offshore and survey services to major operators and service companies alike.

For more information, visit www.n-sea.com.



ECS saves time with Sonardyne Connect at Julimar

A major metrology campaign conducted off the coast of Western Australia has been completed in just 26 hours thanks to the time saving features offered by specialist survey software supplied by subsea technology company Sonardyne International Ltd, UK.

The project was led by global offshore construction company EMAS CHIYODA Subsea (ECS), who was contracted by Apache Energy to install infrastructure at the Julimar natural gas field. The scope of work included installation of two manifolds, connected by five 30-m vertical spools and five 80-m horizontal spools.

Underwater metrology requires accurate, precise and robust measurements that are critical for successful fabrication and installation of spools and jumpers. Surveyors estimated that to gather the 10 metrologies at Julimar could take anywhere between 60 and 80 hours. By opting to use Sonardyne's Connect software package to streamline the process, the entire operation was subsequently completed in just 26 hours.

Connect was developed in partnership with survey engineering company 4D Nav and speeds up metrology campaigns by introducing expert settings, automated data collection and robust processing of acoustic measurements from planning through to report delivery. Not only does Connect help users save time and money, it also reduces the risk of spool pieces being fabricated incorrectly.

The work at Julimar was conducted from ECS' heavy lift, deep water, multi-lay vessel Lewek Constellation, operating with Sonardyne's 6G (Sixth Generation) acoustic positioning transponder hardware. These were deployed on the seabed and placed in survey receptacles attached to the various structures. The design of the ROV-friendly transponders enabled them to be moved around the site and easily and precisely aligned relative to each structures' north.

During the operation, the survey team collected depth and profile data using an ROV-held digiquartz depth sensor, then heading and inclination data at each survey receptacle whilst also collecting Long Baseline (LBL) acoustic range measurements. The collected data was analysed as one data set. The site's shallow water depth meant paying particular attention to sound velocity.

Connect's ability to edit the sound velocity applied to individual and groups of baseline observations and reprocess multiple metrologies to evaluate the effect of the changes with a few mouse clicks, proved invaluable to the ECS team. Once the data QC was completed, each spool metrology was processed and a final report generated that contained a summary of the results, including hub-to-hub horizontal distances, slant range, depth differences, attitudes, and details of the calculations to support the results.

For more information, visit www.sonardyne.com.

Aker Solutions signs two subsea framework contracts with BP

Aker Solutions secured two 5-year framework agreements for potential future deliveries of subsea production systems and lifecycle services at BP-operated oil and gas fields globally.

The first 5-year contract covers engineering, procurement and construction of subsea production systems for new and maturing developments worldwide. Aker Solutions would bid for work under the contract, which sets out the terms and conditions that would need to be met. The companies also agreed on a 5-year servicing agreement, coinciding with the first contract, for any equipment delivered under the first contract.

and to support previously installed subsea hardware. Both contracts started in August 2016.

"This further expands our long-standing relationship with BP, which spans more than 20 years," said Luis Araujo, chief executive officer of Aker Solutions. "We look forward to working together to find sustainable solutions for securing needed energy resources from BP's subsea fields around the world."

The contracts allow Aker Solutions to bid for work as one of four preferred suppliers for BP's development portfolio across the world. The size of the framework agreements depend on the amount of work necessary, and orders will be booked as they come in.

For more information, visit www.akersolutions.com.

CGG wins major award from Pemex

CGG announced that it has been awarded a major contract by Pemex to deliver an orthogonal wide-azimuth integrated solution designed to optimize subsalt seismic imaging in the geologically complex deep waters of the Perdido area.

A new wide-azimuth survey, covering approximately 10,000 sq. km, will be acquired perpendicularly over the existing wide-azimuth seismic data acquired by CGG in 2010. Imaging of this first large-scale combined orthogonal wide-azimuth dataset for Pemex is expected to provide significantly enhanced subsalt imaging results due to the improved illumination of the targets beneath the complex salt canopy.

The survey will commence in early 2017 with delivery of Fast Trax pre-stack depth migration RTM results by the end

of the year and full production processing results in 2018. The data will be processed in CGG's Villahermosa and Houston subsurface imaging centers.

Jean-Georges Malcor, CEO, CGG, said: "CGG is proud to have been selected to conduct Mexico's first offshore orthogonal wide-azimuth program to address the significant imaging challenges relating to the presence of complex geology and salt structures in the deepwater Perdido area. CGG has historically been a key provider of high-end seismic services to Pemex and has an invaluable 28-year track record of operational experience in Mexico. We are delighted to have the opportunity to continue developing our longstanding partnership with Pemex to support their exploration and development plans."

For more information, visit www.cgg.com.

Aker Solutions to acquire majority stake in Brazil's C.S.E.

Aker Solutions has agreed to buy 70% of Brazilian C.S.E. Mecâ nica e Instrumentaç ã o Ltda, building on a strategy to expand its services business in key international markets.

The agreement includes an option to purchase the remaining 30% of the company 3 years after the expected close of the transaction by the end of the first quarter of 2017. The parties agreed to not disclose the purchase price.

The acquisition gives Aker Solutions access to Brazil's growing market for servicing existing oil and gas fields. C.S.E., which had revenue of BRL 322 million in 2015, provides maintenance, assembly, commissioning and crane operation services at offshore and onshore facilities.

For more information, visit www.akersolutions.com.

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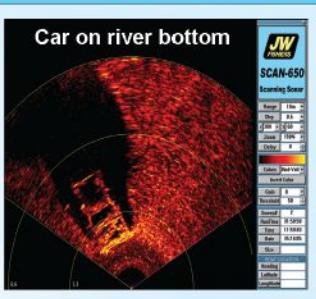
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Petrobras and Total form a strategic alliance

Petrobras and Total announce that Pedro Parente, CEO of Petrobras, and Patrick Pouyanné, Chairman and CEO of Total, have signed today, in Rio de Janeiro a Memorandum of Understanding that sets the general framework for a strategic alliance covering Upstream and Downstream activities in Brazil as well as international potential opportunities.

Through this agreement, the companies undertake to join forces in some key areas of mutual interest and to evaluate opportunities in Brazil and abroad to jointly benefit from their internationally recognized expertise on all segments of the oil and gas value chain.

As a first phase of implementation, the companies intend to focus on upstream and on gas and power.

In Upstream, Petrobras will propose Total to partner in projects in Brazil and Total will propose Petrobras to partner in opportunities outside of Brazil. This new partnership will allow both companies to combine their world-class experience and expertise in deep water development to optimize the production and jointly develop this strategic area of activity in Brazil and in other high potential oil and gas provinces as well as sharing costs and risks in projects with high investment and complexity.

In downstream, the companies will be working to develop joint activities in the gas and power generation in Brazil.

For more information, visit www.total.com.

OGCI to invest \$1B in low emissions technologies

The Oil and Gas Climate Initiative (OGCI) announced an investment of \$1 billion over the next 10 years to develop and accelerate the commercial deployment of innovative low emissions technologies.

OGCI Climate Investments (OGCI CI) will aim to deploy successfully developed new technologies among member companies and beyond. It will also identify ways to cut the energy intensity of both transport and industry. Working in partnership with like-minded initiatives across all stakeholder groups and sectors, the OGCI CI believes its emission reduction impact can be multiplied across industries.

In a joint statement, the heads of the 10 oil and gas companies that comprise the OGCI said: "The creation of OGCI Climate Investments shows our collective determination to deliver technology on a large-scale that will create a step change to help tackle the climate challenge. We are personally committed to ensuring that by working with others our companies play a key role in reducing the emissions of greenhouse gases, while still providing the energy the world needs."

This investment represents an unprecedented level of oil and gas industry collaboration and resource-sharing in this space. This new, additional investment will complement the companies' existing low emissions technology programs and draw on the collective expertise and resources of the member companies.

Through discussions with stakeholders and detailed technical work, the OGCI has identified two initial focus areas: accelerating the deployment of carbon capture, use and storage and reducing methane emissions from the global oil and gas industry in order to maximize the climate benefits of natural gas. The OGCI believes that these are areas where the oil and gas industry has meaningful influence and where its collaborative work can have the greatest impact.

Beyond this, OGCI CI will make investments that support improving energy and operational efficiencies in energy-intensive industries. OGCI CI will also work closely with manufacturers to increase energy efficiency in all modes of transportation.

A CEO and management team for OGCI Climate Investments will be announced in the near future. The closing of OGCI Climate Investments is subject to customary conditions including regulatory clearances as required.

For more information, visit www.oilandgasclimateinitiative.com.

Chevron announces first gas at U.K. Alder Field



Installation of the Alder Subsea Isolation Valve (Britannia Platform in background). Photo credit: Chevron.

Chevron North Sea Limited announced it has started production at Alder, a high-pressure, high-temperature (HPHT) gas condensate field in the Central North Sea.

"First gas at Alder represents a significant milestone for Chevron and highlights our commitment to investing and developing resources in the U.K.," said Greta Lydecker, managing director, Chevron Upstream Europe. "The safe and successful completion of this project was underpinned by strong collaboration between Chevron and Alder co-venturer ConocoPhillips. Alder supports our goal of helping maximize the economic recovery of the U.K., adds significant production to our portfolio, and helps extend the field life of Britannia, an important asset to Chevron in the North Sea."

Andy Samuel, chief executive at The Oil and Gas Authority, said: "We are very pleased to see the safe flow of first gas from the Alder Field. Chevron's application of innovative subsea technologies and use of the U.K.'s experienced supply chain is closely aligned to the Maximizing Economic Recovery Strategy, adding reserves and extending the life of an existing asset."

Alder is a single subsea well tied back, via a 28 km pipeline, to the existing ConocoPhillips-operated Britannia Platform, in which Chevron holds a 32.38% non-operated working interest. The project has a planned design capacity of 110 million cubic feet of natural gas and 14,000 barrels of condensate per day. Production from the HPHT Alder Field is expected to ramp up over the coming months.

More than 70% of the Alder development work was executed by U.K. based companies, providing significant investment to the U.K. supply chain. The contracts supported several hundred jobs across a range of U.K. locations, including Aberdeen, Invergordon, Leeds and Newcastle.

Discovered in 1975, the development has been enabled through the application of innovative subsea technologies designed to meet the temperature and pressure challenges of Alder. Key technologies have included a number of firsts for Chevron in the North Sea, including a vertical mono-bore subsea tree system, a subsea high integrity pressure protection system (HIPPS), and a specially designed corrosion monitoring system to measure the real-time condition of the production pipeline.

Chevron Upstream Europe (CUE) is a strategic business unit of Chevron's Europe, Eurasia and Middle East Operating Company, and is headquartered in Aberdeen, Scotland. CUE manages the company's upstream exploration and production interests in Denmark, Greenland, Norway and the United Kingdom. Chevron currently has over 800 upstream staff and contractors across its European operations, including the Global Technology Centre in Aberdeen.

For more information, visit www.chevronunitedkingdom.com.

Statoil awards contracts on Trestakk

Statoil, on behalf of the Trestakk license holders, is awarding an EPCI contract to FMC Technologies and Technip Norge and a topside contract to Aker Solutions for deliveries to the Trestakk development.

FMC Technologies and Technip will jointly deliver an EPCI contract (engineering, procurement, construction and installation)—subsea, umbilicals, risers, flowlines—including subsea template, manifold, subsea trees, completion system, wellheads, pipelines, risers, control systems, control cable and marine operations.

"Statoil has cooperated closely with partners and suppliers to reduce development costs for the Trestakk field. We submitted the plan for development and operation to the authorities on 1 November, and we are pleased to be able to award contracts already now to FMC Technologies, Technip and Aker Solutions."

"The Trestakk development is important to maintain activity on the Norwegian continental shelf," says Torger Rød, senior vice president for project development in Statoil.

Aker Solutions in Trondheim will be awarded the contract for the Åsgard topside work. The Åsgard A production vessel will be modified to receive oil and gas from the Trestakk field.

The work mainly consists of piping to connect the well stream to the vessel, and upgrading of the metering systems.

For more information, visit www.statoil.com.

Trelleborg goes the extra mile for Malaysian project

Trelleborg's engineered products operation has successfully completed its supply of floatover equipment for the PETRONAS NC3 gas field, located in Block SK316, 200 km north of Bintulu, Sarawak in Malaysia.

Trelleborg provided PAPE Engineering, an engineering company responsible for the transportation and installation of the platform jacket and topside, with four Leg Mating Units (LMUs) as well as four sway fenders, four loadout pads and four deck support units (DSU).

Mr. Olivier Beauclair, director for platform transportation and installation at PAPE, commented: "Having worked

closely with Trelleborg to great success on previous projects, we know that they're able to supply proven quality solutions with considerable ease of use and offer quick turnaround times—both imperative for a high stakes project like PETRONAS NC3. This meant that we had no hesitation it was entirely suited for the project."

In addition, Trelleborg site service engineers were able to provide super-

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vised on-site support, ensuring a seamless LMU installation within the topside of the Central Processing Platform.

Performed at the fabrication yard prior to the floatover process, the LMU installation provided PAPE with assured and risk-free performance before the floatover operation commenced.

Vincent Tan, sales and marketing manager at Trelleborg's engineered products operation, commented: "At Trelleborg, we aim to support every aspect of customer projects with a fast response and high quality solutions, whilst making sure we meet all delivery schedules and site requirements. With a global reach and local support, we're able to provide exactly that. Our manufacturing facility in Singapore ensured that PAPE had the local feet on the ground support, whenever it was needed."

For more information, visit www.trelleborg.com.

Ecosse Subsea Systems invests £3M in jetting tool

Ecosse Subsea Systems (ESS) is to invest up to £3 million in developing a water-jetting tool that has the potential to double trench production rates in seabed trenching operations.

The subsea and engineering technology company has awarded a contract to Northumberland-based Osbit, which specializes in bespoke engineering projects for international energy clients.

Osbit will be the lead detail design and development provider for the SCARJet subsea vehicle that features ESS's unique water-jetting and burial performance enhancement technologies and complements its range of SCAR-branded seabed preparation and trenching solutions.

The technology will expand Banchory-based ESS's capability to execute larger scopes of work—including soft soil projects—whilst the innovative design will differentiate them from existing suppliers.

ESS was recently awarded a subsea trenching contract by leading European offshore specialist JD-Contractor A/S for the Kriegers Flak windfarm offshore Denmark.

The Aberdeenshire company has just completed a £5 million seabed clearance project on behalf of DONG Energy on the Race Bank Offshore Windfarm located off the Norfolk coast and a route clearance and trenching project on behalf of Prysmian Group on the 70-turbine Wikinger offshore wind farm in the Baltic Sea.

The subsea trencher is a modular design, incorporating hydraulically driven track assemblies, a primary burial tool water feed and deployment systems, and a work-class ROV docking interface, compatible with the most widely used ROV systems in service today.

For more information, visit www.ecosse-subsea.com.



Rowan Joe Douglas joins bpTT rig fleet

BP Trinidad and Tobago LLC (bpTT) has announced that the Joe Douglas 240C jack up rig, owned and operated by Rowan Companies, has joined the bpTT rig fleet and has begun drilling at the bpTT Amherstia facility.

BPTT regional president Norman Christie commented: "The Joe Douglas rig is a welcome addition to the bpTT rig fleet. It represents an opportunity to access more hydrocarbons from our existing acreage in the Columbus Basin and is a demonstration of our continued commitment to Trinidad and Tobago."



The Joe Douglas rig previously worked for another operator in Trinidad and was moored in Chaguaramas for approximately 45 days where it underwent maintenance. After completion of the maintenance work, the rig was moved to the offshore location alongside the Amherstia platform located off the southeast coast of Trinidad, where it commenced drilling operations in October.

This is the first time a jack-up rig will work alongside the Amherstia facility and will drill three new wells, with the potential for a fourth. The expected gas output from these three wells is approximately 235 million standard cubic feet a day (mmscfd).

BPTT operates in 904,000 acres off Trinidad's east coast. BPTT has 13 offshore platforms and two onshore processing facilities.

For more information, visit www.bp.com.

NorSea Group and Scotoil combine as NSDecom

NorSea Group (UK) Ltd and Scotoil Services Ltd, two of the leading service companies in the onshore decommissioning sector, have joined forces as NSDecom. The new collaborative venture will bring more efficient and cost-effective benefits to the sector by providing a single project focal point for all services related to quayside and onshore decommissioning activity.

Targeted at operators, project managers and lead contractors, the new partnership combines the logistics expertise of NorSea Group with Scotoil's track record of experience in waste management and NORM decontamination. NSDecom will deliver a complete onshore service from receipt of waste and equipment at the quayside through the cleaning and cutting process to the final reuse/recycle/disposal option.

The main centre of operations will be at NorSea Group's purpose-built, deepwater decommissioning facility at Smith Quay in Peterhead. Relevant licences are also in place at Aberdeen Harbour and NorSea's supply base in Montrose.

"With the decommissioning sector being guided by SEPA, we recognised the importance of working alongside an experienced and well-established specialist waste contractor," said Walter Robertson, MD of NorSea Group (UK). "Scotoil Services has more than 30 years of experience and both parties saw the benefits to the sector of combining NorSea Group's

quayside assets and logistics experience with Scotoil's market-leading NORM decontamination service and special waste management capabilities."

Craig Smith, MD of Scotoil Services, said: "The collaborative alliance was developed in response to industry calls for more efficient and effective ways of working which would bring about lower costs and robust operational improvements. Together we have the key components to offer a complete and seamless onshore service which will benefit both operators and lead decommissioning contractors."

For more information, visit www.norseagroup.com.

Bosch Rexroth introduces a modular program for hydraulic power units

Bosch Rexroth is launching a modular hydraulic power unit (HPU) program specially developed for the Maritime and Offshore market. These high-end power units cover a power range of 350 to 3,000 kW and have obtained the type approval by Lloyd's Register. The program starts with a "basic" unit that can be expanded using all kinds of options. Because all variants are included in the modular options matrix, a design can quickly be calculated complete with dimensions and weights. This gives Bosch Rexroth a lead in the world of hydraulic power units.

Pierre Wouters, responsible for detail engineering of HPU at Bosch Rexroth in Boxtel, explains how the idea for this remarkable modular concept was born. "Within the Maritime & Offshore sector, power units are nearly always unique," says Wouters. "This means that until now, each HPU was separately designed and drawn. However, the market more than ever now demands fast response times and so a power range of 350 to 3,000 kW was chosen based on market demands. The units can be configured using a list of options, enabling the system to be made more maintenance friendly, more reliable and more efficient."

