

OCEAN NEWS

September 2016 www.oceannews.com

35
YEARS

& TECHNOLOGY
News for the Ocean Industry

SAIC Introduces New Generation of
Commercial Tsunami Buoy Systems

Feature Story - Page 10

A Worldwide Survey of Recent
Ocean Observatory Activities:
2016 Update

Editorial Focus - Page 30





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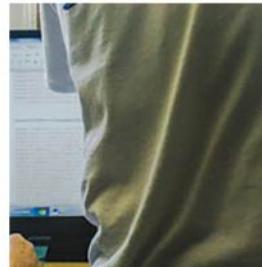
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in this issue

Ocean Industry



Offshore Industry



Feature Story

- 10 SAIC Introduces New Generation of Commercial Tsunami Buoy Systems**
24 Improved Current Profiling Systems For Offshore Rigs

- | | |
|-----------------------------------|---------------------------------------|
| 15 Ocean Industry Briefs | 37 Offshore Industry Headlines |
| 18 Maritime Transportation | 42 Upstream Oil & Gas |
| 20 Ocean Science | 46 Underwater Intervention |
| 22 Ocean Energy | 52 Maritime Communications |
| 26 Defense | 56 Subsea Cables |

6

Departments

- | |
|------------------------------------|
| 8 Editorial |
| 60 Offshore Stats and Data |
| 64 Product News |
| 70 People & Company News |
| 72 Calendar & Events |
| 75 Ocean Industry Directory |

Cover Photo



SAIC Tsunami Buoy being deployed in the Indian Ocean.
Photo Credit: Science Applications International Corporation (SAIC).

- Editorial Focus**
30 A Worldwide Survey of Recent Ocean Observatory Activities: 2016 Update

Company Spotlight

- 29 Sonardyne International Ltd.**

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More News, More Technology, More Data

in the next issue

Editorial Focus

- Offshore Communications
- Subsea Inspection, Monitoring, Repair, Maintenance

Product Focus

- Acoustic Modems, Releases & Transponders
- Marine Communications
- Survey & Exploration Services