The Modular Hydraulic Power Unit (MHPU) program starts with a configured solution for standard applications. This takes account of the minimum functions demanded by the customer. The HPU can also easily be adapted to additional requirements. For instance, if one requires it to include an e-cabinet and/or starter cabinet configuration. A large number of options can also be supplied, such as double cooling pumps

for situations requiring redundancy, but also a cleanliness measurement system or depth filtration kit. The MHPU can also be fitted with pulsation dampeners, as well as a number of other options. Efficient IE3 electric motors, which can drive one or more pumps, are employed for driving the pump units. The MHPU program means that based on the

request, often a detailed quotation and a 3D drawing of the aggregate can be presented on the same day. All this including relevant information on dimensions and weight. Moreover, a Lloyd's Type Approval has been obtained for the entire MHPU program.

For more information, visit www.boschrexroth.com.



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Wireless Technology - Bringing the Industry Together

*By: Ross MacLeod,
Business Development Director,
Ashtead Technology*



Wireless technology has transformed the way we live—yet today, most communications from oil and gas platforms and vessels to shore still depend on expensive satellite links and capturing data from these remote locations is still a major challenge for the industry.

The potential benefits of wireless systems for offshore applications are clear. Long-range radio modems and gateways have enabled people to communicate in even the world's most challenging, far-flung seas.

Leading provider of subsea equipment rental, sales, and services to the offshore industry, Ashtead Technology

recently secured a worldwide agreement with Belgium-based nCentric to supply seamless video streaming and data transmissions for large-scale, wireless dynamic mesh networks from its offices across the globe.

The nCentric technology can be used to monitor offshore operations, increase communication, and relay high-definition footage from Remotely Operated Vehicles (ROVs) in real-time. The system can be configured remotely and monitored from an onshore location, reducing the number of people required offshore and limiting downtime.

The technology was a key compo-

nent in the clean-up operation following the Deepwater Horizon disaster in 2010. The U.S Government identified that increased visibility and enhanced communication were needed to monitor the operation. The fast-track nature of the project required an extremely quick turnaround.

Utilising nCentric's communication node on board eight vessels, crews were able to stream more than 10 live ROV video images to the offshore command centre as well as between each other and create a reliable communication link. The wireless mesh network also accommodated ongoing vessel movements and

“As companies venture into increasingly remote and isolated locations, communication lifelines are vital to managing fleet and vessel operations as well as maintaining crew safety.”

Some oil and gas hubs are home to hundreds of platforms, transfer sites and drilling rigs, many of which are unmanned and unmonitored. Then there are the countless vessels in the surrounding area. The ability to reliably network these assets represents a substantial advantage in terms of safety and incident management.

The need to implement secure, fast and reliable communications systems to monitor activity and track production is a vital part of any offshore operation. Mesh networking solutions have been built to withstand challenging conditions encountered in oil and gas, military and renewables, with minimal maintenance required.

A wireless mesh network allows the industry to connect and collaborate on a project, bringing together all parties involved to exchange real-time IP data and video images across large, hard-to-reach geographical areas. The technology can also be used for multi vessel projects where data are required to be shared between all assets.

Historically, the range and availability of sensors and transmitters was limited and questions were raised by the industry over the accuracy and reliability of the data exchanged. However, over time, technological advances have led to

many of these problems being largely resolved due to enhanced functionality, security, and the introduction of industry set standards.

The technology is self-healing, which means that if a link is lost or out of range then the data seamlessly redirects itself to eliminate the risk of a communication drop out.

This means that engineers can now monitor and assist offshore operations as if they were onsite. The network is highly responsive, ensuring voice, video and data can quickly and securely flow between all field coverage nodes in the network.

By providing seamless mobility, critical applications like VoIP, video streaming and data, transmissions are not interrupted as they move through the network. The technology can specifically address the overall communication requirements of platforms, vessels and other assets operating in remote areas, providing high bandwidth with extremely low latency communication solutions, delivering more efficient and safer operations.

As the world's energy demand continues to grow and the industry faces numerous challenges of greater complexity, it is important that companies increase both the number of discoveries and the efficiency of their operations. By transitioning to the digital oilfield and utilising seamless, high-bandwidth communication services, the industry can revolutionise the way it carries out projects and create opportunities to make better decisions faster.

Today's technology will only get more sophisticated as time goes on. The range of applications supported by wireless technology is virtually unlimited, from remote monitoring of platforms and equipment to seamless data transfer and video security.

The industry relies on anywhere, anytime communications and amidst the backdrop of tough operating conditions, technology that can enhance the speed and safety of projects is key. The need for an infrastructure that allows all assets, whether fixed or in motion, to connect and communicate in real-time, at all times, is growing. This means that

the industry must be open to adopt new or changing network technologies to increase productivity and communicate without interference, interruption, or manual intervention.



nCentric Nova Node (break-out box).

nCentric's Nova Node is different to existing systems currently on the market. It features four independent high-powered 5-GHz radios and can be linked with iridium 3G, 4G, and LTE modems for reliable remote connectivity.

To provide 360° coverage without sacrificing range or bandwidth, nCentric developed a unique antenna array and now offers a 900MHz module to extend the wireless range up to 20km.

For extremely cold conditions an internal heating element can be added to prevent ice build-up in and around the node.

It also includes a GPS tracking device so vessels and other assets can be located at any time, no matter where they are in the world.

UNDERWATER INTERVENTION

ROVs • AUVs • Imaging • Mapping • Diving Systems • Support Equipment

ASV Global surpasses 1,000 days of unmanned surface vehicle operations

The milestone was reached during the Unmanned Warrior 2016 event, which saw more than 50 unmanned vehicles operating in a variety of themed activities. The event enabled the Royal Navy to see first-hand how these types of systems and sensors could integrate into current and future operations. A number of ASV Global developed vehicles and systems participated in the event, including converted vessels such as BAE Systems' Pacific 950 and Pacific 24 RIBs and Dstl's Maritime Autonomy Surface Testbed (MAST) based on the innovative "Bladerunner" hull shape. The event also showcased vehicles designed and built by ASV Global, including the commercial vehicle C-Worker 5 and Thales' mine countermeasures demonstrator platform "Halcyon."

For more information, visit www.asvglobal.com.

MacArtney docking head to ensure optimum handling of the Schmidt Ocean Institute ROV SuBastian on board the R/V Falkor

Combining advanced science with state-of-the-art technology to achieve lasting results in ocean research is essential to Schmidt Ocean Institute. Therefore, they decided on a MacArtney product.

The R/V Falkor will soon again be setting sail for the study of the sea—a surface microlayer and air-sea boundary cruise. ROV SuBastian is a new underwater robotic vehicle equipped with a modular frame to provide scientists with a flexible vehicle for ocean exploration like the link between interfacial processes at the sea surface and marine biogeochemical cycles, air-sea interactions, and climate. This leads to a profound understanding of the environment.

The MacArtney MERMAC D docking head for Schmidt Ocean Institute ROV SuBastian has been designed featuring a special property, viz. one single suspension point. In consequence, its design and functionality ensure safe launch and recovery of the ROV system as well as stability and steadiness in heavy seas with no unexpected movement of the systems.

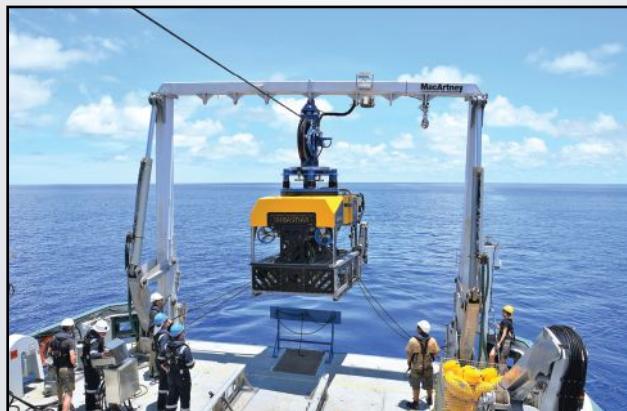
The docking head is fitted with a sheave being capable of translating position within its plane or rotation so as to alter the placement of its axis of rotation. This allows the docking head to safely accommodate trouble-free passage.

Recent testing and integration in the open ocean of the ROV SuBastian from aboard its 272-ft oceanographic research vessel Falkor turned out very satisfactorily, placing SuBastian in real-world conditions, demonstrating its functionality as a modern research tool with innovative systems.

MacArtney has supplied more products to Schmidt Ocean Institute and the R/V Falkor in addition to the MERMAC D docking head for handling the ROV SuBastian, among them a MERMAC R30 AHC winch as well as an A-frame. The MacArtney products made optimal performances and are integral pieces of the successful ROV operation carried out during the sea acceptance trials.

Being a privately owned corporation with group headquarters in Esbjerg on the west coast of Denmark, MacArtney Underwater Technology has supplied products and engineering solutions for almost four decades.

For more information, visit www.macartney.com.



Deep Trekker inspects and surveys the inside of the USS Arizona in HD



This year marks the 75th anniversary of Pearl Harbor and the sinking of the USS Arizona. Unlike most other ships that were bombed on that fateful day, the steel battleship suffered so much damage that it was never salvaged. The final resting place of over 900 souls, the ship has remained submerged in a shallow harbour of Honolulu. The internal structure is a maze of obstacles, hazards, and very small corridors to maneuver through, making it impossible for divers to enter. With the help of a small ROV, many areas have been filmed in high definition video.

The USS Arizona has been deemed the official memorial site for the Pearl Harbor attacks and brings in thousands of visitors every year. The most heavily bombed ship during the attacks, the USS Arizona led to more than double the amount of casualties compared to any other ship that day. An extremely important site for U.S. history, the vessel continues to play an important role in sharing the message of what took place during that WWII attack.

The USS Arizona was first surveyed in 1983, but it wasn't until 2014 that "Project Team Arizona" assembled to completely map the wreck using sophisticated sonars, LiDAR, photogrammetry, and laser scanning. The National Parks Service along with a team of companies such as Etrac, Autodesk, and others are aiming to develop a baseline comparison model in order to understand how the steel ship continues to change as it rests in the salt waters of Hawaii. The mission is important to ensure this active gravesite remains an intact memorial for years to come.

In the most recently completed phase of the mapping, the team brought in Deep Trekker to enter the ship to collect full HD quality video of the ship's interior. Spherical and about the size of a basketball, the Deep Trekker was able to maneuver



ver through small and otherwise unreachable areas. The system sports internal batteries, requiring no generators or additional equipment to operate the system, while still being robust enough to carry payloads of sediment and water sampling tools and sonar systems.

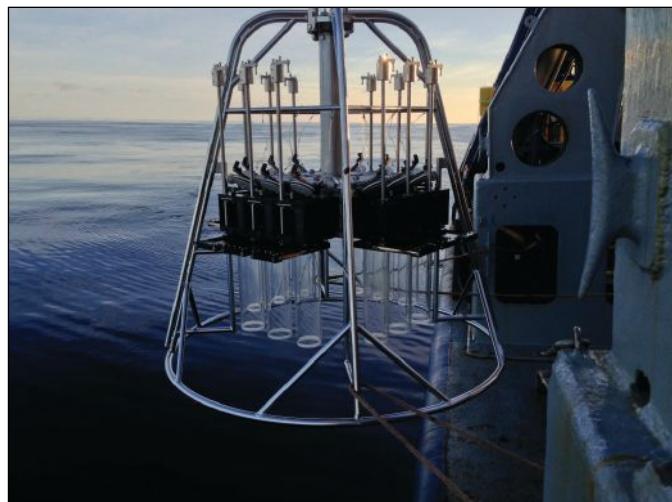
"Underwater drones provide a way for people see and interact with history," commented Sam Macdonald, Deep Trekker president. "We hope that this expedition inspires others to be citizen scientists to start searching and discovering the many mysteries our waterways hold."

The team will be sharing all of the data collected shortly in hopes to pass along the experience with the USS Arizona memorial center as well as post the footage online for those that cannot reach the memorial site in person. The high-definition footage will be vital in demonstrating the current state of the vessel, offer insights into the naval world of WWII, and spread awareness about the memorial center. High-definition filming will ensure a more accurate understanding of the ship's interior and the lives of those who were lost aboard the USS Arizona.

For more information, visit www.deptrekker.com.

Deep sea mining exploration aided by OSIL Corers

Deep sea mining is a relatively new process of extracting minerals from deep sediments. Exploration of potential sites can be problematic, but these undertakings can be facilitated by the use of the OSIL Giant (Jumbo) Piston Corer, which can retrieve sediment cores up to 60 m in length, and the OSIL Multi Corer, which can take up to 12 high quality undisturbed samples simultaneously.



The OSIL Giant (Jumbo) Piston Corer is used in the exploration and identification of zones of strategic deep sea mineral deposits like poly-metallic nodules, hydrothermal sulphide deposits containing base metals along with gold, cobalt, nickel and silver and cobalt-nickel encrustations. Piston corers are one of the most important basic tools used in the study of marine sediments, and OSIL offers customisable systems (including Launch and Recovery Systems and Winches) from 18 to 60 m in length.

The OSIL Multi Corer has long been an item of specification in the oil and gas industry for pre-site surveys and environmental impact assessments, and the performance history



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of the system helps establish its place in the expanding deep sea mining industry to help identify areas of potential interest. The hydrostatically damped sampling and closure mechanism of the corer ensures that a truly undisturbed surface sediment (~400 mm length) and water sample (~200 mm deep) is preserved and recovered on retrieval of the corer, by eliminating the typical bow wave seen with other corers and grabs that sweeps away precious sedimentary information.

OSIL (Ocean Scientific International Ltd) are experts in the manufacture, global supply and operation of sediment corers up to full ocean depth, with particular experience in the oil and gas and marine mining industries, and a worldwide customer base that covers a wide range of sectors including offshore renewable energy, coastal engineering, ports and harbours, oil and gas, aquaculture, water and utilities, academia, research and statutory monitoring.

For more information, visit www.osil.co.uk.

UK's largest marine robot fleet defies storms to complete successful mission

A fleet of ten marine robots has successfully completed an ambitious 2-week mission off northwest Scotland, despite being hit by a succession of Atlantic storms with winds gusting up to 60 mph and waves up to 7 m high.



The mission comprised the largest simultaneous deployment of marine robots yet attempted in UK waters, with seven submarine Seagliders and three surface Wave Gliders operating in challenging waters around the Outer Hebrides.

The robot fleet was collecting a variety of marine environmental data in support of the Royal Navy's Unmanned Warrior programme, including ocean temperature, salinity, oxygen, turbidity, tidal currents, and surface weather and wave conditions. While the robots were taking a battering from the weather, the mission pilots and scientists were safe and warm operating the fleet via satellite from the comfort of dedicated operations rooms.

The Seagliders surveyed an area of more than 5,000 sq. km during the 2-week deployment, venturing up to 125 km off the island of Barra into waters deeper than 1,000 m. The Wave Gliders ventured up to 150 km north of Lewis, each covering a distance of more than 300 km. The ability of the Wave Gliders to accurately target features such as oceanic fronts, visible on satellite images provided by Plymouth Marine Laboratory, was a particular success given the combination of strong winds, waves and tides.

The mission was coordinated by the National Oceanography Centre, Southampton (NOC) and the Scottish Association for Marine Science (SAMS), Oban and involved more than 20 industry and government partners. The UK

Defence Science and Technology Laboratory (DSTL) was the primary sponsor of the mission, and all of the collected data will be archived at the British Oceanographic Data Centre and made available for future scientific research.

For more information, visit sams.ac.uk.

M² Subsea snaps up 32 best-in-class ROV assets following investment

A recently formed subsea services business has secured a substantial injection of private equity investment to acquire a fleet of 32 best-in-class ROVs.

Aberdeen and Houston-based M² Subsea Limited has attracted the investment from a fund advised by Alchemy Special Opportunities.

M² Subsea is set to become one of the largest independent providers of ROV services globally and offer its customers safe, cost-effective solutions for inspection, repair, maintenance, decommissioning and light construction.

The recently established business expects to create at least 50 onshore and 100 offshore jobs operating primarily in the North Sea, Gulf of Mexico, West Africa, and eventually Asia Pacific and the Middle East by the end of 2017.

Leveraging the experience, expertise and unrivalled contacts of the senior management team, M² Subsea offers an independent service that is focused on delivering best value while reducing cost and risk to meet the demands of the low oil price environment.

Mike Arnold is heading up the business; he brings 35 years' experience in the subsea industry as original founder of Rovtech as well as Hallin Marine UK and Bibby Offshore's ROV services unit. He is joined by a strong management team of other subsea veterans, including Mark Wood and Mike Winstanley.

For more information, visit www.m2subsea.com.



COMPANY SPOTLIGHT

www.balmoraloffshore.com



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A client-focused company, Balmoral Offshore Engineering is dedicated to technologically-driven composite and polymer solutions for today's demanding subsea and deepwater oil and gas industry.

Proprietary laboratory, hydrostatic and mechanical testing facilities enable Balmoral to research, identify and develop cost effective materials across a spectrum of applications.

Products include ROV/AUV and subsurface buoyancy, drilling and distributed riser buoyancy, thermal insulation, elastomer cable protection, bend restrictors, stiffeners, clamps and riser protection guards.

Many of Balmoral's SURF-related products are accredited by Bureau Veritas to API 17L standards as follows:

- Bureau Veritas API 17L1:2013 Specification for flexible pipe ancillary equipment: Distributed buoyancy module and internal clamp
- Bureau Veritas API 17L1:2013 Specification for flexible pipe ancillary equipment: Dynamic bend stiffener
- Bureau Veritas API 17L1:2013 Specification for flexible pipe ancillary equipment: Bend restrictor

World-leading subsea test centre under construction

The company is constructing a new manufacturing facility, R&D laboratories and an industry-leading hydrostatic test centre at Group HQ in Aberdeen.

The new centre trebles Balmoral's previous capacity for bespoke hyperbaric testing enhancing the services available to external customers from a range of sectors. Fraser Milne, engineering and projects director at Balmoral, is in charge of the project and has been telling us about the new subsea test centre:

Editor: What will the new test facility bring to the industry?

Fraser Milne: The Balmoral Subsea Test Centre offers a comprehensive range of procedures including hydrostatic, mechanical and laboratory trials.

New and upgraded vessels and procedures are in place offering independent testing for all types of subsea equipment to depths of 10,000msw, 32,808ftsw, equivalent. All our vessels will be underground meaning that access is at ground level making handling much easier and safer.

Bespoke software has been written to allow full test traceability and will provide real time observation from anywhere in the world.

Standard hydrostatic tests include:

- Uplift determination
- Water ingress
- Instrumented buoyancy loss
- Hydrostatic compression and creep
- Hydrostatic collapse
- Bulk modulus
- Buckle arrestment performance

The test vessels use air driven liquid pumps and can accommodate electric, hydraulic and instrumentation connec-

tions. Each vessel can be fitted with chart recorders, pressure and temperature data loggers that provide highly detailed results for analysis.

In terms of mechanical testing the multi-purpose load rig performs the following test-types:

- Axial and lateral slip loads to 60 tonne
- Static loading and 3-point bend to 100 tonne
- Bend restrictor/stiffener load to 10 tonne
- Bend restrictor locking radius measurement under load
- Compression and shear testing on companion cylinders to 200 tonne and tensile testing to 150 tonne
- Dropped weight and swing arm impact testing
- Lifting point/insert load testing

Editor: What makes it the most comprehensive hyperbaric test centre in the world?

Fraser Milne: Our new centre is impressive by any standards. It is housed adjacent to our R&D laboratories and covers some 800m² with a working height of 12m. An overhead crane is capable of lifting 40 tonnes while the centre is being fitted out with state of the art remote vessel monitoring and control equipment.

The new facility will house 14 vessels when fully operational and offer a lifting capacity of 40 tonnes with vessels operating to various pressures with a maximum of 10,000psi, 700bar.

We also installed a 9m diameter x 4.5m deep, 286,000 litre, 63,000 gallon, test tank to undertake large scale displacement testing.

Editor: What types of equipment can the new centre accommodate?

Fraser Milne: We test everything from massive drill riser buoyancy modules and ROVs to tiny pieces of subsea equipment such as valves, controls, etc. Equipment can be trialled continuously to suit project requirements.



The new Balmoral Subsea Test Centre in Aberdeen

OceanServer delivers next generation AUV for water quality solutions with YSI integrated systems and services



OceanServer Technology, the leading manufacturer of commercial Autonomous Underwater Vehicles (AUVs), announced the continuation of a successful 10-year partnership with the launch of the next generation EcoMapper.

The i3XO EcoMapper AUV is based on the robust Iver3-

580 AUV platform and takes advantage of YSI's expertise in water quality solutions. The i3XO AUV utilizes the EXO water quality system to provide users high-resolution water quality data, side-scan sonar imaging, downward-looking current profiling, and an option for bathymetric surveying. Used by government agencies, military, universities, contractors, and private organizations, the versatility of the i3XO system delivers a wide range of simultaneous monitoring capabilities.

The new compact EXO design provides new EcoMapper customers up to eight water quality parameters (via four sensor ports). The 100 m Iver3 based EcoMapper will benefit from extended bottom lock range (up to 80 m), forward looking object avoidance, swappable battery section, and new chirp-based sonar systems. Shipments for the system have already started.

For more information, visit www.ysi.com/EcoMapper.

James Fisher Subsea implements innovative ROV methodology on six North Sea oil rig platforms for Shell UK

James Fisher Subsea (JF Subsea), a world-leading subsea services division of James Fisher Marine Services (JFMS), has reduced inspection downtime to 2% for Shell UK through the innovative use of asset-based remotely operated vehicles (ABROVs) on oil rig inspection programmes in the North Sea.

Traditionally, oil rig inspections are undertaken using a dedicated remotely operated vehicle support vessel (ROVSV) on which an ROV is secured. To remove the need of a ROVSV and the hazards involved with securing an ROV to the offshore platform, JF Subsea provided Shell UK with a gravity-based ABROV system.

While the use of ABROVs is not a new concept, the innovative way in which JF Subsea adapted them to Shell's needs and the duration for which they were utilised demonstrates the close working relationship the company develops with its customers as well as its ability to tailor services to specific requirements. Following focused engagement sessions between both companies' offshore installation managers, ABROVs were successfully trialled on a planned riser and structural inspection on Shell's Brent Bravo platform in the North Sea.

JF Subsea—which has a strongly developed relationship with Shell—provided inspection equipment, ROVs and personnel as part of a bespoke turnkey solution, with the inspection completed and a final report delivered within 2 weeks. Post-project analysis concluded that downtime was reduced to 2% over the 4 month campaign period.

Tim Welford, operations manager at JF Subsea said: "We have long project managed and supplied inspection solutions to Shell UK within the North Sea, and our latest collaboration has not only delivered the exceptional service Shell have come to expect, it has also improved efficiencies from all angles and provided detailed, credible reporting."

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"Following the success of the 2016 ABROV inspection campaign on the Brent Bravo, Shearwater, Curlew, Brent Alpha, Gannet and Nelson platforms, Shell UK are now in discussions with JF Subsea to supply this style of service for the next 5 years on various platforms in the North Sea. JF Subsea is actively marketing this service globally, as the benefits cannot be dismissed," Welford concluded.

For more information, visit www.james-fisher.com.

Cooperation agreement between ECA and Vestdavit for launch and recovery systems

The use of Unmanned Maritime Systems (UMS), ROV, AUV as well as USV by navies but also by oil and gas, scientific and other customers, requires to have them operated from various types of ships, even in high sea states. In addition, when a combination of different types of vehicles are used from the same vessel, they need to be managed, stored and handled on board, taking into account, launch and recovery of course, but also their support (e.g., bat-

tery charging, maintenance, repair, etc.).

ECA and Vestdavit have decided to combine their expertise and capabilities to develop the next generation of launch and recovery systems for UMS.

As part of this agreement, ECA will bring its 50 years of experience in developing and providing over 2,000 unmanned underwater and surface vehicles worldwide as well as its knowledge in operating them and, in particular, its technology and patents regarding the launch and recovery of AUVs.

On its side, Vestdavit will bring its 40 years of experience and over 1,900 davits and side and stern launch systems provided worldwide for all types of customers as well as its mission bay concept.

The solution that will be provided under this agreement will incorporate the latest technologies and innovation developed by both companies, enabling ECA to propose the best launch and recovery solution for its UMS customers, allowing them to operate their systems safely even in the most demanding environment conditions.

For more information, visit www.vestdavit.no.

Forum to provide ROV to University of Limerick

Forum Energy Technologies UK has secured a contract with University of Limerick, Ireland for the provision of remotely operated vehicle (ROV) systems suitable for inspection and intervention on marine renewable energy infrastructure.

In addition, iXBlue, as part of the Lot 2 of the tender, has been contracted to provide navigation systems to be integrated with the ROV.

Lot 3 was for launch and recovery system (LARS) and tether management systems (TMS) for the ROV.

The ROV system will be housed at Limerick Docks where ROV systems experimentation, testing and demonstration will be carried out. For offshore operations with the ROV, the system will be mobilised from Limerick port or alternatively can be transported to other ports.

According to the tender information, the value of the contract is approximately €2.1 million (\$2.3 million).

For more information, visit www.f-e-t.com.

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geoswath.com

Phasor completes broadband satellite transmit tests from a moving platform

Phasor has taken a critical step forward in the productization of its groundbreaking flat panel, electronically steered antenna (ESA) system. The company has demonstrated the transmission of live HD video over the Intelsat 903 satellite from its test site in Essex, UK.

The Phasor team has spent several months carrying out detailed beam pattern measurements on the system. This has taken place in the company's near-field and far-field test ranges, ensuring that the dynamic beam forming adheres to the regulatory requirements for live transmissions. Following the lab tests, the 8-module Tx system (equivalent in aperture area to a 67-cm parabolic dish) was deployed to Phasor's outdoor test site.

Maritime IT services integrator OmniAccess is partnering with Phasor to bring the electronically steered antenna to the super yacht mobile broadband market and provided its ground station and satellite capacity for testing purposes. The link was successfully established and has been running flawlessly for over 2 weeks.

The 8-module system achieved an impressive uplink performance of 2 Mbps under the test plan, which involved transmissions from a moving platform demanding rapid beam scanning. The Phasor antenna was able to transmit a full HD video stream using efficient MODCODs (Modulation and Coding techniques), avoiding the need for any form of inefficient spread-spectrum techniques and maintained perfect pointing with no ASI (Adjacent Satellite Interference) throughout.

Based on the achieved 903 performance and the known performance of uplink-efficient HTS satellites, this small eight-module Phasor array would be able to close return links of well over 15 Mbps. An aperture equivalent to a 1-m dish (16 panel system) would achieve a Tx throughput of over 60 Mbps.

Phasor's very low profile antenna provides high-bandwidth connectivity in a more reliable and robust way. The antenna is solid-state, with no moving parts so satellite signals are tracked electronically. Its low-profile, sleek look is ideal for the yacht market, eliminating the need for visually unappealing radomes spread around the vessel. The terminal can be scaled to achieve performances better than a 2.4-m parabolic dish, making it very well suited to meet the demanding communications requirements of the super-yacht market.

For more information, visit www.phasorsolutions.com.

Telenor Maritime provides mobile and WiFi services on all Color Line Vessels

Telenor Maritime has announced an expansion of the communications services onboard the entire Color Line fleet, deploying connectivity platforms supporting the complete digital value chain that will greatly enhance the customer experience.

"Telenor Maritime is a mobile company at sea, placing the mobile in the center of all we do. With our connectivity platform, we take full end-to-end responsibility for connecting the applications, the access layer with the onboard mobile and WiFi systems, and the backhaul from Ka/Ku satellite and land-based mobile broadband from our network of global operators," said Frode Støldal, CEO of Telenor Maritime.

The THOR-7 Ka high-performance satellite provides seamless coverage throughout Europe, favorable in the northern regions where Color Line operates, enabling unprecedented performance for mobile services and applications.

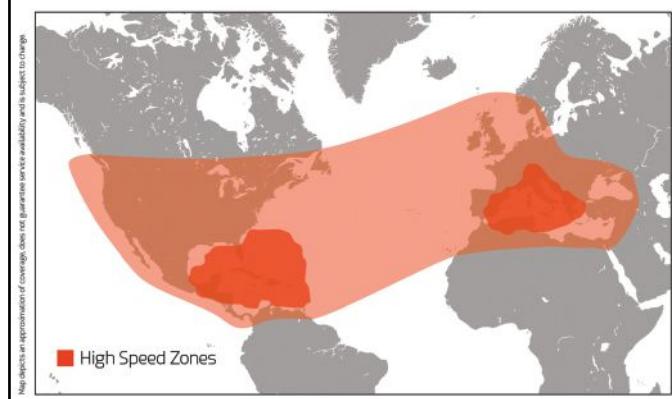
"The introduced connectivity platform will be a major steppingstone for the ongoing digital transformation within Color Line. Our focus is always to improve the end user experience and improve operational efficiency," Frode Støldal continues.

"The agreement with Telenor Maritime means that we can offer full WiFi coverage on our vessels with increased capacity and bandwidth during Q1 2017. This enables further investments in digital solutions to provide guests with the best experience on board," explains Marianne Gade Gørbitz, CIO of Color Line.

For more information, visit www.telenormaritime.com.

Marlink introduces flexible high speed zones for yachts

Regional Coverage Map : Yachting



Marlink has launched two new High Speed Zones that enable Internet connectivity up to 20 Mbps on standard equipment in specially dedicated areas in the Mediterranean and the Caribbean without any changes to the customers' technical setup onboard. The new High Speed Zones are a revolutionary service aimed squarely at yacht owners and charter companies that require the fastest available Internet access on board for temporary periods, and can be enabled within hours of request.

Designed for the high-end requirements of the superyacht sector, the new service provides flexibility for upgrades to meet higher bandwidth demand during peak yachting periods. While crew communication and operational needs are met by Marlink's standard global Sealink VSAT (Very Small Aperture Terminal) services, the ability to massively increase connectivity speeds for a period of a week or more ensures the work and entertainment needs for bandwidth hungry applications are available on board in a similar way as on shore. With such high throughput, Marlink's new High Speed Zones enable a wide range of new applications, including the use of streaming services such as Netflix and fast Internet connectivity available for all guests on board at the same time.

In addition to fast-response dynamic bandwidth increases up to 20 Mbps with standard equipment on board, Marlink can also deliver over 100 Mbps throughput to superyachts using customized configurations in its Mediterranean and Caribbean High Speed Zones.

As an end-to-end service, Marlink manages all aspects of a superyacht's standard Sealink service and speed boosts in the High-Speed Zones either directly or through its network of dedicated superyacht satellite service providers, including satellite capacity, satellite service, above deck equipment, below deck equipment, delivery, value added services (such as optimization), and support through a 24/7 support desk. Bandwidth increases are delivered over several satellites in each region, ensuring high availability and redundancy, guaranteeing Marlink's ability to meet High Speed Zone bandwidth requests.

"The superyacht sector is unique, with very special requirements for Internet connectivity, and Marlink in conjunction with our satellite network operators and service provider partners can now meet these service levels on standard configurations," said Tore Morten Olsen, president maritime, Marlink. "Our new High Speed Zones will offer a new online experience available at sea and we expect significant uptake, driven by owners spending time on board and charter companies looking to deliver the full VIP experience for guests."

For more information, visit www.marlink.com.

Speedcast picked as provider for ABF patrol boats

SpeedCast International Limited has been awarded a tender for delivery of Wideband Management Systems for military and commercial satellite networks used by the Australian Border Force (ABF) for the delivery of satellite communications to their Cape Class Patrol Boats.

SpeedCast will deliver the ABF a full network management system, consisting of equipment, software, monitoring, maintenance, and support, as well as provide a secure network integration strategy to satisfy the customers' stringent security and quality requirements.

SpeedCast's certified engineers will equip each of the eight Cape Class vessels with Wideband Management terminals and state-of-the-art, high-efficiency satellite modems, which will allow two-way communication between the vessels and the ABF headquarters in Canberra. The network management component of the solution supports remote access management, and is designed to comply with the operational management controls specific to ABF requirements.

In addition to the provisioning of the Wideband Management Systems, SpeedCast was awarded an overarching supplier contract to provide fixed and mobile satellite solutions to the Commonwealth Government including the ABF and other relevant departments in the agreement.

Simon Luck, inspector maritime communications, electro-optic and sensor systems at the Australian Border Force said that having a cutting-edge network monitoring system for the ABF's telecommunications network is essential to ABF's maritime operations.

For more information, visit www.speedcast.com.

XChange Media connects crews of global shipping company UASC

Global shipping company United Arab Shipping (UASC) has installed XChange Media, Marlink's news, entertainment and television solution on 44 of its vessels to provide on-demand multi-lingual content for crew via their personal devices.

UASC's fleet is already equipped

with Sealink, Marlink's global high-quality VSAT service that provides seamless IP connectivity to optimize fleet management and electronic document handling systems whilst providing significant bandwidth for crew communications. Deployment of XChange Media across the UASC fleet was carried out remotely and completed in less than a week.

UASC increases crew satisfaction in a cost-efficient way through the provision of daily updated content on XChange Media. The solution comes with cost-efficient program packages, as content can be shared with all crew members at no extra cost to them. Crew can simply use their own smartphones, tablets, and laptops via WiFi either in their cabins or with friends and colleagues in communal areas on television whenever their shifts allow.

Using XChange Media, UASC does not face extra airtime cost as the Sealink VSAT bandwidth will not be affected. Whilst XChange Media delivers new content every day, the masters and on-shore managers can be fully confident of the continued availability of band-

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width for business and operational communication facilities.

Built on the XChange communications management system, XChange Media is an ideal alternative to satellite TV on board as it requires no extra hardware or installation costs.

For more information, visit www.marlink.com.

Ericsson, SpeedCast International announce global partnership

Ericsson and SpeedCast International Ltd have entered into a strategic agreement which leverages both organizations' global capabilities to create a strong partnership in the global maritime sector, enabling both companies to expand their offerings to the market.

By selecting SpeedCast as its satellite connectivity solution partner, Ericsson will expand its end-to-end service solutions for shipping, ports and terminal customers using SpeedCast's global network and satellite communication services to support customers worldwide.

SpeedCast has established a strong track record of successfully delivering connectivity to the shipping sector, while Ericsson has become a top provider of end-to-end managed solutions to the shipping, port and terminal markets. Through the partnership, Ericsson will be able to achieve significant economies of scale and an enhanced global infrastructure that enables it to deliver a comprehensive portfolio of services to its customers.

Both organizations will be able to drive revenue growth and operational efficiencies for their customers by combining their offerings, including:

- A tailored portfolio of connectivity services aimed at lowering operational costs, including global connectivity, data capture and operations analytics tools

- A global sales force and support organization that reaches all major shipping locations

- A satellite and ground-based network infrastructure that can provide customers connectivity across multiple frequency bands anywhere in the world

- Technologies that enhance connected vessel offerings and improve efficiencies across fleets

- Engineering, technical and managerial resources to effectively drive program management, product maintenance, and field support

For more information, visit www.ericsson.com.

Transas calls for regulatory compliance for big data connectivity

Frank Coles, Transas CEO, delivered a keynote speech calling for the International Maritime Organisation (IMO) to set standards of compliance for the communication connections between ship and shore or else create a significant cyber security risk.

The speech on Connected Ships & Cybersecurity was delivered at the Shipping Insight Fleet Optimization Conference which took place in Stamford, CT. on October 18-19.

Cybersecurity is without a doubt a highly-debated topic in the maritime industry. Coles opened by stating that compared to the highly regulated ship equipment environment, the connectivity environment is relatively uncontrolled in terms of maritime certification and compliance.

"The connected ship is like a long chain, with each piece linking to the next and at every point there is the opportunity for a failure. It can be hardware or software or both and it can be a cyber virus penetration or simply a denial of service, either of which can cause damage," he explained.

The essence of cybersecurity is a smart information technology system, process and procedures and therefore standardization and regulatory controls for the ship's systems need to include connectivity.

"Before we get to unmanned ship discussions, we should recognize that although connectivity is not new, what is new is the connection in smart shipping. There are international maritime standards for GMDSS or AIS, but for the big data nothing exists. This means the cyber security risk is left to each satellite operator, each service provider and each hardware manufacturer," Coles stated.

With the current growing demand and use of the fleet operations centers ashore, operating alongside the vessel monitoring services of the various government bodies, the security of connectivity is going to be very important, and the industry is going to need contingency plans in the event that the link is broken.

"This is where the human will become important, both on board and in the monitoring centers, as they will be able to communicate with each other and maintain a safe environment," said Coles.

"It is time for the IMO to apply the same standards of compliance used for GMDSS, ECDIS and other bridge equipment to the standard communication networks and equipment. If these

networks and the associated equipment is going to be used for operational, remote management and technical decision, it must be cyber secure and compliant with a global set of international maritime standards. Until then we will have a cyber risk associated with a non-standard approach to connectivity," Coles concluded.

For more information, visit www.transas.com.

KVH adds NEWSlink editions in Japanese and Korean

KVH Media Group, part of KVH Industries, Inc., has expanded its market-leading NEWSlink portfolio with the launch of two new daily local language editions in Japanese and Korean. These new versions raise the count to nearly 110 NEWSlink editions in 23 languages and, together, they reflect KVH's ability to address the crew welfare needs of seafarers around the world. NEWSlink now produces editions in the native languages of the majority of the world's seafarers.

The Japanese and Korean editions are standard four-page newspapers delivered seven days a week, following the style of most NEWSlink titles. Each title covers the key daily political, general, financial, sporting, and entertainment news stories from those countries in the local language, and joins NEWSlink's offering of high-quality daily and weekly newspaper digests, which are currently enjoyed by seafarers and cruise guests on more than 9,000 vessels around the world.