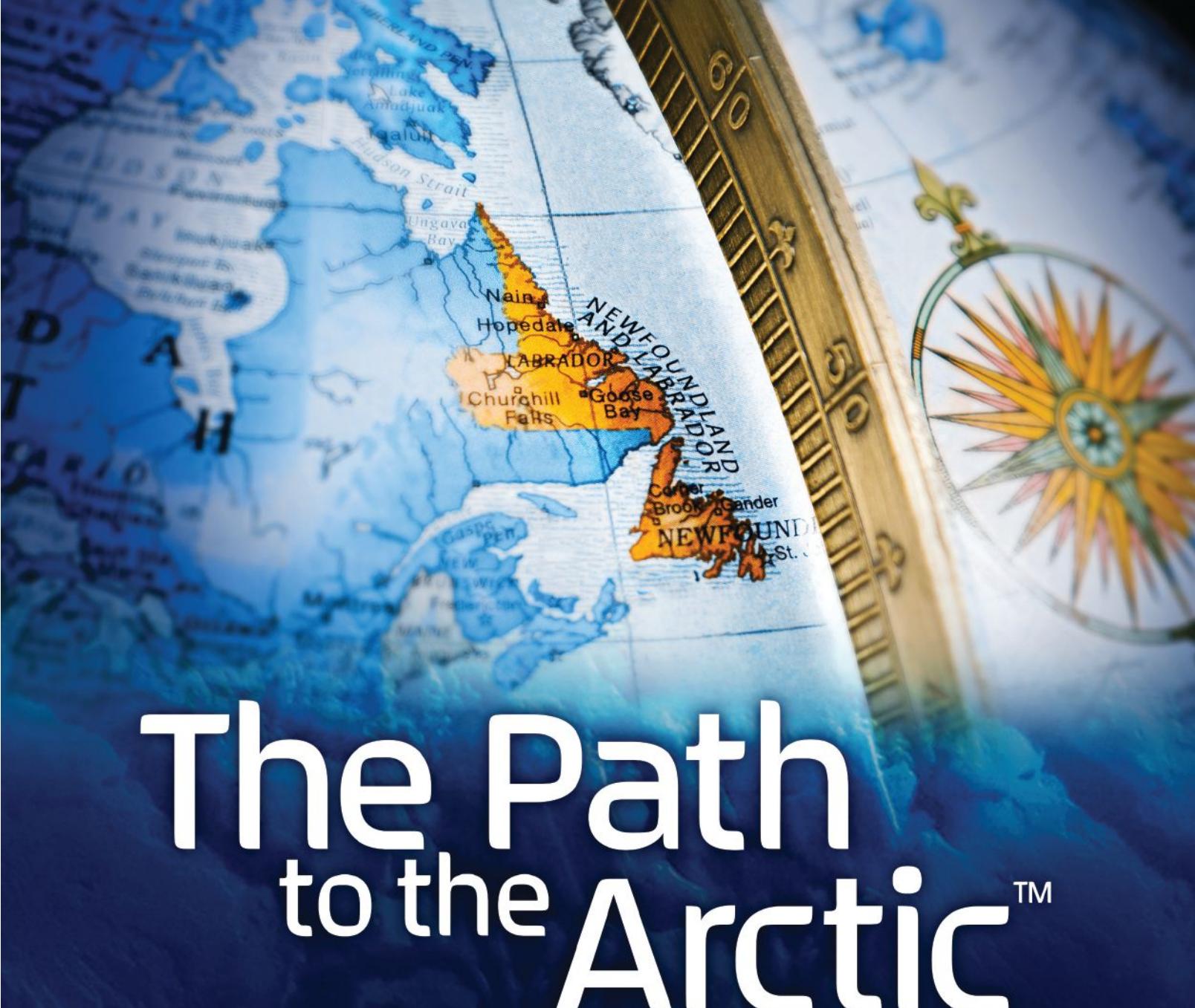


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Integrated Ocean Observing Linked to Building Coastal Resiliency

By **Ray Toll** – Director Coastal Resilience Research, Office of Research, Old Dominion University, President Marine Technology Society, Captain USN, RET

This and next month's edition of ON&T provide our annual update to the ocean observatories around the globe. Progress continues in a multidisciplinary fashion as many of the 65 maritime nations look to linking ocean observations to a global network that can truly capture the physical, dynamic, chemical, and biological processes and interdependences that exist throughout our blue planet.

It is clearly understood that in order for us to understand and estimate climate change and sea level rise, we must first understand the engine that drives these changes. Almost 15 years ago, the U.S. Oceans Commission recognized this fact and challenged the academic, government, and private sectors to work together to achieve integration across all observation platforms.

In his Climate Change Executive Order in 2013, President Obama challenged our nation to look at regional priorities and potential solutions by establishing pilots throughout the country. One such pilot was created in June 2014 and introduced in the ON&T August 2014 Editorial. Scoped at 2 years, this pilot was organized and convened by Old Dominion University (ODU) to study an integrated whole government/community approach to building coastal resiliency in the region called Hampton Roads. Named for an old British term meaning safe anchorage, this region includes 7 major municipalities, 17 jurisdictions, and a huge federal presence that includes the largest Navy base in the world. In fact, approximately one of every two jobs is a federal one. Coincidentally, it also has one of the largest natural harbors in the world.

Over the past 2 years, this integrated regional approach has looked at building coastal resiliency through mitigation and strategic adaption processes in a unity of effort involving over 400 volunteers from all echelons of government, citizen groups, private sector, and focused research from both ODU and The College of William and Mary. The focus has been on both national security and economic impacts to our maritime industry. Interdependencies were studied from legal, infrastructure (private and public), public health, citizen engagement, economic impacts, and science perspectives. Ultimately, this approach will lead hopefully to a realignment of federal and non-federal programs that could exemplify a whole government/community methodology

that other regions could use. Certainly, this approach would lead to a more efficient use of the tax dollar to address a challenge all societies must address at some point.

In Hampton Roads, the research community lead by ODU research has identified three key reasons why sea level rise and recurrent flooding is threatening local communities:

- Global warming causing ice melt and an increase in storm severity and frequency;
- Slowing of the Gulf Stream; and
- Land subsidence.

Thus, one clear priority from this 2-year effort going forward is the need to build a regional network to properly monitor both sea level rise and the regional challenge of land subsidence caused by years of drawing from below ground water tables. This network is needed to identify the changes occurring within the region and offshore so that the various interdependencies in both the water cycle and ocean-based phenomenology can be properly measured and studied to improve our ability to model and predict future changes.

To understand and predict future sea level rise, we must better observe the oceans by enhancing the existing ocean observing systems and making the research efforts operational. Clearly, this must be accomplished on a global scale. The Marine Technology Society (MTS), an international organization, provides a forum through which the latest technology and its relevance in this arena is disseminated worldwide. Ocean observing systems, like research vessels and far-ranging sea gliders, represent operational assets with scope and reach that frequently transcend international borders—cooperation among neighboring maritime nations is essential to the success of operational oceanography on this scale. MTS works closely with the United Nations Intergovernmental Oceanographic Commission (IOC) to ensure its stakeholders—from government, academia, and the private sector industry—are afforded the opportunity to be engaged in this global activity.

Both the regional and global challenge are among those addressed in this edition. Clearly, integrated ocean observing must remain a priority to address societal needs today and into the future—the health and welfare of our future generations are depending on it.



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SAIC INTRODUCES NEW GENERATION OF COMMERCIAL TSUNAMI BUOY SYSTEMS

*By: Rob Lawson, SAIC
Senior Director International Tsunami Buoy Program*

Following 10 years of supporting the evolving tsunami buoy network, Science Applications International Corp. (SAIC), in collaboration with the U.S. National Oceanic and Atmospheric Administration (NOAA), will soon be deploying commercially available fourth generation (4G) buoy systems worldwide. As a leader in commercial tsunami buoy systems manufacturing, SAIC is helping to provide the world's tsunami warning centers with access to affordable technology and critical data.

September 2016

10

Ocean News & Technology



STB-MF Systems underway in the Northwest Pacific.

Working with NOAA, SAIC develops, tests, and implements commercial tsunami buoy systems under a NOAA-patent license agreement. Under this license, SAIC has produced more than 35 second-generation buoy systems based on the NOAA Deep-ocean Assessment and Reporting of Tsunamis II (DART® II) system, and two types of third-generation systems based on the Easy-to-Deploy (ETD) DART technology.

SAIC's second- and third-generation buoy systems are currently operational in maritime countries worldwide, including Australia, Chile, China, India, Japan, Russia, and Thailand, and are gathering actionable data for its users and NOAA. Recently, SAIC provided developmental 4G payloads and bottom pressure recorders to NOAA in support of a 4G research effort off the coast of Chile.

Now, as SAIC enters another decade of work with NOAA, the company is manufacturing more than 85 percent of world's commercially deployed tsunami buoys, helping to make the concept of a globally interconnected, tsunami buoy network a reality.

A Trusted Tsunami Buoy System Provider

Following the 2004 mega-tsunami in the Indian Ocean, NOAA accelerated development and fielding of second generation (2G) DART II systems replacing the few developmental DART I tsunami buoys, which had been deployed in Alaska and Hawaii. These second-generation DART II systems featured improved electronics, new firmware, robust energy management, and two-way communications allowing for more control of system functions.

NOAA's DART II buoys quickly caught on, and soon were deployed to 39 locations in the Atlantic and Pacific oceans, and the Caribbean Sea. These new robust DART II systems were the envy of the international community and the need for a commercially-available version grew, resulting in SAIC's highly-experienced team of oceanographers and engineers collaborating with NOAA to explore the feasibility of a commercial DART II system.

In 2006, the SAIC Tsunami Buoy (STB) was born, and the company began manufacturing its first commercial prototype tsunami assessment system. Like the DART II system, the



ETD DART System makes a big splash in the Coral Sea.

STB has three subsystems: a bottom pressure recorder (BPR), a surface communications buoy, and a mooring subsystem.

With the goal of providing timely, accurate, and reliable sea-level data that can be integrated into international disaster warning systems, SAIC engineers determined that the cornerstone of this effort would be the development of a technically advanced, commercially available, deep-ocean sensor that could match the capabilities of the NOAA DART system, which currently protects the coastal United States.