"Having a Japanese language daily edition of NEWSlink is a significant step forward," says Hiroki Matsubara, CEO of Nautical Training Systems, Inc., KVH Media Group's agent in Japan. "Selling the full range of content, connectivity, and training services that KVH has to offer is made a lot easier when you can show a prospective client a newspaper in their local language."

"We are committed to expanding our portfolio of news from home available to seafarers in their own language, which goes a long way to make them feel more connected to family, friends, and events," says Mark Woodhead, managing director of KVH Media Group. "This can also have a positive effect on recruitment and sea staff retention strategies, ultimately helping to improve manpower cost efficiencies."

All the titles are produced in NEWSlink newsrooms located in Liverpool, Delhi, and Manila, where a round-the-clock news monitoring service ensures the most current information is included in every edition. "Our

editorial offices follow the sun with an experienced team editing up-to-the-minute news stories for more than 100 papers. We are delighted to be adding more Asian language titles to this portfolio," says Mr. Woodhead.

NEWSlink titles come in a range of formats and through a range of technologies, and are available in compact formats for maritime and other industries where bandwidth is limited or delivery costs are high. These newspapers are also available via KVH's innovative IP-MobileCast content delivery service, which utilizes satellite-based multicasting technology to deliver content via a vessel's broadband connection without affecting the vessel's data speed or airtime plan.

In addition to the NEWSlink service, KVH offers a wide range of solutions for maritime operations and crew welfare. These services include mini-VSAT Broadband connectivity, TracPhone VIP-series satellite communications hardware, IP-MobileCast content delivery service, and Videotel maritime training programs – a complete solution that KVH refers to as the Power of One.

For more information, visit www.kvh.com.

SpeedCast's solution leads the way at Vendée Globe Race

SpeedCast International Limited has provided its two-way secured satellite communication and broadcast services to over 90% of competitors in this year's Vendée Globe Race – one of the toughest sailing events in the world – making SpeedCast the number one provider of satellite services for this huge sporting event.

The eighth Vendée Globe Race began yesterday from Les Sables d'Olonne, France, and is the only non-stop solo race around the world without assistance. This year's event will see 29 skippers representing four continents and ten nations setting sail on IMOCA 60s in pursuit of beating Françoise Gabart's record time of 78 days, 2 hours and 16 minutes set in the 2012-13 race.

SpeedCast's innovative media transmission solution and value added services have been installed on 27 out of 29 competing vessels, in order to benefit from livestreaming capabilities, monitoring and connectivity.

"When the race first began 27 years

ago, we would never have imagined it would be possible to broadcast live from the ocean in such challenging conditions," said Bruno Gicquel, MSS Maritime director, SpeedCast. "Today, the advances in technology coupled with the unprecedented demand for high-quality, real-time media content have made this possible. Using our world class satellite communications solution, coupled with the SpeedCast Clipway technology, developed by SpeedCast's R&D team, we have created an innovative offering that is enabling us to meet this unprecedented demand."

SpeedCast's Clipway will play a big role as the solution will allow the Race Headquarters, family members and the general audience to watch the race in real time. Clipway can store, forward and livestream broadcast quality video and can accept all broadcasting formats, including HD, SDI and GoPro, which differentiates it from competing technologies.

For more information, visit www.speedcast.com.

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TE SubCom supplies MAREA cable system

Facebook, Microsoft, and TE SubCom, a TE Connectivity Ltd. company, announced that TE SubCom has been named the system supply partner for the new MAREA submarine cable across the Atlantic Ocean.

TE SubCom has completed the route survey and begun manufacture of the system at its facility in Newington, New Hampshire. The parties are on track to begin laying cable using TE SubCom's state-of-the-art cable installation ships next year, with a scheduled completion date of October 2017.

As announced by Facebook and Microsoft in May 2016, MAREA will be the highest-capacity subsea cable to ever cross the Atlantic—featuring eight fiber-pairs and an initial estimated design capacity of 160 Tbps. The new 6,600-km submarine cable system will connect the United States to southern Europe: from Virginia Beach, Virginia to Bilbao, Spain. This new southern route will provide greater diversity of connections and enhanced reliability for customers as well as optimal connectivity to data centers on the East Coast of the United States.

Led by Facebook and Microsoft, TE SubCom is constructing MAREA to be interoperable with a wide variety of network equipment. This new "open" design brings significant benefits for customers—lower costs and easier equipment upgrades, which lead to faster growth in the speed of communications for users since the system can evolve at the pace of optical technology innovation.

For more information, visit www.subcom.com.

NTT Com announces launch of APG

NTT Communications Corporation (NTT Com), the ICT solutions and international communications business within the NTT Group, has launched the Asia Pacific Gateway (APG), a high-bandwidth optical submarine cable network connecting regions and countries in Asia. NTT Com has implemented the new service in partnership with major telecommunication carriers in each country.

The APG will increase data transmission capacity in the Asian region, improve connectivity between various regions and countries, and improve redundancy by means of diverse routing.

With a total length of 10,400 km, the APG network leverages 100 Gbps optical transmission capabilities and digital coherent technology to deliver a capacity of more than 54 Tbps, the highest of any network in Asia. The cable routing avoids areas prone to earthquakes and typhoons and has connectivity points in Mainland China, Hong Kong, Taiwan, Japan, Korea, Malaysia, Singapore, Thailand, and Vietnam.

NTT Com has established two diverse landing points, one in the East and the other in the West of Japan for the APG and Pacific Crossing-1 (PC-1) submarine cable that connects between Japan and the U.S., having diverse routes such as north and south routes. The company has also implemented diverse landing points in Hong Kong and Singapore for the APG and for the Asia Submarine-Cable Express (ASE), which was launched in August 2012. NTT Com thereby operates totally diverse cable routes between the U.S. West Coast and key economic hubs in Asian regions, offering even greater reliability and redundancy in its global network.

For more information, visit www.ntt.com.

JDR awarded Hornsea cable contract

JDR has been awarded a contract by DONG Energy to supply subsea power cables for the Hornsea Project One.

With a total capacity of 1.2 gigawatts (GW), Hornsea Project One will be the world's largest offshore wind farm and the first to exceed 1 GW capacity. The project is located 120 km off the Yorkshire coast and will meet the electricity needs of well over 1 million UK homes.

The contract—which is the largest array cable award in JDR's history—will see the company design and manufacture 242 km of array cables, covering two thirds of the total wind farm capacity. JDR will also provide terminations, hang-off arrangements and additional accessories as well as services at the site.

For more information, visit www.jdrcables.com.

Ile de Re arrives in Auckland for final TGA work



The cable ship Ile de Re has arrived in Auckland – en route to the middle of the Tasman Sea where it will continue laying the final section of the Tasman Global Access (TGA) undersea cable.

Telecommunications companies Spark, Vodafone and Telstra are investing approximately \$100 million to build the TGA cable—which will stretch 2,300 km from Ngarunui Beach in Raglan, to Narrabeen Beach in Australia.

Upon completion, the TGA cable will significantly improve New Zealand's international broadband connectivity. Other benefits include strengthening links into fast-growing Asian markets, providing important redundancy and resiliency, and better connecting with the five main international cable systems currently serving Australia.

Weighing in at 5,378 tons, and more than 140 m in length, the Ile De Re will be hard to miss as it docks at the Ports of Auckland for just one day. The ship is scheduled to make its way back to the middle of the Tasman Sea to lay the final stretch of cable and connect it to the Raglan shore landing.

The cable is composed of two fiber pairs, and will have a total capacity of 20 Tbps. It has 20 repeaters which are used to amplify the optical signals along the length of the cable.

The Ile de Re is the property of Alcatel-Lucent Submarine Networks (part of Nokia), which is the company contracted by Spark, Vodafone and Telstra to carry out the TGA cable project.

For more information, visit www.spark.co.nz.

SEAX Asian regional system announced

Consumers in the Southeast Asia region can look forward to faster Internet connections in the next 5 years, with a new submarine cable system unveiled last week.

Super Sea Cable Networks (SEAX) announced the new Asia/Pacific regional submarine cable system aimed at wholesale carriers for emerging markets who want to own cable systems but do not wish to operate them themselves, according to a press statement by the Singapore-based company. The countries targeted are Indonesia, Malaysia, Thailand, Cambodia, Philippines, Bangladesh, Vietnam and Myanmar.

SEAX said its submarine cable project will be divided into three phases from 2016 to 2021. The first phase will connect Singapore, Malaysia and Indonesia, drawing Internet traffic from the region towards Singapore and then transmitting out to the rest of the world, especially the US and Europe.

The second phase will connect Singapore to the U.S. through Guam, a U.S. territory in the Pacific region of Micronesia. The firm said this will link the Southeast Asian

region directly to the U.S. through a path away from the earthquake-prone and heavy shipping traffic zones of the South China Sea.

The final phase of the project will connect Asian countries such as Bangladesh, Myanmar, Thailand, Malaysia and Indonesia, which will potentially act as an alternative path from these countries using Singapore as a transit hub to the rest of the world, SEAX added.

For more information, visit www.seacablex.com.

Prysmian secures contract for Rentel project

Prysmian Group has been awarded a contract worth up to 13 million euro by Tideway B.V. for the Rentel offshore wind farm project. Rentel N.V. was founded by a consortium of Belgian specialists in renewable energy with a significant track record in offshore wind who have joined forces to develop, finance and operate the Rentel offshore wind project, which holds a 309 MW offshore wind concession in the Belgian North Sea.

The Rentel wind farm is located approximately 34 km from the Port of Zeebrugge and approximately 40 km from Oostende off the Belgian coast. It will consist of 42 Siemens D7 type wind turbines and will produce nearly 309 MW at its peak, supplying CO₂ friendly electricity to 285,000 households. The project will become the fifth offshore wind farm to be constructed within the Belgian North Sea and shall contribute to Belgium's leading role within offshore wind energy towards achieving EU climate standards and increasing the security of energy supply in Belgium.

Prysmian is responsible for the design, manufacture and supply of the 33 kV submarine cables in various cross-sections, together with the related cable accessories. Prysmian will also provide the offshore cable termination and testing services. The cables will be produced in the Prysmian facility in Drammen, Norway, one of the Group's centers of excellence for submarine cables. The cables are planned to be delivered in summer 2017, whilst the termination works are scheduled to be completed in spring 2018.

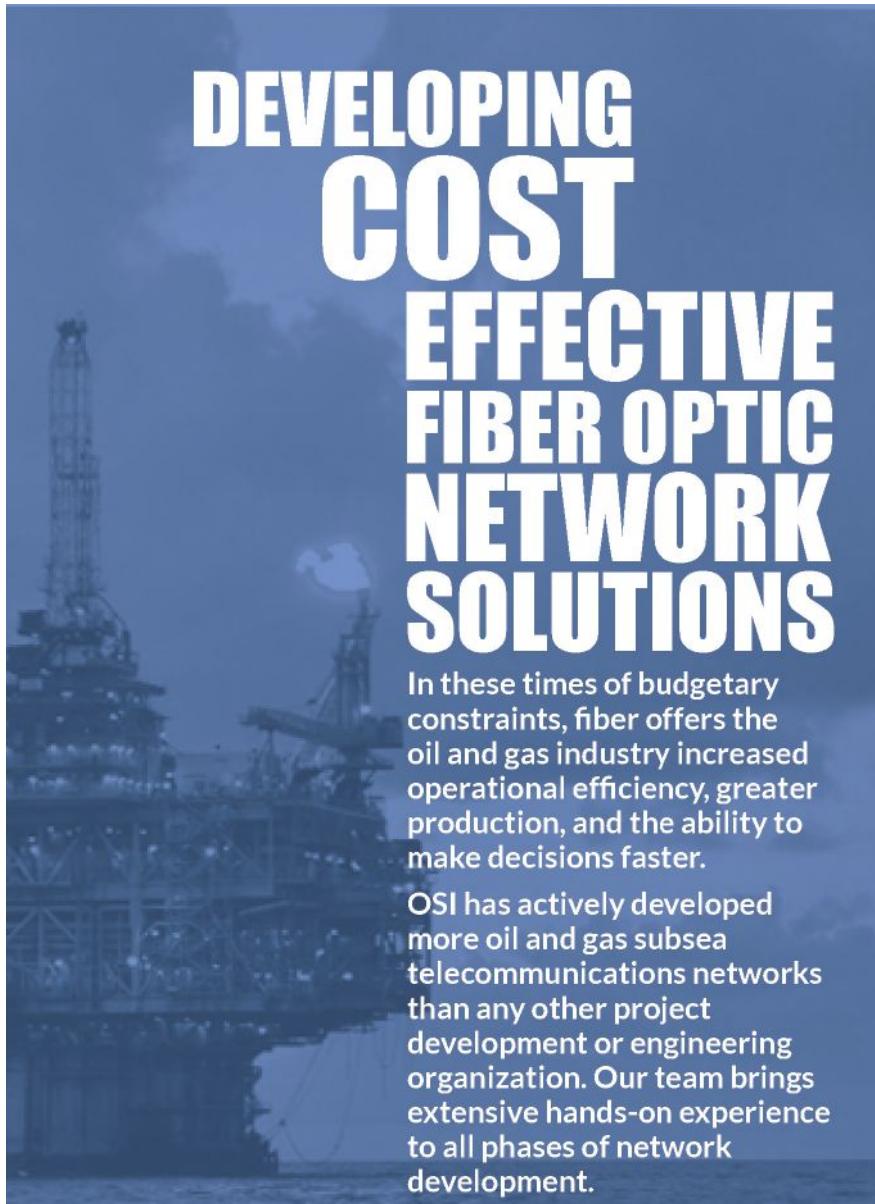
Over the years Prysmian has moved ahead with major investments in new and upgraded manufacturing and installation assets, broadening the range of its offered products and innovative technologies, strengthening its services and capabilities in production and project execution in order to serve the offshore

wind market and support the demands of this growing industry as a trusted and dedicated partner, whether for medium voltage inter-array cables, HVAC or HVDC export cable needs.

Recently the Group has announced the launch of its EPR insulated 66 kV cable solution for inter-array application, the first at this voltage level, enabling up to 15% cost reductions for offshore wind farms.

Prysmian operates three production facilities dedicated to submarine cables, situated in Arco Felice (Italy), Pikkala (Finland) and Drammen (Norway), as well as three installation vessels, Giulio Verne, Cable Enterprise, and the newly procured Ulisse, together with proven in-house cable protection equipment and specialized operations teams.

For more information, visit www.prysmian.com.



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High performance wind farm cable handling delivered by Osbit

A state-of-the-art quadrant handling system, designed and built by Osbit for offshore contractor DeepOcean, has successfully completed its first inter array cable installation job for a leading international developer.

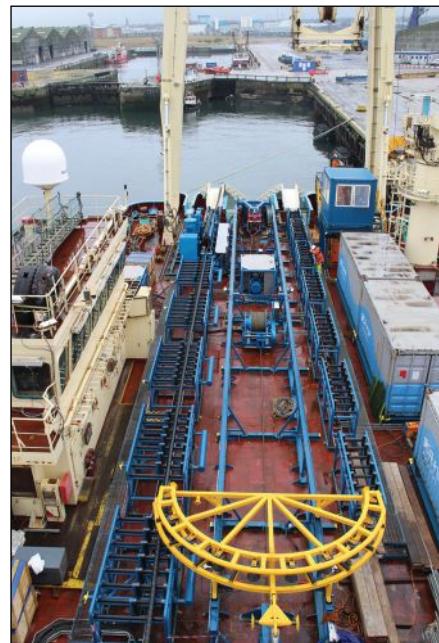
The system has delivered class-leading efficiency, successfully facilitating the laying of two complete cables per day in the first stage of its deployment from the Maersk Recorder vessel at an east coast wind farm.

Osbit modified its existing system to fit an entirely new deck layout, incorporating operator-owned equipment alongside its own. The company also upgraded its equipment to add additional functionality, including the addition of two new stern chutes and associated grilles. A novel quadrant handling A-Frame was also integrated to streamline the most complex handling operation throughout the whole lay cycle.

These changes helped to support the safe and effective first and second end deployment of the subsea quadrant as it installed the offshore wind farm inter array cables. The equipment was also crucial in minimising on-site costs, accelerating the deployment process to achieve a lay rate of at least two complete cables per day.

Osbit's design also allows the system's cable production units to be assembled offline on the system while it carries out laying operations, maximising technician productivity on board the vessel.

Brendon Hayward, managing director of Osbit, said: "We continue to focus on developing new, technology-led solutions to support contractor operations in



the construction of offshore wind farms. The success of this project highlights the effectiveness of our collaborative, objective-driven approach, which ensures that our systems achieve efficient and productive offshore operations."

Pierre Boyde, commercial director at DeepOcean, said: "Osbit's understanding of our requirements and its engineers' expertise has produced one of the most advanced quadrant handling systems on the market. The system gives DeepOcean an advantage over our competitors in multiple key areas, including speed, and personnel and product safety."

For more information, visit www.osbit.com.

JDR to open new European support center

JDR has announced its plan to open a new European service support center, located in Newcastle upon Tyne, UK, to deliver greater service value for clients and support anticipated growth.

Located on the River Tyne, the 4,000 sq. m facility including workshop, warehouse and state-of-the-art offices, will act as the central base for JDR's UK and European service operations. Housing up to 50 staff, the center will be able to coordinate JDR's service activities in the Middle East and Asia and will be a base for the sales and marketing teams. The location was strategically selected for its proximity to projects in the North Sea and Europe, JDR's Hartlepool facility and the local supply chain.

The new service support center has arisen from high demand for JDR's service work, including offshore installation support and maintenance activities. This world-class facility will provide space for the planned growth of the company's service team and offer JDR's partners a dedicated European hub for integrated services beyond factory delivery. This will provide clients with the ultimate in technical support for onshore and offshore activities associated with deployment, installation and commissioning, maintenance and repair, and decommissioning.

The full Newcastle facility including offices is expected to be operational by the third quarter of 2017.

For more information, visit www.jdrcables.com.

NKT Cables awarded order for Borssele offshore projects

NKT Cables has been awarded a contract by TenneT for delivery and installation of the export cable systems for Netherlands' grid connection system Borssele Alpha together with an option

for Borssele Beta, in a consortium with Boskalis' subsidiary VBMS.

For NKT Cables, the Borssele Alpha contract value in market prices will be approximately €77 million. The order comprises supply of 125 km of 220 kV AC high-voltage submarine cables delivered ready for installation in late 2018. The cables will be manufactured in Cologne, Germany, and ensure full visibility of the offshore production until end-2018.

In addition to the award for the Borssele Alpha offshore grid connection system, TenneT has separately awarded the option for delivery and installation of export cable systems for Borssele Beta, connecting the future Borssele 3 and 4 offshore wind farms to the grid. This option is subject to financial close.