In October 2006, this commercial prototype system was deployed approximately 200 nautical miles west of San Diego, at a depth of 3,875 meters. It was deployed approximately 28 nautical miles south of a NOAA DART II system in order to perform a comparison of performance. Over the next year, the STB team successfully completed an at-sea test, including an independent evaluation by NOAA's National Data Buoy Center (NDBC).

SAIC was subsequently granted a patent license by NOAA to build DART technology-based commercial tsunami buoy systems. As newer generations of tsunami systems followed, and others have entered the commercial tsunami market, SAIC remains the only company currently licensed by NOAA to build commercial DART-based tsunami buoys, after NDBC tested and qualified it as meeting or exceeding DART performance standards.

Reliability and Performance

During the last 12 years, DART Technology developed by NOAA Pacific Marine Environmental Laboratory (PMEL) is considered the most reliable tsunami meter technology and is used in more than 95 percent of all currently globally deployed tsunami buoy systems.

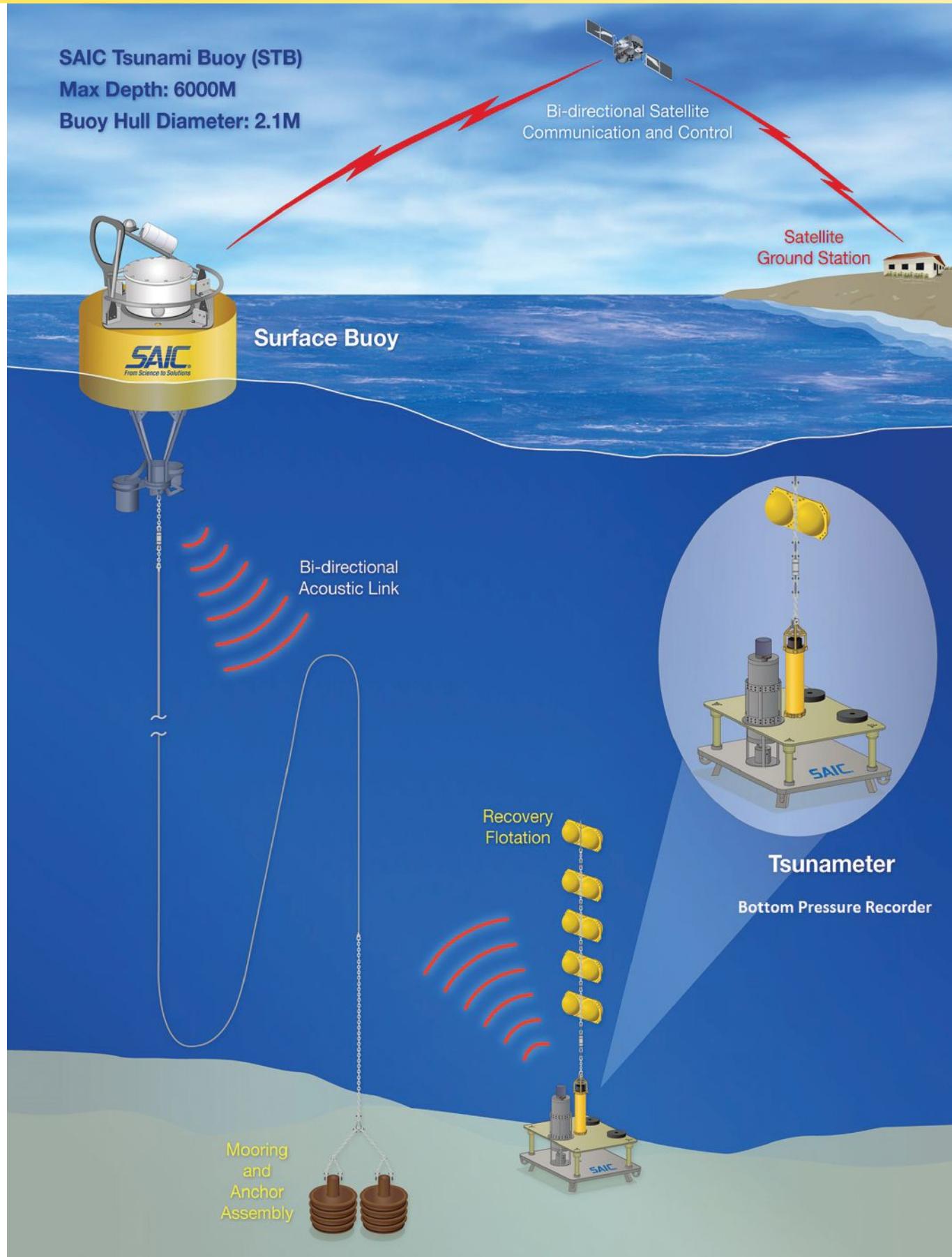
As part of SAIC's licensing agreement, the SAIC team began production of third generation (3G) commercial ETD DART systems that are smaller in size and weight compared to the STB, but still maintain DART performance standards. Despite its small size, the ETD DART's performance has been exceptional in challenging locations. One of the systems deployed in the Coral Sea successfully weathered the impact of a Category 5 cyclone (winds 130 knots, seas 12 meters), and several weeks later accurately reported data as the remnants of the 2011 Tohoku tsunami traveled into the region.