The future Borssele 1 and 2 wind farms, which will be connected to the grid by TenneT's Borssele Alpha connection system, will be located in the North Sea approximately 20 km from the coast of the Dutch province of Zeeland and will each have a capacity of 350 MW. The first combined 700 MW grid connection system is planned to be operational in 2019. The two wind farms will provide electricity for approx. one million households, thereby representing a milestone to achieve Netherlands' renewable energy targets.

For more information, visit www.nktcables.com.

Jee awarded funding for tidal array cable solution

Technologies that harness tidal energy (i.e., tidal energy convertors or TECs) are in the advanced stages of development. Single TECs have been tested in UK waters for some time but only recently has a fully commercial, grid-connected array been installed. Despite the rapid progress, the tidal sector is relatively immature and the greatest challenge is to find a cost-effective method to deploy these technologies at a large scale. Only then will these projects become commercially viable to developers and unlock the potential of tidal energy in the UK and worldwide.

Innovate UK, the UK's innovation agency, has awarded Jee Ltd. £75,000 in funding to develop a conceptual design of its "Excalibur" solution. The project, kicked off in October 2016, is due to be completed by June 2017. Jee's Excalibur system is a novel subsea infrastructure solution for the deployment of tidal arrays and the protection of subsea array cables. It will enable the cost-effective installation and maintenance of TECs at an array scale and will standardize and modularize the design

SUBSEA CABLES

of the structural foundation, cables, cable protection system and the TEC connection to the infrastructure. Ultimately, the solution will reduce the levelized cost of energy (LCOE).

As a typically standard yet customizable off-the-shelf unit, the solution facilitates the quick installation of tidal turbines, thus reducing design and installation costs as well as the lead times for these projects. The solution also enables maintenance of the TECs above the waterline without the need to disconnect or disrupt the power production. Together, this minimizes the number of subsea activities meaning fewer vessels are required for less time.

Jee is forming a steering committee of key stakeholders, including tidal array farm developers, installation contractors and cable suppliers. The steering group will help shape the design, confirm the technical requirements and gain market feedback.

Innovate UK works with people, companies and partner organizations to find and drive the science and technology innovations that will grow the UK economy. Along with the Engineering and Physical Sciences Research Council (EPSRC) and the Department of Energy and Climate Change (DECC), Innovate UK established the Energy Catalyst to support new investments to accelerate innovation in the energy sector. The competition was open to any sector who could address the three key challenges facing the global energy sector – reducing emissions, improving security of supply and reducing cost.

For more information, visit www.jee.co.uk.

Huawei to deploy middle package of Palapa Ring

Huawei and PT.LEN Telekomunikasi Indonesia (LTI) announced an agreement to design and construct a portion of the Palapa Ring project in Indonesia.

The Palapa Ring is a broadband network project led by Indonesian government for the purpose of increasing broadband penetration in the more remote areas in Indonesia. It consists of three separate sections, dubbed the West, Middle and East packages.

PT.LEN Telekomunikasi Indonesia signed an agreement with Kominfo and IIGF for the development and construction of the Middle package. Huawei and Huawei Marine are contracted to construct the Middle package.

The Middle package of Palapa Ring project will connect Kalimantan, Sulawesi and North Maluku by a submarine cable system supplied by Huawei Marine, who will lay 1,600 km of submarine fiber-optic cable in several segments to connect multiple locations. The system is equipped with Huawei's unified WDM/OTN backbone equipment OSN 8800 with a design capacity of 960 Gb/s.

For more information, visit www.huawaimarine.com.

TE SubCom completes Monet's U.S. landing

TE SubCom, a TE Connectivity Ltd. company, has successfully completed the U.S. shore landing for the Monet Submarine Cable, a 10,556 km cable that will connect Boca Raton, Florida to both Fortaleza and Praia Grande, Brazil.

Monet is owned by Algar Telecom (a Brazilian telecom company and Internet service provider), Angola Cables (an Angolan telecom company operating in the wholesale market), ANTEL (the Uruguayan telecom company), and Google. The 100G-capable cable system will provide a low latency route from Brazil to North America with a minimum bandwidth of 60 Tbps.

The Boca Raton landing is the third of three shore landings successfully installed by TE SubCom for the Monet Cable. Shore landings were completed earlier this year in Fortaleza and Praia Grande, Brazil.

For more information, visit www.subcom.com.

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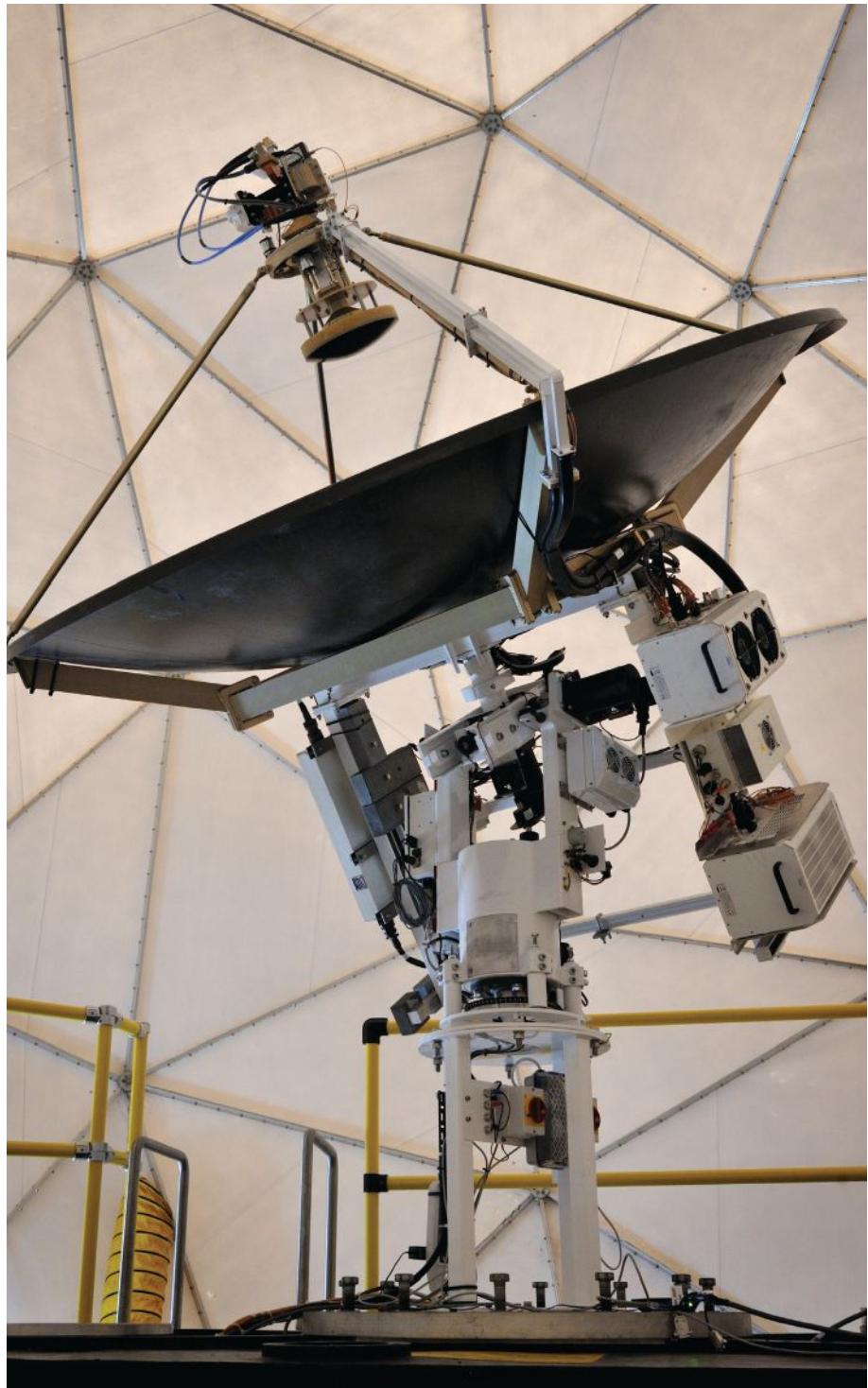
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Oil and Gas Industry Accelerates Technological Innovations During Downturn



Even as the oil and gas investment cycle reaches its bottom, the strategic imperative to improve productivity through innovation has never been clearer as the industry prepares for a slow, drawn-out recovery. Despite the high-tech nature of oil and gas, historically, energy firms have been hesitant to embrace new technology. Yet as the market recovers in coming years, the industry can expect to see a bifurcation between firms that merely survived the crash versus those that used the crisis as an opportunity to drive productivity throughout their business model. As a result, the energy ecosystem is seeing a thought shift in approaches to adopting new technology as firms challenging their old models will be best positioned during the inevitable rebound. Communication service providers play an important role by assimilating new solutions across the industry to enable the gradual shift to the digital oilfield where connectivity will allow secure real-time collaboration and enable data analytics. The future of oil and gas will be centered on information technology and software. Firms failing to make these investments today will be left behind.

Technological shift

Like the shale revolution that has dramatically upended the oil and gas industry, the satellite value chain is undergoing its most significant changes in generations. Revolutions in how firms design and launch satellites will enable a dramatic increase in connectivity in the coming years, enabling firms like Harris CapRock to build networks utilizing a combination of Geostationary Satellite Orbit (GEO), Medium Earth Orbit (MEO) and Low Earth Orbit (LEO) high throughput satellites. This is supported by continued investment in terminals and operating models to shift from a “best efforts” to an “always on” offering that delivers a level of reliability and security that would have been unthinkable just a few years ago. This unrelated technological shift appeals to oil and gas thought leaders seeking to leverage connectivity in their digital strategy to build a differentiated, sustainable operating model. These changes will shift the conversation from availability percentages and committed information rates to application-level performance.

As oil and gas companies position themselves for the delayed upturn, they are being forced to reassess their asset portfolios to match the opportunities likely to arise over the next few years. As sub-premium assets are increasingly placed into storage or scrapped, com-

*By Matt Broida,
Vice President of Strategy and Marketing, Harris CapRock*

munications investments continue with the remaining fleets that will create a digital roadmap for assets returning to service in the coming years. As connectivity and reliability improve, firms are adjusting their operating models to leverage this in remote regions to pull multiple levers that will reduce costs. This includes reducing staffing in remote locations, enabling onshore subject matter experts' insight across multiple assets, growing automation, and aggregating big data to improve the timeliness and accuracy of critical decisions.

The growing use of data and the increased accessibility of this data play to the strength of companies like Harris CapRock and to the innovations we are seeing in the satellite sector. Big data has arrived; today's hydrocarbon abundance is driven as much by information technology as new equipment. Firms can now utilize imaging, sensors, and analytics while collaborating across multiple locations in real time, optimizing both drilling and production.

One way Harris CapRock is facilitating these innovations is Harris CapRock® One. This is an intelligent communications service that gives users the ability to access multiple satellite feeds and other transport layers through a single terminal while intelligently switching between beams or networks to provide the highest performing network connectivity for each application. While there is no way to predict all of the innovations that may arise over the next several years, Harris CapRock has designed this system to work with new technologies that may surface, including flat panel phased arrays.

As Harris CapRock builds multi-transport networks supported by the industry's most dynamic terminals and software, they can focus on customers' individual application performance. More bandwidth and high availability will be meaningless if these networks cannot optimize data flow. As they work with customers to better understand their current and future connectivity needs, Harris CapRock can ensure each application will run across a network best suited to its individual performance parameters with redundant networks for additional reliability.

What are the barriers to the adoption of new technology?

Advanced sensing, enhanced data collection, analytics, and automation are a few of the technology-focused upgrades being reviewed and adopted across the industry. These types of improvements translate to a higher rate of data consumption moving forward. The ultimate goal of this shift is to use

these advancements to create a safer, more reliable and efficient working environment. Unfortunately, it's not that simple. While technology-dedicated spending will come back over time as oil prices recover, the biggest adoption barrier currently stems from the inertia of large oil organizations and how they make decisions.

Traditionally, leadership of these companies has been reluctant to alter the way they leverage technology, but as margins are squeezed, a new generation of tech-savvy leaders who embrace technology are making their mark and helping accelerate innovation that previously could have taken decades to achieve. This can be seen in the assets currently running. Projects are coming through faster, and operating costs are decreasing. Innovation is no longer being seen as a cost and more as an investment. Companies are looking at IT as a facilitator for growth and advancement instead of just a cost center.

The other significant barrier to the realization of the digital oilfield is cybersecurity. Multiple examples of malicious software unintentionally downloaded by offshore oil workers has incapacitated computer networks on some rigs and platforms, exposing gaps in security that could pose serious risks to people and the environment. Harris CapRock is addressing emerging cybersecurity needs in two separate, but related ways. First, Harris CapRock has worked to ensure its networks are the most secure in the industry, utilizing Global VSAT Forum (GVF) guidelines as the minimum standard. Second, they continue to introduce new customer offerings to defend and monitor networks while preventing attacks before they occur. As firms ramp-up cybersecurity spending to defend their systems, Harris CapRock can deliver the secure connections that firms need.

Implications for firms and their employees

As companies are turning to these innovations and improvements in technology, they are beginning to look at ways to operate their facilities remotely and reduce the need for on-site personnel. This effort is a transformative cost decelerator in the offshore environment due to the reduction in expense of having individuals on worksites. There is a trend to embrace a minimum headcount asset manning operating philosophy as both the efficacy and reliability of communications technology improves.

Automation tools remain a rare growth product line in the offshore oil and gas industry as firms seek to reduce

offshore personnel for millions of dollars in savings. At the same time, these providers are seeking to collect growing amounts of data to aggregate into proprietary algorithms to leverage big data into providing preventive maintenance, Service Level Agreements (SLAs), and other applications the industry is just beginning to uncover. Growing connectivity and security is allowing oilfield service providers and operators to place more subject matter experts onshore, in a lower-cost and safer environment, where their skills can be leveraged across multiple assets. While many companies reduced their workforce to manage costs in the recession, the innovations in the industry are giving companies the ability to intelligently automate tasks and reduce the need to endanger personnel on remote assets.

As oil and gas companies decrease the number of people working offshore, they'll increasingly rely on companies like Harris CapRock to supplement in-house operations. Rather than becoming an expert in collecting data, building and managing networks, companies will shift their focus to extracting valuable insights from the data they are bringing in to enable sound decision making. Organizations that don't make this shift during the downturn may be left behind by competitors.

As the industry returns to profitability, the focus will be on higher instrumentation, higher bandwidth, and technologically advanced assets. The real strategy behind implementing this model is going to be utilizing increased connectivity and digital enhancements to institute operational changes that are required to keep costs down while utilizing technology to better empower the industry's most important assets—its personnel and data.

As vice president of marketing and technology, Matt Broida is responsible for leading the communications, commercial, and technology teams. These teams align emerging customer requirements into a commercial and technology strategy to enable a strategic growth plan across energy, maritime, and other emerging verticals. Broida has more than 10 years of international experience leading commercial and strategy engagements in a wide range of markets, including offshore oil exploration and production, technology, and private equity.

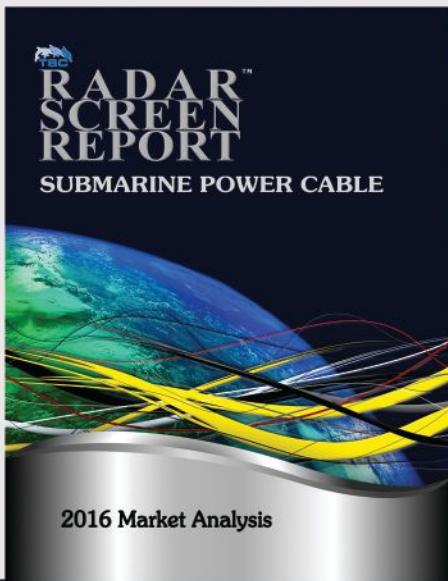
Broida earned a Bachelor of Science degree in finance from Ohio State University and a master's degree in business administration from Kellogg at Northwestern.

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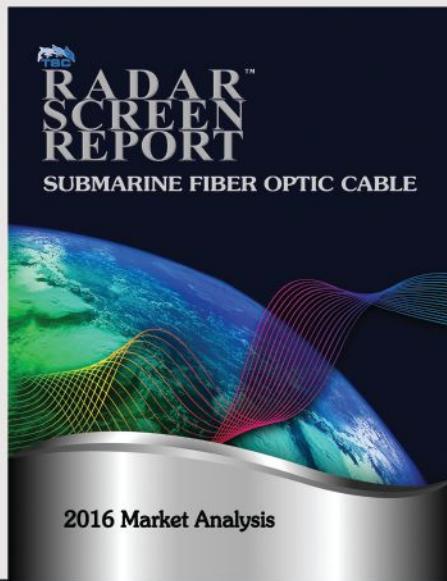
The highly specialized
2016 Radar Screen Report is
available this year in three volumes

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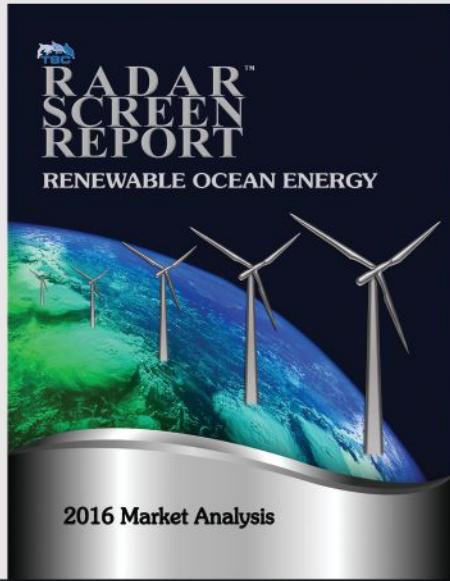
2016 Market Analysis

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OFFSHORE STATS & DATA

Quest Offshore Activity Report

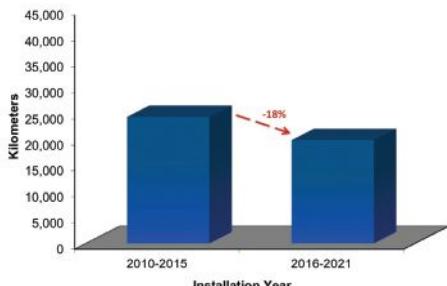
December 2016

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Ocean News & Technology

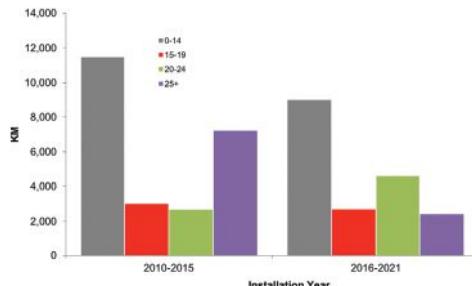
Worldwide Pipeline Demand Growth

2010 – 2015 vs. 2016 – 2021



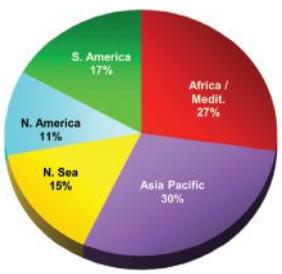
Worldwide Pipeline Demand Growth

2010 – 2015 vs. 2016 – 2021



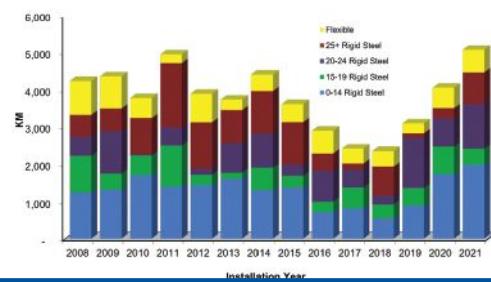
Worldwide Pipeline Demand by Region

2016 – 2021 Installations (19,885 KM)