SAIC's ETD DART buoys have been deployed in the Coral Sea, the Northwest Pacific Ocean (south of the Kuril Islands, and further south off the coast of Bali), and in the Tasman Sea.



ETD DART and STB Systems in final stages of production.

FEATURE STORY



STB-MF System with single pressure vessel Bottom Pressure Recorder (BPR).



STB-MF System being deployed in the Bay of Bengal.

Data Collection for the Greater Good

With much of the world's population concentrated in coastal regions, the potential impacts of destructive tsunamis continue to grow as an international concern. Specifically, significant destructive tsunamis in Chile, the Indian Ocean, Japan, and the South Pacific Ocean have demonstrated the requirement for a global network of reliable deep-water sensors which can provide accurate and timely assessment of sea-level data to regional and national tsunami warning centers.

SAIC tsunami buoys record water temperature and pressure at the sea floor every 15 seconds, and the pressure measurements are converted to values that indicate the height of the water surface above the ocean floor. These data are then sent via satellite to national weather services and warning centers of the buoy owners every 6 hours under normal circumstances. When there is an event, such as a pressure anomaly, the buoys immediately send initial data reports followed by 17 reports over the following three hours before returning to normal reporting mode.

After SAIC customers receive data off their buoys, they typically disseminate it to the Global Telecommunication System (GTS) of the World Meteorological Organization. The GTS enables member nations to exchange real-time data critical to detecting, reporting, and forecasting meteorological hazards, including tsunami data and warnings.

A New Era for Tsunami Buoys

After producing the ETD DART, SAIC found that it could integrate some of the newer 3G ETD DART technologies into its existent 2G STB to create a hybrid third-generation STB-MF tsunami buoy system. These upgrades included:

- Replacement of the standard Low-Frequency (LF) BPR with a single pressure vessel MF BPR.
- Increased reliability of the BPR by eliminating wet-mate cables and connectors, and reducing from five (5) pressure vessels to one (1).
- Utilization of the updated ETD DART core circuit board package.

- Replacement of the bulky, older technology LF transducers with more compact and updated MF transducers, to provide a 60-70 degree communication cone as opposed to the 40 degree cone in the LF system.

- More flexible buoy and BPR depth placement due to larger communication cone and watch circle.

- Increased use of inverse catenary moorings that are more robust in higher ocean currents.

However, one challenge remained. A long-time goal of tsunami assessment has been to develop a sensor that can detect and measure near-field tsunamis as close to the generation area as possible. If this is accomplished, the country will have much faster access to data, which could improve evacuation time.

NOAA PMEL developed a fourth-generation (4G) DART system that has the potential to solve the near-field data collection challenge. The 4G DART includes a new and improved pressure sensor, increased sampling rate, advanced internal processing software, and upgraded power management. Developmental 4G DART systems have been deployed and are currently being evaluated off the Chilean and Oregon coasts with good results. A commercial 4G system is expected to be available within the next 12 months.

Although still in its infancy, the concept of a global tsunami buoy network is becoming a reality. SAIC's highly-successful line of commercial tsunami buoys is a major contributor to this evolving network, making up nearly 85 percent of the commercial systems currently deployed. Without a global network consisting of many buoys and data sharing capabilities, countries are exposed to risks similar to the 2004 tsunami disaster in the Indian Ocean where more than 230,000 people died.

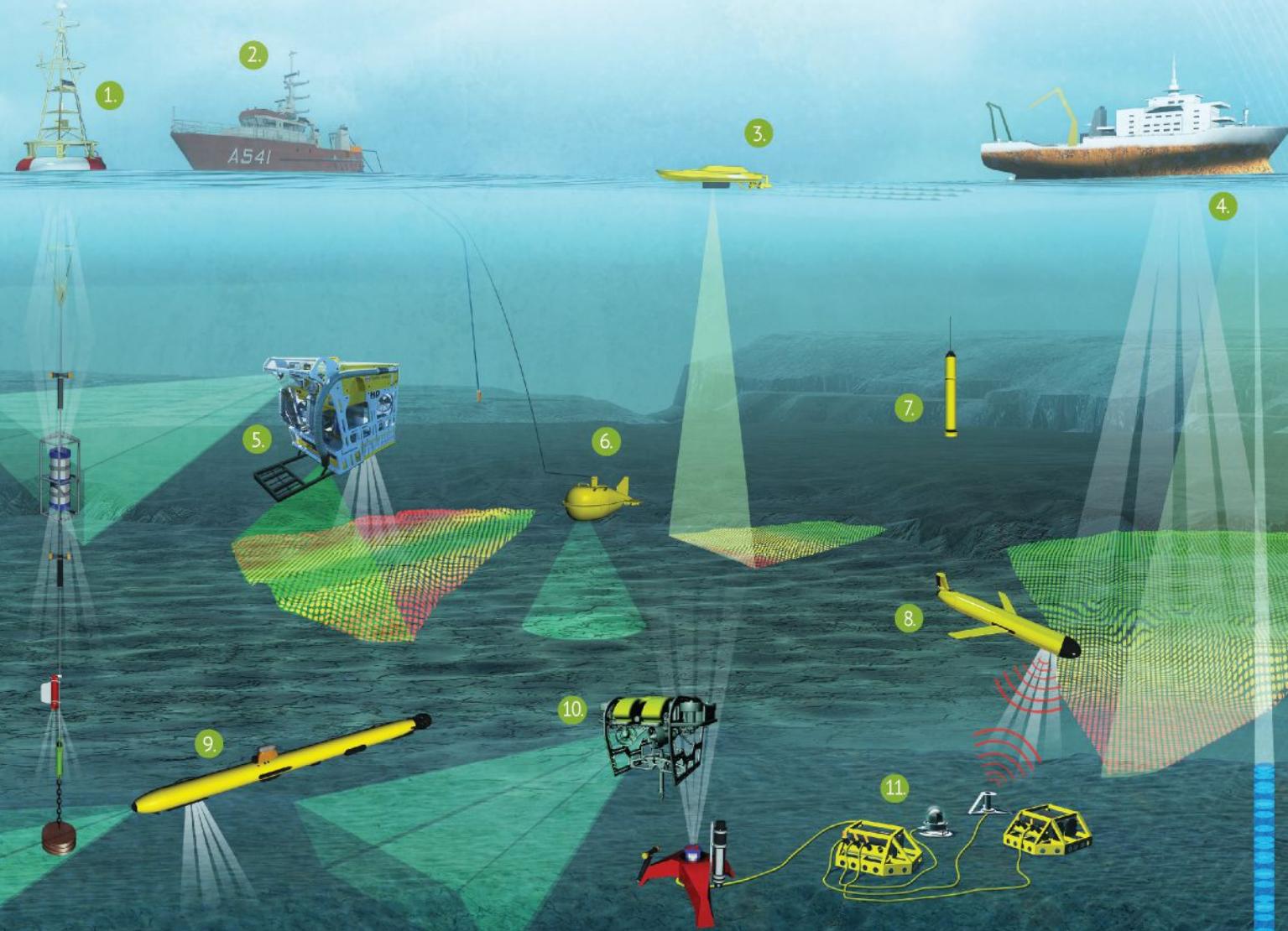
With the ability to quickly transition new research and technology into operational systems, SAIC looks forward to future deployments of 4G STB-MF and 4G ETD DART in support of the global tsunami buoy network.