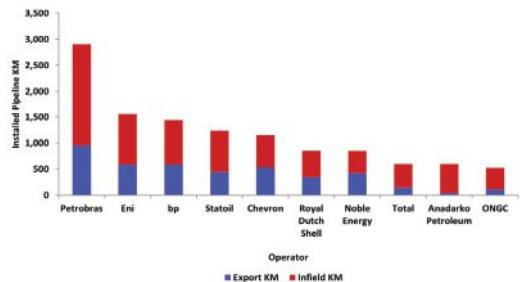
Worldwide Pipeline Demand

2008 – 2021



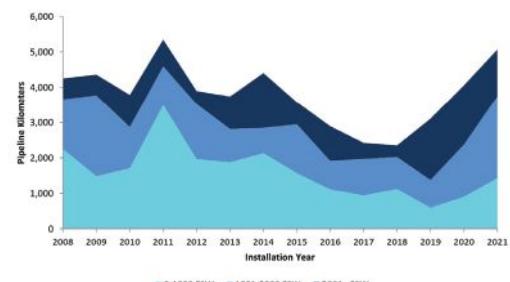
2016e – 2021e Top Operators by Pipeline Installation (KM)

Infield vs. Exports



Global Project Water Depth Installation Analysis

2008 – 2021e



FOR MORE DETAILED INFORMATION

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www.QuestOffshore.com • www.SubseaZone.com • www.FloatingProductionZone.com

Monthly Stock Figures & Composite Index

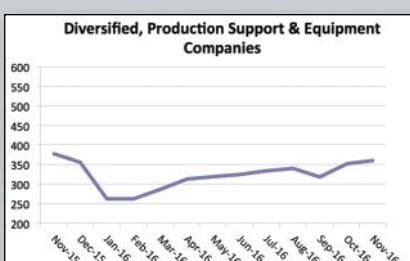
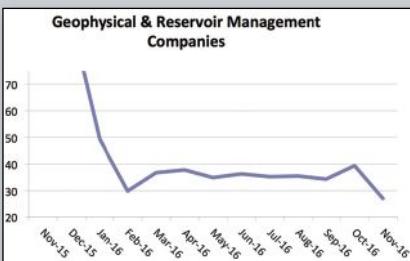
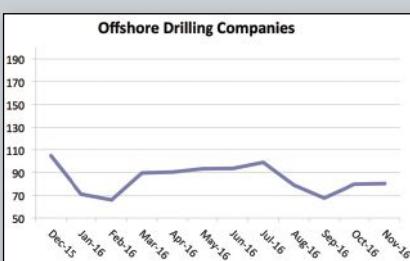
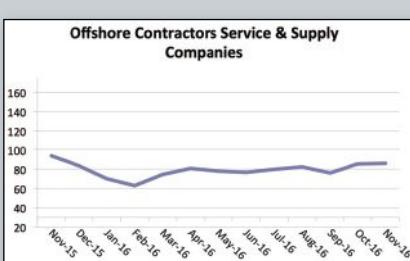
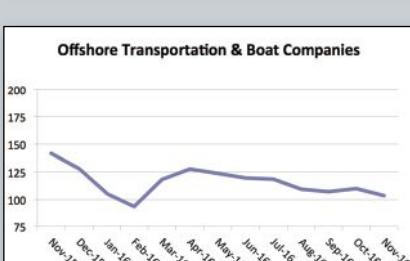
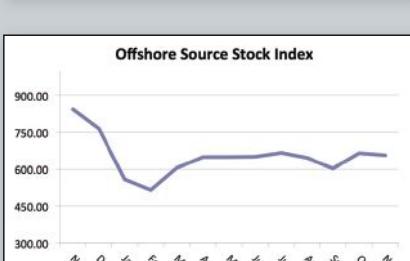
Industry Company Name	Symbol	Close (Mid) November	Close (Mid) October	Change	Change %	High 52 week	Low
Diversified, Production Support and Equipment Companies							
Baker Hughes, Inc.	BHI	60.00	52.24	7.76	14.9%	62.16	37.58
Forum Energy Technologies, Inc.	FET	20.17	21.75	-1.58	-7.3%	22.85	8.47
Drill-Quip, Inc.	DRQ	53.30	55.20	-1.90	-3.4%	66.73	46.90
Halliburton Company	HAL	49.17	47.32	1.85	3.9%	50.23	27.64
Tenaris SA	TS	31.51	29.06	2.45	8.4%	31.71	18.53
Newpark Resources, Inc.	NR	7.20	7.25	-0.05	-0.7%	7.73	3.35
Schlumberger Ltd.	SLB	81.04	81.88	-0.84	-1.0%	84.30	59.60
Superior Energy Services, Inc.	SPN	16.11	17.90	-1.79	-10.0%	19.83	8.25
Weatherford International, Inc.	WFT	5.18	6.05	-0.87	-14.4%	11.21	3.73
Deep Down, Inc.	DPDW	0.90	0.90	0.00	0.0%	0.98	0.83
FMC Technologies	FTI	35.09	31.74	3.35	10.6%	35.09	22.30
Total Diversified, Production, Support and Equipment.....	359.67	351.29	8.38	2.4%	392.82	237.18	
Geophysical / Reservoir Management							
Dawson Geophysical Company	DWSN	7.90	7.30	0.60	8.2%	8.87	2.90
Mitcham Industries, Inc.	MIND	3.57	3.37	0.20	5.9%	4.69	2.24
Compagnie Gnrale de Gophysique-Veritas	CGV	15.60	28.79	-13.19	-45.8%	29.37	15.60
Total Geophysical / Reservoir Management.....	27.07	39.46	-12.39	-31.4%	42.93	20.74	
Offshore Drilling Companies							
Atwood Oceanics, Inc.	ATW	8.12	9.06	-0.94	-10.4%	16.57	4.82
Diamond Offshore Drilling, Inc.	DO	16.70	17.01	-0.31	-1.8%	26.72	14.18
ENSCO International, Inc.	ESV	8.52	8.19	0.33	4.0%	18.93	6.50
Nabors Industries, Inc.	NBR	13.38	12.94	0.44	3.4%	13.64	4.93
Noble Drilling Corp.	NE	5.36	5.86	-0.50	-8.5%	14.31	4.45
Parker Drilling Company	PKD	1.95	2.35	-0.40	-17.0%	3.16	0.98
Rowan Companies, Inc.	RDC	15.35	14.42	0.93	6.4%	21.07	10.67
Transocean Offshore, Inc.	RIG	10.87	9.81	1.06	10.8%	15.20	7.67
Total Offshore Drilling.....	80.25	79.64	0.61	0.8%	129.60	54.20	
Offshore Contractors, Services, and Support Companies							
Helix Energy Solutions Group, Inc.	HLX	9.79	9.27	0.52	5.6%	10.96	2.60
Gulf Island Fabrication	GIFI	10.25	10.09	0.16	1.6%	10.81	6.34
McDermott International, Inc.	MDR	5.88	5.12	0.76	14.8%	5.93	2.20
Oceaneering International	OII	25.2	27.41	-2.21	-8.1%	45.69	22.47
Subsea 7 SA	SUBCY.PK	11.81	11.24	0.57	5.1%	11.84	4.86
Technip ADS	TKPPY.PK	17.69	16.29	1.40	8.6%	17.69	9.69
Tetra Technologies, Inc.	TTI	5.33	5.93	-0.60	-10.1%	9.44	4.40
Total Offshore Contractors, Service, and Support.....	85.95	85.35	0.60	0.7%	112.36	52.56	
Offshore Transportation and Boat Companies							
Seacor Holdings, Inc.	CKH	56.61	58.87	-2.26	-3.8%	62.93	41.24
Gulfmark Offshore, Inc.	GLF	1.40	1.62	-0.22	-13.6%	7.50	1.05
Bristow Group	BRS	13.81	11.89	1.92	16.1%	15.82	9.46
PHI, Inc.	PHII	14.90	17.87	-2.97	-16.6%	21.70	12.51
Tidewater, Inc.	TDW	1.95	3.03	-1.08	-35.6%	11.58	1.44
Swire Pacific	SWRAY	10.06	10.80	-0.74	-6.9%	12.13	9.06
Hornbeck Offshore	HOS	4.80	5.85	-1.05	-17.9%	13.15	3.00
Total Offshore Transportation and Boat	103.53	109.93	-6.40	-5.8%	144.81	77.76	

December 2016

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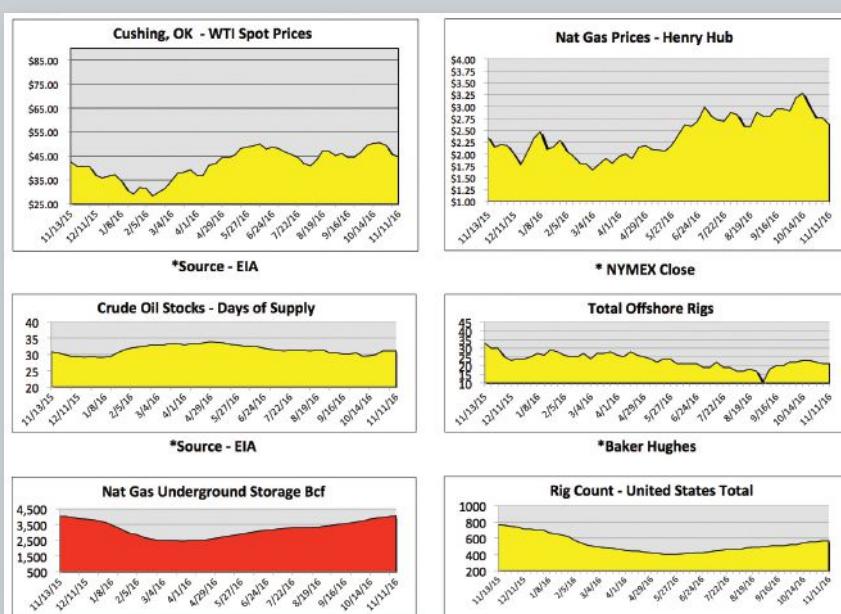
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Monthly Stock Figures & Composite Index

Industry	Close (Mid) November	Close (Mid) October	Change %	Change %	High 52 week	Low
Total Diversified, Production, Support and Equipment	359.67	351.29	8.38	2.4%	392.82	237.18
Diversified, Production Support & Equipment Companies						
						
Total Geophysical / Reservoir Management	27.07	39.46	-12.39	-31.4%	42.93	20.74
Geophysical & Reservoir Management Companies						
						
Total Offshore Drilling	80.25	79.64	0.61	0.8%	129.60	54.20
Offshore Drilling Companies						
						
Total Offshore Contractors, Service and Support	85.95	85.35	0.60	0.7%	112.36	52.56
Offshore Contractors Service & Supply Companies						
						
Total Offshore Transportation and Boat	103.53	109.93	-6.40	-5.8%	144.81	77.76
Offshore Transportation & Boat Companies						
						
Total Offshore Source Index	656.47	665.67	-9.20	-1.4%	822.52	442.44
Offshore Source Stock Index						
						
DISCLAIMER						
<i>The information on this page is provided for information and comparison purposes only and should not be used to make financial and business decisions and is accurate to the best of our knowledge for the period indicated.</i>						

Oil & Gas Industry Trends

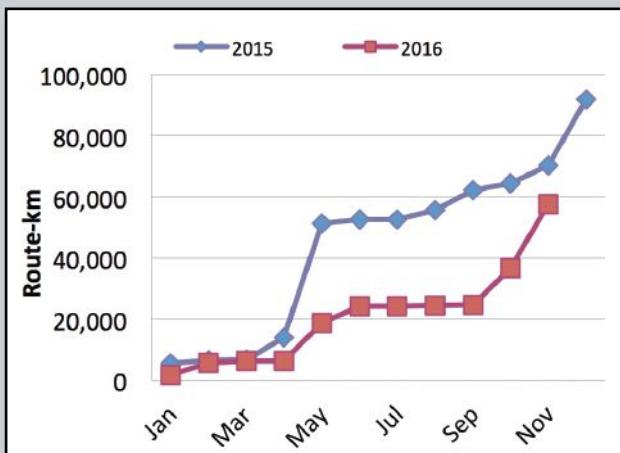
Monitoring the Pulse of the U.S. Offshore Oil & Gas Industry



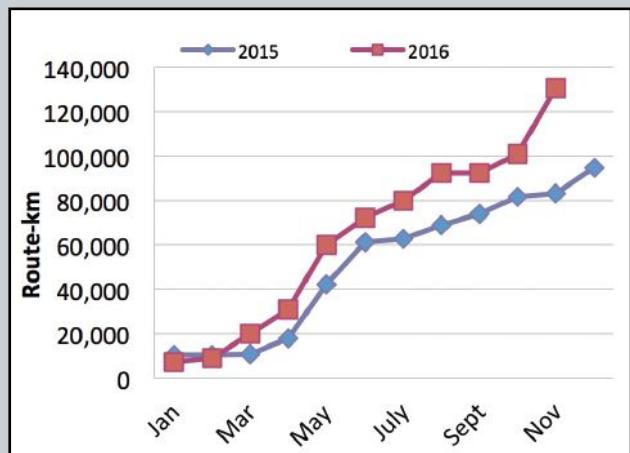
Positive trend, at least 3 weeks
Changing trend, less than 3 weeks
Negative trend, at least 3 weeks

Subsea Telecom & Power Cable Data

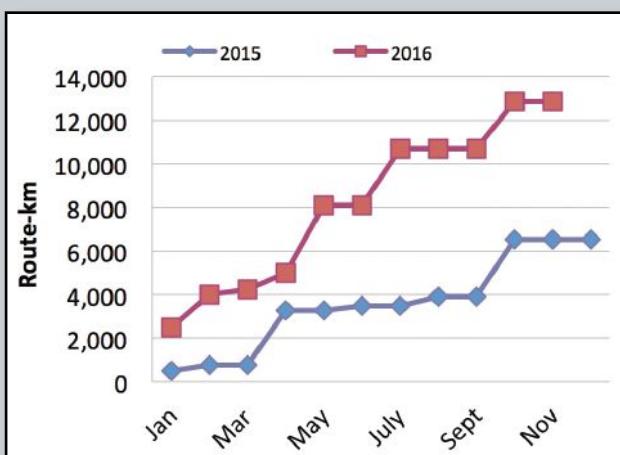
FO Cable Awards by Month



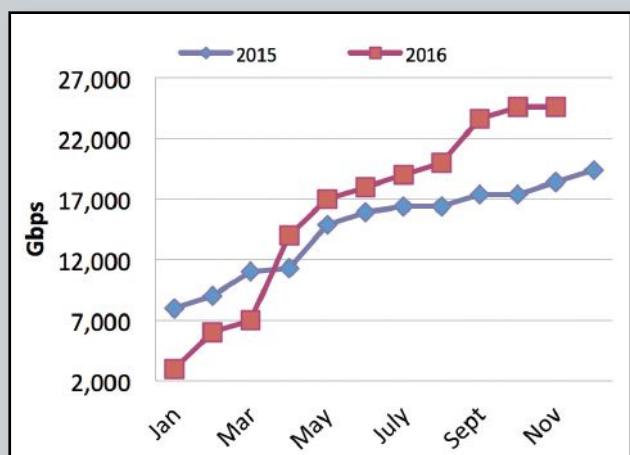
FO Cable Announcements



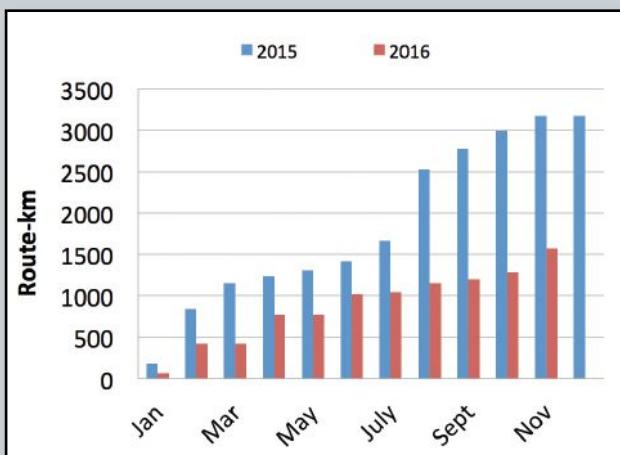
Submarine FO Cables Entering Service in Route-km



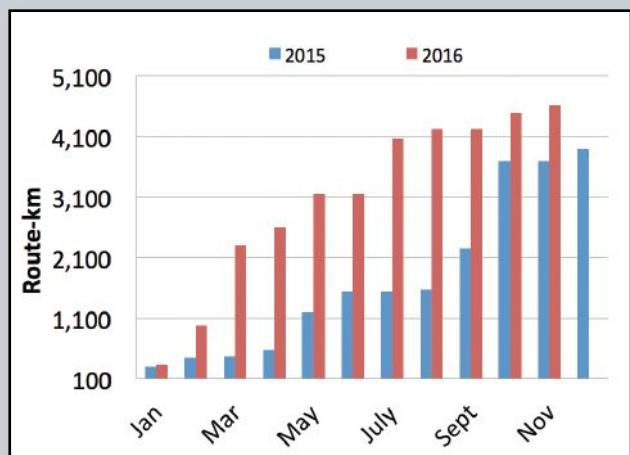
Upgrades of Existing Cable Systems in Gbps