For further information, please visit www.saic.com/buoy.

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OCEAN INDUSTRY

Battleship sunk on secret Russian mission surveyed



Keith Bichan, Roving Eye Enterprises.

A secret mission to persuade Tsar Nicholas II of Russia to stay in the First World War failed when Britain's Secretary of State for War Lord Kitchener and over 700 sailors died in the sinking of the warship HMS Hampshire after it hit a mine off the Orkney Isles.

One hundred years later a Saab Seaeye Falcon underwater robotic system operated by Roving Eye Enterprises examined the wreck in a collaborative project that includes the University of the Highlands and Islands Archaeology Institute, with licensed permission from the Ministry of Defence.

Sandra Henry, a marine archaeologist from the Institute said that the remote survey has provided many new insights into the sinking and wreck of the HMS Hampshire, adding that ongoing work will continue to develop the knowledge base, revealing new information as they continue to gather and process data.

Although there have been two previous surveys of the ship, this is the first extensive mapping of the wreck site since it sank.

Roving Eye Enterprises, based in the Orkney Isles in the far North of Scotland, were chosen for the project because of their experience working in demanding sea conditions whilst undertaking precision filming and survey tasks.

During the mission they deployed the Falcon with its low-light camera and a Nexus advanced ultra short baseline position and tracking system designed to locate subsea targets through acoustic signals. The tracking system was provided and operated by Triscom Marine, a specialist survey company who, together with Roving Eye, provided their services free for the commemorative project.

The survey confirmed previous findings that the ship capsized and sank following an explosion between the bow and the bridge and lies upturned on the seabed in approximately 60 m of water. The hull is also damaged in places throughout the length of the vessel, exposing parts of the interior.

Guns from the ship's secondary armament were identified at a distance of up to 30 m from the main body of the wreck. The location of these breech-loading 6-in. MK VII guns may be related to the sinking event or salvage activity.

"Having operated the Falcon for over 10 years now," says Keith Bichan of Roving Eye, "the survey of the Hampshire reinforces my belief that I made the right choice when I purchased my first Falcon. Power, versatility and reliability are still the key factors that make it the leader in its class."

For more information, visit www.seaeye.com or www.orkneyrovspspecialist.co.uk.

in this section

Ocean Industry Briefs	15
Maritime Transportation	18
Ocean Science	20
Ocean Energy	22
Defense	26

Post-Deepwater Horizon research consortium announces first project awards

The Texas OneGulf Center of Excellence is announcing more than \$2 million in research projects to address priority problems affecting the health and wellbeing of the Gulf of Mexico and those who depend on it. Texas OneGulf is led by the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi.

These projects, funded by the Office of the Governor, represent the first major allocation of research dollars from the Texas OneGulf consortium, which was created after the Deepwater Horizon oil spill to direct funding in support of programs, projects, and activities that restore and protect the environment and economy of the Gulf Coast region. The projects tackle a variety of issues that directly impact the Gulf of Mexico and its residents, from studying the impact of red tide blooms on human health and the health care infrastructure to using underwater gliders to search the coast for hypoxic dead zones.

A consortium of nine Texas institutions, Texas OneGulf is a unique multi-disciplinary team of marine science, socio-economic and human health researchers united to promote collaborative research and problem-solving actions.

For a list of awarded projects, visit www.harteresearchinstitute.org/texaseonegulf-first-project-awards.

Milestones reached for enlisted women on submarines

One of the first enlisted women to serve aboard a Navy submarine earned her submarine qualification, or "dolphins," on 2 August and is preparing to deploy aboard USS Michigan (SSGN 727).

Chief Culinary Specialist Dominique Saavedra, a native of Los Angeles, became the first female enlisted Sailor to earn her silver dolphins in a pinning ceremony held at Puget Sound Naval Shipyard.

Though assigned to Michigan, Saavedra embarked aboard USS Ohio (SSGN 726), which is currently deployed, to earn her basic, advanced, and underway watch qualifications. "I couldn't be more proud to wear the 'dolphins,'" said Saavedra. "To have earned the respect of my fellow submariners is more rewarding than expected. I am honored to serve as a qualified member in such a prestigious community."