Submarine Power Cable Awards in Route-km



Submarine Power Cable Announcements in Route-km



Gulf of Mexico Data

Current Deepwater Activity

Operator	Area	Block	OCS Lease	Rig Name	Prospect Name	Water Depth (f)
ANADARKO PETROLEUM CORPORATION	SE	39	G27779	ROWAN RESOLUTE	Phobos	8,700
SHELL OFFSHORE INC.	AC	857	G17565	H&P 205	Perdido	7,812
SHELL OFFSHORE INC.	WR	464	G17001	T.O. DEEPWATER	THALASSA	7,452
SHELL OFFSHORE INC.	MC	567	G33744	NOBLE BULLY I		7,289
SHELL OFFSHORE INC.	MC	392	G26253	T.O. DEEPWATER PROTEUS	APPOMATTOX	7,255
EXXON MOBIL CORPORATION	WR	584	G25251	MAERSK VIKING	Julia	7,147
EXXON MOBIL CORPORATION	WR	584	G25251	*WIRELINE UNIT (N.O.DIST)	Julia	7,147
EXXON MOBIL CORPORATION	WR	584	G25251	*WIRELINE UNIT (HOUma DIST)	Julia	7,147
CHEVRON USA INC	WR	758	G17015	T.O. DISCOVERER CLEAR LEADER	Jack	6,968
SHELL OFFSHORE INC.	MC	566	G08831	NOBLE GLOBETROTTER	Fourier addition	6,925
BP EXPLORATION & PRODUCTION INC	GC	743	G15607	SEADRILL WEST AURIGA	ATLANTIS(GC)	6,825
LLOG EXPLORATION OFFSHORE LLC	MC	565	G34452	SEADRILL WEST NEPTUNE	Fourier	6,822
BP EXPLORATION & PRODUCTION INC	MC	822	G14658	SEADRILL WEST VELA	Thunder Horse South	6,267
BP EXPLORATION & PRODUCTION INC	MC	778	G14658	THUNDER HORSE PDQ	Thunder Horse NORT	6,034
ENI US OPERATING CO INC	MC	773	G19996	NABORS POOL 140	Devil's tower	5,610
ANADARKO PETROLEUM CORPORATION	GC	859	G24194	*WIRELINE UNIT (HOUma DIST)	HEIDELBERG	5,355
ANADARKO PETROLEUM CORPORATION	GC	859	G24194	NOBLE BOB DOUGLAS	HEIDELBERG	5,355
CHEVRON USA INC	GC	807	G31752	PACIFIC SHARAV	GC 807 (Anchor Well)	4,954
HESS CORPORATION	MC	726	G22898	STENA FORTH	Tubular Bells	4,570
COBALT INTERNATIONAL ENERGY LP	GB	959	G30876	ROWAN RELIANCE	North Platte	4,566
SHELL OFFSHORE INC.	MC	812	G34460	NOBLE DON TAYLOR		4,475
BP EXPLORATION & PRODUCTION INC	GC	782	G15610	MAD DOG SPAR RIG	Mad Dog Phase 2	4,428
BP EXPLORATION & PRODUCTION INC	GC	782	G15610	*COIL TUBING UNIT (HOUma #2)	Mad Dog Phase 2	4,428
BHP BILLITON PETROLEUM (GOM) INC	GC	654	G20085	*COIL TUBING UNIT (HOUma #2)	Shenzi development p	4,300
CHEVRON USA INC	GC	640	G20082	T.O. DISCOVERER INSPIRATION	Tahiti 2	4,292
ANADARKO PETROLEUM CORPORATION	GC	608	G18402	*WIRELINE UNIT (HOUma DIST)	Genghis khan	4,287
ANADARKO PETROLEUM CORPORATION	GC	563	G34992	*WIRELINE UNIT	Timon	4,200
ANADARKO PETROLEUM CORPORATION	GC	563	G34992	DIAMOND OCEAN BLACKHAWK	Timon	4,200
CHEVRON USA INC	KC	10	G27698	PACIFIC SANTA ANA		4,025
ANADARKO PETROLEUM CORPORATION	GC	562	G11075	DIAMOND OCEAN BLACKHORNET	K-2	3,926
LLOG EXPLORATION OFFSHORE LLC	MC	895	G33764	SEADRILL SEVEN LOUISIANA		3,825
HESS CORPORATION	GC	512	G34551	DIAMOND OCEAN BLACKLION	Stampede	3,599
ANADARKO PETROLEUM CORPORATION	EB	643	G09184	*WIRELINE UNIT (L.J.DIST)	Boomvang spar	3,453
ANADARKO PETROLEUM CORPORATION	EB	643	G09184	*HYDRAULIC WORKOVER UNIT (L)	Boomvang spar	3,453
MARUBENI OIL & GAS USA INC	EB	579	G19030	CAL-DIVE Q-4000	Falcon	3,412
MURPHY EXPLORATION & PRODUCTION	GC	338	G21790	*COIL TUBING UNIT (HOUma DIST)	Front runner	3,326
DEEP GULF ENERGY LP	GC	448	G28077	ENSCO 8505	GC 448	3,266
SHELL OFFSHORE INC.	MC	807	G07957	OLYMPUS N88 MARS		3,039
SHELL OFFSHORE INC.	MC	807	G07963	H&P 201	MARS	2,945
SHELL OFFSHORE INC.	MC	807	G07963	*WIRELINE UNIT (N.O.DIST)	MARS	2,940
CHEVRON USA INC	VK	786	G12119	NABORS 87	Petronius Compliant	1,754
ENVEN ENERGY VENTURES LLC	EW	1003	G06921	*LIFT BOAT (HOUma DIST)	Prince	1,483
HESS CORPORATION	GB	215	G09216	NOBLE PAUL ROMANO	Conger	1,457
WALTER OIL & GAS CORPORATION	EW	834	G33140	H&P 203	Hummingbird	1,186
FIELDWOOD SD OFFSHORE LLC	EB	160	G02648	*NONE RIG PA OPERATION (LJ)	Cerveza	940
FIELDWOOD SD OFFSHORE LLC	EB	159	G02646	*NONE RIG PA OPERATION (LJ)	Ligera	924
EXXON MOBIL CORPORATION	SM	6636	P00188	*WIRELINE (GENERIC)		842
CHEVRON USA INC	GB	189	G06358	*WIRELINE UNIT (L.C.DIST)	Tick	718
FIELDWOOD SD OFFSHORE LLC	EB	110	G02650	*NONE RIG PA OPERATION (LJ)	Tequila	660

Deepwater prospects with drilling and workover activity: 49

Current Deepwater Activity as of Monday, November 14, 2016

Activity by Water Depth

Water Depth (m)	Active Leases	Approved Applications	Active
0 to 200	1,041	36,347	2,076
201 to 400	67	1,134	20
401 to 800	125	904	10
801 to 1000	165	582	9
1000 and Above	1,926	2,185	31

Rig Activity Report 11 November 2016

Location	Week of 09/09	Week		Week		Year Ago
		+	-	Ago	+	
Land	546	0	546	-185	731	
Inland Waters	1	-1	2	-2	3	
Offshore	21	0	21	-12	33	
U. S. Total	568	-1	569	-199	767	
Gulf Of Mexico	21	0	21	-12	33	
Canada	176	22	154	0	176	
North America	744	21	723	199	943	

Activity by Water Depth Information current as of Friday, November 11, 2016.

Maximum number of rigs operating in the deepwater Gulf of Mexico. The rig unit includes platform rigs operating on deepwater production facilities in addition to the MODU's. The numbers do not distinguish between rigs drilling and those in service for completion and workover operations.

Information provided courtesy of the U.S. Bureau of Ocean Energy Management and Baker Hughes

Kongsberg launches next generation GeoSwath shallow water multibeam echo sounder

Kongsberg Maritime has launched GeoSwath 4, the fourth generation of its market-leading GeoSwath shallow water multibeam echo sounder. GeoSwath remains the most successful shallow multibeam of its type—but now, after more than 10 years of record breaking sales, it has been brought up to date with new features, better software and improved performance.

GeoSwath 4 features a new look deck unit, which is much smaller and lighter, with sufficient Ethernet, USB and serial interfaces to suit any combination of peripheral sensors. Inside, the new hardware enables the GS4 to transmit on both port and starboard transducers simultaneously, doubling the previous along track data density and increasing the performance and resolution as a result.

The new design positions GeoSwath 4 as the most advanced multibeam echo sounder in its class. It delivers unsurpassed productivity in shallow waters thanks to a very wide swath coverage, which can exceed 12x water depth, in addition to data coverage up to the water line. The system also enables reliable seabed classification and monitoring with real-time side scan data, co-registered and geo-referenced and calibrated for repeatable results.

GeoSwath 4 is available in three distinct versions for versatile deployment options. The Standard version (GeoSwath 4) features the compact improved deck unit and compact transducer head as



standard while the Rugged version (GeoSwath 4R) for deployment in extreme environments additionally features an IP68 rating and 24 VDC power supply. The third version is configured specifically for AUV, USV and ROV deployment (GeoSwath+ AUV/USV/ROV).

With a brand-new GUI, GeoSwath 4 has been simplified and automated for easier operation, helping surveyors to deal with complex survey situations. The new GS4 software has been specifically designed for the system and features real-time processing and new automated filters. Although interfaces are available to all major packages, no third-party software is needed to deliver accurate results. The software includes 64-bit acquisition and processing, improved graphics, new file formats and many additional improvements that make the system faster and easier to use.

For more information, visit www.km.kongsberg.com.



DeepSea Power & Light releases the LED SeaLite®

Specifically developed to exceed current market demands, the new LED SeaLite delivers a high-performance, field serviceable, and affordable subsea light. This light's durable design, for which DeepSea Power & Light is known, is backed by a 2-year limited warranty.

The LED SeaLite has up to 9,000 lumens with either a flood or spot beam pattern. The compact design weighs as little as 240 g in water and measures 78.7 mm in diameter and 88.5 mm long in a flood configuration without a connector. This light uses a hard anodized 6013 aluminum housing and is depth rated to 6,000 m with a standard sapphire port and 3,000 m with an acrylic port.

Both the LSL-1000 and LSL-2000 models have wide range inputs and low inrush current. No soldered wire connections or specialized tools required makes the LED SeaLite fully field serviceable.

For more information, visit www.deepsea.com.



Oceanscan invests in Tritech's Gemini Systems

Tritech International Ltd (Tritech), a Moog Inc. Company, has secured a deal with Oceanscan for the purchase of multiple Gemini 720is and Narrow Beam Imaging (NBI) units from the company's range of multibeam imaging sonars.

The Gemini 720is, which is an upgrade of the Gemini 720i, was launched in March 2016 and combines the benefits of high-definition imaging with long-range target detection, making it ideal for Autonomous Underwater Vehicle (AUV) and ROV platforms, including installation on pan and tilt units.

The enhanced electronics offer real-time visualisation and a fast update rate of 30 Hz across a 120 degree field-of-view. The Gemini 720is is also ideally suited for target recognition, subsea monitoring and inspection and obstacle detection.

For more information, visit www.tritech.co.uk.

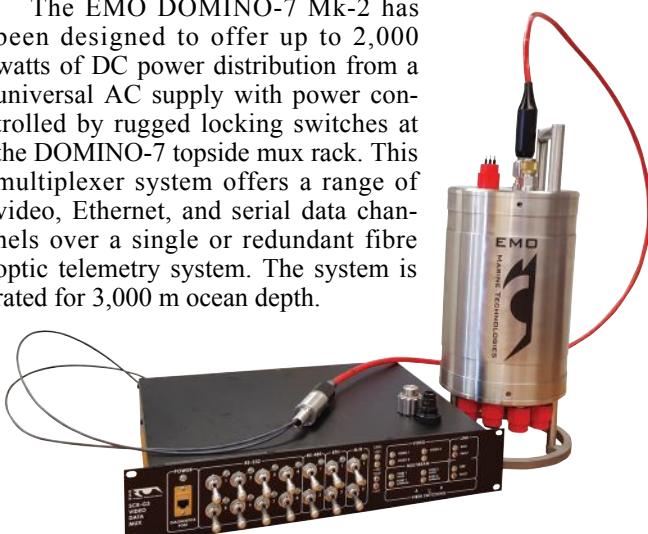


MacArtney EMO multiplexer systems supplied to Unique System, Houston operations

Unique System LLC (USA), a Unique Maritime Group company, is one of the world's leading integrated turnkey subsea and offshore solution providers based in New Iberia, Louisiana and Houston, Texas. The company specialises in the supply of equipment for sale and rental to the diving and offshore industries in the Gulf of Mexico region.

Unique System LLC, Houston, has taken delivery of two EMO DOMINO-7 Mk-2 fibre optic multiplexer systems that are to be added to Unique System's ROV rental pool of products.

The EMO DOMINO-7 Mk-2 has been designed to offer up to 2,000 watts of DC power distribution from a universal AC supply with power controlled by rugged locking switches at the DOMINO-7 topside mux rack. This multiplexer system offers a range of video, Ethernet, and serial data channels over a single or redundant fibre optic telemetry system. The system is rated for 3,000 m ocean depth.



The DOMINO-7 line is the most compact form-factor of working class ROV multiplexer systems available on the market today. The DOMINO-7 MUX system remains flexible to user requirements and can be rapidly reconfigured to meet the power and protocol needs of a large number of ocean tools and devices.

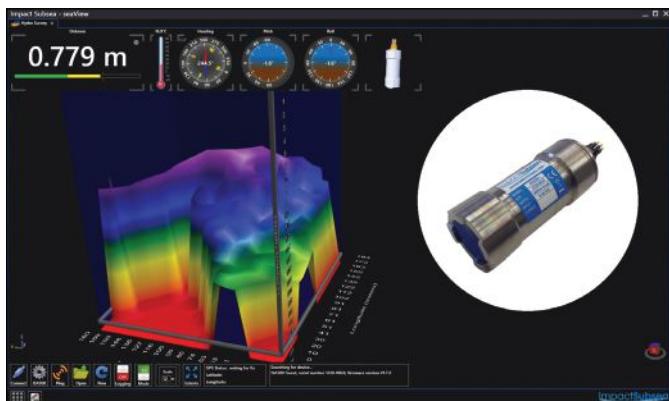
For more information, visit www.macartney.com.

seaView Hydro Survey released

seaView Hydro Survey has been released and provides an easy-to-use and cost-effective hydrographic survey solution.

The Hydro Survey application operates with the Impact Subsea ISA500—using the unit as a single beam echo-sounder. Each range reading is synchronised with a GPS input, allowing data to be logged and plotted in real-time on screen.

seaView Hydro-Survey is intended to provide a highly cost-effective method of conducting basic underwater surveys



using the ISA500. In a step away from industry norm, the seaView Hydro Survey software is being provided free of charge to industry.

Alastair McLennan-Murray, technical director, commented, 'the long range, high accuracy capability of the ISA500 unit makes it an excellent unit for basic hydro-graphic survey purposes. Building on the capabilities already offered in the seaView software package, we wanted to provide a capability to conduct basic hydrographic surveys quickly and easily.'

Aimed at basic hydrographic survey applications, such as sediment monitoring in ports and harbours, the seaView Hydro Survey app provides a new generation of easy-to-use hydrographic software.

For more information, visit www.impactsubsea.co.uk.

STR announce agreement with Inertial Labs to supply their innovative motion reference systems

Subsea Technology & Rentals Ltd (STR), global specialists in the design, manufacture and rental of advanced subsea technology for the offshore energy industry are pleased to announce a partnership agreement with USA-based Inertial Labs to distribute their innovative motion reference systems. Inertial Labs' newest product, the Motion Reference Unit (MRU-B2), along with their Enhanced Motion Reference Unit (MRU-E) and (MRU-P) professional model, will be the latest products to join STR's expanding rental pool.



The Motion Reference Unit (MRU-B2), is an inertial sensor-based orientation, positioning, and control solution for a diverse array of marine and subsea applications. It has been designed to meet the exacting standards for heave, surge, sway, angular rates, accelerations, heading, velocity and positioning required by maritime and hydrographic applications for any type of device upon which it's mounted. The MRU-B2 features high precision inertial sensors for superior accuracy in multiple tasks.

Through STR, Inertial Labs also provides an Enhanced Motion Reference Unit (MRU-E) that contains embedded heading reference and MRU-P professional model that measures horizontal positions and velocities of vessels, boats, ships and offshore platforms with the accuracy of DGPS/RTK.

For more information, visit www.str-subsea.com.

Coda Octopus releases its new real-time 3D cloud module

This Module comprises an upgrade to the firmware capabilities of the Echoscope® as well as an additional real-time software module that allows the generation of real-time beamformed XYZ data for critical third-party decision making applications. AUV and other vehicle-based platforms can instantly benefit from the unparalleled volumetric real-time 3D data from the Echoscope® as a fully integral part of the active payload for real-time applications such as object avoidance and detection, pipeline or cable route tracking and other tasks of a real-time nature.

This module enables computed XYZ data and, optionally, intensity data, to be broadcast to other networked systems whilst simultaneously acquiring live data from our sonars in standard format for post-mission playback in their Underwater Survey Explorer software. The module can be easily configured to compute and output either relative local coordinates or using the platforms navigation systems, absolute global coordinates for each of the 16,384 beams in every ping.

To assist further in application integration testing, the real-time output can be captured to a file instead of a network broadcast, allowing repeated simulations of missions to be performed in a lab.

This exciting new capability provides a fantastic opportunity for systems integrators and existing Echoscope®, C500 and Dimension owners and/or users to build specific task-oriented processes around the volumetric 3D imaging data provided. End user software integration is made straightforward by the use of base XYZ and, optionally, intensity data and should allow developers to quickly and easily get Echoscope® data integrated into their systems.

For more information, visit www.codaoctopus.com.

Trimble® releases Marine Inertial Positioning System

Trimble has released a precise Marine Inertial Positioning System that provides robust 3D position, attitude and orientation data in the most challenging of marine environments. It's targeted at marine contractors who are constructing ports or waterways with dredging, placement or piling machines that need reliable position and orienta-



tion data. In some cases there is a need to precisely survey the waterway bed before the machines are moved off site. This system ensures precise data can be integrated with single beam or multi-beam sonar, allowing the hydrographic survey vessel to undertake progress and "as built" surveys.

The system integrates a Trimble dual antenna GNSS receiver with the IMU sensor in one housing to compute a tightly coupled solution—resulting in the most robust positioning solution possible. The system will keep delivering position and attitude even when used in compromising marine situations such as a congested port. Its performance surpasses loosely coupled solutions of a dual GNSS antenna receiver cabled to an IMU (Pitch Roll Heave) sensor. Data is delivered while dead reckoning in cases where satellite coverage is limited for short periods—to maintain your productivity. The system can be used on new installations or as a drop-in replacement to your existing INS system. The real-time data outputs are industry standard messages including heave that your existing marine software will be able to import.

For more information, visit www.trimble.com.

Acoustic beacons aid scientific exploration and research

Two young engineers will soon be attempting a 250 km crossing of the English channel in a pedal-powered submarine. The two friends, Antoine Delafargue and Michael de Lagarde, are passionate about technical challenges, exploration, and sustainable management of natural resources. Their plan is to travel from Plymouth, England to Saint-Malo, France just a few meters above the seafloor in their human-powered sub equipped with variety of observation instruments. The two pilots will provide propulsion through pedals attached to a crankshaft connected to a drive train that turns the sub's propeller. The sealed hull is constructed of wood, fiberglass and a resin composite and has many of the features found on a full size

submarine including ballast tanks, CO₂ scrubbers, bow thrusters, and a sonar. The sub also has a number of safety features such as an emergency buoy and an acoustic pinger. The pinger will allow a surface vessel to track the sub throughout its journey.

The pair had hoped to make the crossing in the summer of 2016, but equipment problems caused them to postpone the trip. Antoine reported, "We had a few good dives down to 50 m and the sub worked very well, but we had an issue with a gas sensor in the cabin. Traces of hydrogen were escaping from the sub's batteries and were messing up our carbon monoxide sensor. We were able to test the pinger and found it worked well, getting ranges of up to 3 nmi. The 16-kHz transmission was clearly noticeable inside the sub, but not annoying." The pinger the team chose for their mission is JW Fishers SLFP-1. The advantage of this low frequency pinger is that its acoustic signal can be detected at a range of several miles, an obvious benefit when tracking a moving target across such a wide expanse of ocean.

Sea trials will resume next spring with the onset of better weather. The team will be running the sub down to depths of 250 m and practicing extended underwater operations, staying submerged for periods of up to 24 hours. If all goes well, Delafargue and Lagarde will launch the official crossing sometime next summer. Once the expedition is complete, the two intend to create a 250-km long photographic mosaic of the seabed between the two countries. They then plan to exhibit their submarine and underwater images at aquariums and museums across France, Monaco, and the UK.

For more information, visit www.jwfishers.com.



OSIL announces low-cost satellite comms option for currents and waves

Ocean Scientific International Ltd has added a new low-cost, low-power satellite modem to its range of telemetry equipment. The system will publish data (including traditionally high cost/volume currents and waves) from any location globally using the Iridium satellite network.

Monthly line rental costs are minimal, and data costs are kept low (as little as 4p per message) by using SBD messaging with big bundle deals available for multiple or long-term deployments. Conventionally current and wave data transmitted via satellite have proved expensive for the end user owing to the large amount of data produced; however, OSIL is able to vastly reduce the costs by handling the data differently within the Iridium system.



The data can be encrypted or password protected for added security and sent to a specific email address or directly to the client's web-service. The system can provide customisable alarms for when readings fall outside of pre-set criteria or if (in the example of a buoy) the system drifts from a set GPS area.

The modem is cheap to run, equipped with a sleep mode to reduce power consumption (max 450 mA), and employs an RS232 serial connection. The Iridium satellite network offers pole-to-pole coverage, stronger signals, a shorter transmission path and a shorter registration time than other satellite networks—all to the benefit of the end user.

For more information, visit www.osil.co.uk.

ACE Winches announces new 500te linear winch

Leading global deck machinery specialist ACE Winches is pleased to announce a new 500te linear winch to its range of specialised deck equipment.

The new 500te linear winch has been designed, engineered and manufactured at ACE Winches facilities in



Aberdeenshire, UK. The new product is now in its final stages of FAT testing, with mobilisation scheduled for mid-December 2016 for its first contract. The contract will conclude in early spring 2017 when the unit will be available for hire.

For more information, visit www.ace-winches.com.

Sonardyne Ranger 2 USBL selected to support Chinese climate change research

Ocean science technology company Sonardyne Asia Pte. Ltd., Singapore has announced that its underwater acoustic positioning technology has been selected for China's new polar research vessel currently under construction.

Commissioned by the Polar Research Institute of China, the 122-m vessel will be equipped with a Ranger 2 USBL (Ultra-Short BaseLine) system to allow the position of scientific equipment deployed from the ship to be precisely tracked. This will include ROVs, AUVs and seafloor landers. Supplied through Sonardyne's in-country agent, China ORE, Ranger 2 will also provide a position reference for the vessel's Kongsberg dynamic positioning (DP) system, allowing the ship to remain in a specific location during science operations.

Ranger 2 calculates the position of an underwater target by measuring the range and bearing from a vessel-mounted transceiver to a transponder attached to a vehicle or piece of equipment. Sonardyne's exclusive wideband acoustic signal technology and 6G (sixth generation) hardware platform allows multiple targets to be simultaneously and precisely positioned in shallow and deep water.

The equipment being supplied to the Polar Research Institute of China includes Sonardyne's popular Wideband Sub-Mini 6 (WSM 6), a small, lightweight USBL transponder that is easy to install and has a built-in depth sensor and rechargeable battery for added performance and convenience.

For more information, visit www.sonardyne.com.

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Seatooth® ACFM® Subsea smart wireless crack monitoring

WFS Technologies and TSC have launched Seatooth ACFM, a wireless smart NDT monitoring solution designed to reduce subsea inspection costs.

TSC's ACFM array probe is a well-established tool that can be installed on offshore structures to monitor the growth of surface-breaking cracks.

Seatooth is an established subsea wireless communications system that provides reliable communications through seawater and through the splash zone. Seatooth is immune to biofouling, surface noise and turbidity.

Combining the technologies together, 'Seatooth ACFM' is a non-intrusive, easy-to-deploy wireless network solution that can be retro-fitted to offshore structures and subsea assets. Seatooth ACFM units are user-configured to take readings as required, from once a minute to once per month.

Seatooth ACFM can be configured as standalone sensors or within subsea wireless networks. As standalone devices, information is harvested by fly-by ROV or a diver. When configured as

a wireless network on offshore platforms, real-time data is streamed wirelessly through the splash zone to an asset management control station located either on the platform or on shore.

Seatooth ACFM systems come with an internal battery pack to support between 5 and 15 years of operation and are installed by light-class ROV deployed off platforms.

For more information, visit www.wfs-tech.com.

Silicon Sensing pledges support for the Mayflower autonomous ship project

To mark the 400th anniversary of the 1620 sailing of the Mayflower, a team led by U.S.-owned but Plymouth-based firm MSubs, Plymouth University, and ProMare (a charitable research foundation) has an audacious plan to design and build a fully autonomous ship to make the same Atlantic crossing, completely unmanned, in 2020. During the voyage, the Mayflower autonomous ship—MAS400—will conduct a series of scientific experiments before arriv-



ing at its destination in the U.S. Unlike the Mayflower, however, the final destination isn't America, as the plan is for MAS400 to continue on an unmanned circumnavigation of the globe, eventually returning to its home port of Plymouth.

Silicon Sensing is to provide a package of support to help turn the MAS400 concept into reality. In addition to sponsorship of the project, Silicon Sensing will supply its latest precision MEMS IMU, the DMU30, to provide the inertial sensing data within the electronic autopilot to help guide MAS400 during its ocean adventures.

For more information, visit www.siliconsensing.com.

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A tool for simplifying oceanographic data interpretation

Oceanographic instruments measuring currents and other aspects of ocean behaviour collect vast amounts of data. Processing and interpreting these data has traditionally been the preserve of highly specialised scientists working with their own custom-built programmes.

Now the field is opening up to a wider range of users with the advent of unique software designed to simplify data interpretation.

The software, known as Ocean Contour, is the product of extensive consultations with members of the oceanographic community in an effort to meet their needs in a fast-changing technological environment. Expanding on-board data storage capacity and longer battery life mean instruments are capable of staying submerged for a longer period of time—and that means they re-surface with many gigabytes more data than was the case even a couple of years ago.

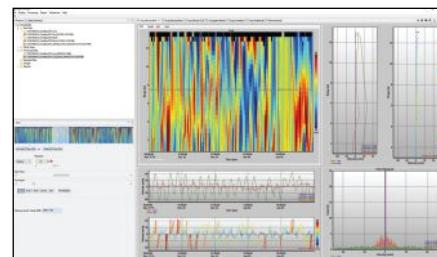
Produced by Boston-based company Ocean Illumination, the software contains a strong visual component to help

simplify data comparisons while the graphics it produces can be readily exported to create presentations in widely used applications.

"It's amazing just how much we are able to 'see' in the oceans these days," says Atle Lohrmann, founder of Ocean Illumination. "Until now, there really haven't been any companies dedicated to producing software for post-processing of oceanographic data, so Ocean Contour is an important tool in making sense of it all in a way that is accessible to the maximum number of users."

Key to the success of Ocean Contour is its ability to speedily handle and dissect these huge datasets in a variety of ways, picking apart complex, inter-related data in a way that can be easily displayed, analysed, and assessed for quality assurance.

To date, such data processing has largely been the preserve of specialised oceanographic scientists working with their own algorithms, usually on software designed for specific manufacturers' equipment. Ocean Contour not only caters for such high-end work but also allows those with lower levels of exper-



tise to extract valuable information from their data.

"Hand-crafting data processing toolkits is time consuming and error prone. This program provides a very easy way to process data from acoustic instruments without requiring much knowledge beyond being able to run a computer application," says Robert Craig, Ocean Illumination's lead software developer.

The first version of the software is designed for use with the Signature series AD2CP instrumentation from Nortek AS, but future releases coming in 2017 will support data provided by different types of instruments, including those from other manufacturers.

For more information, visit www.nortek.no.



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Phoenix International Holdings, Inc. announces that **Patrick Keenan Jr., P.E.** has been appointed as president, effective 1 November. In this position, Patrick will be responsible for all of the company's operating units worldwide. Keenan (CAPT USN retired) served in the U.S. Navy for 30 years as a diver, salvor, and engineer. He is a registered professional engineer and marine surveyor with a BA in chemistry from the University of Pennsylvania, and an MS in materials engineering and naval engineering from the Massachusetts Institute of Technology.

Woods Hole Group is pleased to announce a strategic staffing addition to the company. **Rob Smith** joined Woods Hole Group in October as the new business development manager/senior oceanographer. He will reside in the Texas office, and support the company's domestic and worldwide activities. Rob comes to Woods Hole Group with nearly 30 years of expertise in applied, commercial oceanography and marine environmental science in support of offshore and coastal engineering and marine environmental operational challenges.

Edge Tech, the leader in high-resolution sonar imaging systems and underwater technology, recently announced that **Erik Anderson** has joined the company. Previously with NOAA Office of Coast Survey, Erik brings extensive hydrographic expertise to the organization. With a BS in ocean engineering from Florida Atlantic University, MS in hydrography and category "A" International Hydrographic Certification, Erik joins the team as hydrographic product engineer based in the company's Boca Raton, Florida office.



Anderson

Seanic Ocean Systems is pleased to announce the addition of **Ray Maza** to their business development team. Mr. Maza's history in the subsea market makes him the ideal candidate to help Seanic enhance their long range growth objectives. With beginnings as an ROV pilot and technician, Mr. Maza has progressed through his career taking leadership roles for global commercial activities that include ROV development, subsea project management, operations management, and strategic sales planning.

ValvTechnologies, Inc. has named **Herman Benard, Jr.** director of manufacturing. Based in Houston, Benard will have senior management responsibility for ValvTechnologies' manufacturing groups, leading the achievement of production, productivity, quality, safety and customer satisfaction goals, as well as spearheading manufacturing process continuous improvements. Benard holds a BS

degree in industrial engineering from Lamar University and is a Six Sigma Green Belt.

Steven Mack Sullivan has joined MBC Applied Environmental Sciences (MBC) as a Consulting Scientist. Mr. Sullivan brings hydrographic and geophysical survey capabilities to MBC. Earlier this year, MBC obtained an offshore geophysical survey permit to conduct multibeam sonar and geophysical surveys in California waters.

Unique Group has appointed **Felix Peña** as the new business development manager for subsea rentals and sales. He will be based within the operations team at Unique Group's Houston office. Felix has nineteen years of experience in increasingly responsible roles within sales and operational management. In his most recent position, he managed, planned, and coordinated multiple large rental projects for Forum Subsea Rentals at a global capacity.

Global Maritime Consultancy & Engineering has appointed **Helge Flesland** to lead its mission critical systems group in Norway. Helge will be responsible for managing and further developing Global Maritime's mission critical systems, including crane, marine operations and dynamic positioning. Other areas of Helge's brief will include ensuring that all operations are compliant, actively participating in the company's future strategic direction, and defining mission critical services and client priorities.

With a career spanning more than 25 years in the subsea industry, **Graeme Booth** joins Ashtead from Subsea 7 where he held a number of technical support and offshore operational roles, including survey equipment superintendent. Booth will provide customers with technical support covering equipment rentals and custom engineered packages for survey and ROV operations worldwide.

SpeedCast International Limited announced it has entered into a definitive agreement to acquire **Harris CapRock** in a cash transaction valued at US\$425 million. Harris CapRock is a global leader in the energy and maritime segments. The acquisition strengthens SpeedCast's already strong position in the maritime industry, in which Harris CapRock has a leading position in the fast-growing and bandwidth-hungry cruise sector, and creates a global leader in energy, positioning the company for future growth.

Oceaneering International, Inc. announced that it has acquired the assets of **Blue Ocean Technologies, LLC**, a privately held provider of riserless light well intervention services, for approximately \$30 million in cash.



Sullivan

Seafloor Systems is pleased to announce their signed international distributorship agreement with **Teledyne RESON** and **Teledyne BlueView**, business units of Teledyne Instruments, Inc. RESON manufactures the most advanced, industry-leading SeaBat Multibeam Sonar systems. BlueView manufactures a variety of underwater surveying systems, including M900-2250 2D and 3D imaging sonars, and BV5000 3D Multibeam inspection sonars.

Ocean Aero and **Laurel Technologies** announced an exclusive partnership to distribute the Submaran™ throughout mainland China. This partnership marks Ocean Aero's first international distribution contract for the hybrid unmanned underwater and surface vessel, and the beginning of a promising new relationship with the China-based company.

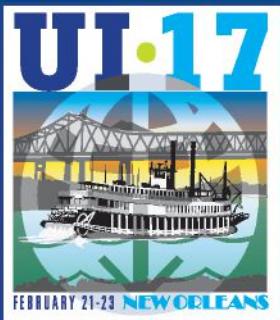
Subsea IMR provider, **N-Sea**, and **BODAC UXO** have announced an agreement to jointly market and execute marine UXO survey, identification and removal projects across Belgium, the Netherlands, Germany and Scandinavia. In doing so, they will have the capability to offer developers, contractors and operators of offshore windfarms a complete suite of UXO solutions.

AutoNaut Ltd, a global leader in autonomous wave propelled vessels, has formally become a partner with the **Marine Robotics Innovation Centre**. UK-based AutoNaut and the NOC have enjoyed a long-term relationship since 2013, and this move is a sign of the company's increasing ambitions.

AXYS Technologies Inc is pleased to announce the appointment of **Incotas** as value added reseller in Latin America. Headquartered in Caracas, Venezuela, and with branch offices in several countries in the region, Incotas offers technical expertise in offshore environments throughout Central and South America and the Caribbean.

Kongsberg formally opened its first office and warehouse facility in the Republic of South Africa on 4 November 2016. Located in Cape Town's airport zone, Kongsberg Maritime South Africa has been established to better serve customers located in or visiting ports across the country and throughout the Sub-Saharan region.

Viper Subsea is preparing to diversify and grow its business by transferring its award-winning technology into new markets. In preparation, Viper Subsea Technology Limited has formally changed the name of the registered company to **Viper Innovations Ltd**. The trading name of Viper Subsea will continue to be used for existing and future business in the subsea oil and gas industry.



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3 Describe your organization (circle 1):

- A. Marine Industry (Shipyard, Naval Architecture; Shipping & Transportation; Construction; Salvage; Dive Services; Subsea Inspection; Marine Electrical/ Electronics; Navigation and Positioning; Ports and Harbors)
- B. Offshore Oil and Gas/ Mining
- C. Ocean Renewables
- D. Education
- E. Government, Military
- F. Government, Civilian
- G. Marine Science/ Environmental/ Fisheries (Science; Environmental; Fishing and Aquaculture; Survey; Observation; Exploration)
- H. Maritime Communications and Computing (Communications Products and Services; Computer Services/ Software; Subsea Telecom; Cables and Connectors)
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January 30-31, 2017 Marine Data Infrastructure GCC Dubai, UAE www.marinedatainfrastructuregcc.com	March 14-16, 2017 Decomm & Abandonment Summit Houston, TX www.decomworld.com/decommissioning	March 29-30, 2017 Ballast Water Management Miami, FL http://tinyurl.com/Ballast-Water-Summit
January 31 - February 2, 2017 Euromaritime Paris, France www.euromaritime.fr	March 20-23, 2017 U.S. Hydro 2017 Galveston, TX http://ushydro2017.thsoa.org	April 3-5, 2017 MCE Deepwater Development Amsterdam http://mcedd.com
February 6-9, 2017 GoM Oil Spill & Ecosystem New Orleans, LA http://tinyurl.com/GoM-Oil-Spill-Ecosystem	March 21-23, 2017 Subsea Tieback San Antonio, TX www.subseatielbackforum.com	April 4-6, 2017 Ocean Business Southampton, UK www.oceanbusiness.com
		May 1-4, 2017 OTC Houston, TX http://2017.otcnet.org

2017 EDITORIAL CALENDAR

CALENDAR

JANUARY

Editorial: Underwater Navigation; Manned Submersibles
Product & Services Focus: Multibeam & Side Scan Sonars; Research & Development Services

FEBRUARY

Editorial: Oceanology & Meteorology; Decom & Abandonment
Product & Services Focus: Buoys & Monitoring Instrumentation; Environmental Monitoring/Testing Services

MARCH

Editorial: Subsea Fiber Optic Networks; Maritime Security
Product & Services Focus: Connectors; Cables & Umbilicals; Diver Detection Systems

APRIL

Editorial: Offshore Technology; Ocean Mapping & Survey
Product & Services Focus: Subsea Tools & Manipulators; Batteries; Training/Safety

MAY

Editorial: Autonomous Unmanned Vehicles; Defense & Naval Systems
Product & Services Focus: Tracking & Positioning Systems; Seismic Monitoring; Equipment Leasing/Rental Services

JUNE

Editorial: UW Imaging & Processing; Marine Salvage/UW Archaeology
Product & Services Focus: Magnetometers; Water Dredges & Airlifts; Diving Services

JULY – Digital Distribution Only

Editorial: Ocean Engineering; Marine Construction
Product & Services Focus: Navigation, Mapping & Signal Processing; Data Processing Services

AUGUST

Editorial: Workclass ROVs; Deepwater; Pipeline/Repair/Maintenance
Product & Services Focus: Cameras, Lights & Imaging Sonars; Oil Spill Clean-Up Services

SEPTEMBER

Editorial: Ocean Observing Systems; Subsea Telecom; Offshore Wind Installation & Maintenance
Product & Services Focus: Water Sampling Equipment; Cable Installation Services

OCTOBER

Editorial: Offshore Communications; Subsea Inspection, Monitoring, Repair & Maintenance
Product & Services Focus: Acoustic Modems, Releases & Transponders; Marine Communications; Survey & Exploration Services

NOVEMBER – Digital Distribution Only

Editorial: Offshore Support, Supply & Emergency Vessels; Deep Sea Mining
Product & Services Focus: Ship Protection Systems; Cranes, Winches & Control Systems; Vessel Charter/Leasing Services

DECEMBER

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