In June 2012, the first female supply officer earned her submarine qualification and the first three unrestricted line officers earned their gold dolphins the following December.

NOAA Fisheries releases final acoustic guidance

NOAA Fisheries released final guidance to help predict how human-made underwater sounds affect marine mammal hearing.

Sound is critical to the survival of marine mammals. It is a primary means of marine mammal communication, orientation and navigation, finding food, avoiding predators, and mate selection.

NOAA will use the guidance in its assessments and authorizations of activities that generate underwater sound. The guidance also allows federal agencies, industries, and other applicants to more accurately predict effects of their proposed projects and help inform decisions about appropriate mitigation and monitoring. NOAA Fisheries also created online tools to help applicants use the new guidance.

"We recognize that growing levels of ocean noise are affecting marine animals and their habitats in complex ways," said Eileen Sobeck, assistant NOAA administrator for fisheries. "The guidance is one part of NOAA's holistic approach to addressing effects of ocean noise on marine life."

NOAA's authorities to address the effects of ocean noise on marine resources fall primarily under the Marine Mammal Protection Act, Endangered Species Act, National Marine Sanctuaries Act, and Magnuson-Stevens Fisheries Conservation Act. These authorities allow NOAA to recommend or require mitigation in order to reduce or eliminate their predicted noise impacts to species and the places they rely on. NOAA shares this responsibility with a number of other federal agencies.

For more information, visit www.noaa.gov.

September 2016

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New Sea Shepherd ship to fight illegal fishing

After 18 months of construction by Dutch shipbuilding company Damen, the Ocean Warrior was lowered into the waters of Antalya Harbour in Turkey.



Purchased thanks to the support and generosity of the Dutch Postcode Lottery, the People's Postcode Lottery in the United Kingdom and the Svenska Postkod Stiftelsen in Sweden, Ocean Warrior is now the fifth vessel in Sea Shepherd Global's current fleet of conservation ships, and the fifteenth in the organisation's history.

Ocean Warrior made its maiden voyage, she sailed to Amsterdam under the command of Captain Cornelissen. However, details about the ship's first official anti-poaching campaign remain under-wraps.

For more information, visit www.seashepherd.org.

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MSC joins CMA CGM in backing TRAXENS

MSC Mediterranean Shipping Company, a world leader in global container shipping, has joined CMA CGM in backing French start-up, TRAXENS.

Founded in 2012, TRAXENS has been developing unique solutions for the cargo logistics arena and has created an innovative container monitoring and coordination system. With a combined fleet of 4.5 million units, these two world leaders transport approximately 25% of the world's shipping containers.

The agreement sees CMA CGM and MSC invest capital in TRAXENS, with each group also represented on the board of directors.

The deployment of the TRAXENS devices across the fleets of both carriers will be announced in Q4 of this year.

Kongsberg wins EPCI contract for two new Caledonian Marine Asset LTD ferries

Kongsberg Maritime has been awarded engineering, procurement, construction & installation (EPCI) contracts with the Glasgow-based shipbuilder and marine fabricator, Ferguson Marine Engineering Limited (FMEL). The contracts, worth more than NOK 160 Million, cover deliveries to two 100-m ferries for Caledonian Maritime Assets Ltd (CMAL).

Kongsberg Maritime, together with its wholly owned subsidiary Kongsberg Maritime Engineering (KME), will execute the project. KME will provide all engineering, procurement and project management while Kongsberg Maritime will supply a 'Full Picture' system delivery. The ferries will be "dual-fuel" vessels so they can operate on liquefied natural gas (LNG) and marine diesel, and are designed to carry 127 cars or 16 HGVs, or a combination of both and up to 1,000 passengers.

The contracts include supply and integration of the electrical, telecom and integrated control systems, project management, interface management and engineering services at all stages. Cables, installation and installation materials for the above systems are also included. In addition, a significant technology scope of supply includes switchboards, automation, propulsion control, navigation systems, and radio/satellite communications. The engineering and construction phase is estimated to be 2 years.

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

ACO Marine welcomes wastewater pollution report

ACO Marine has welcomed the findings reported in the Friends of the Earth 2016 Cruise Ship Report Card, the annual survey of cruise shipping's impact on the environment, which highlights a growing need for the sector to update its sewage treatment technology.

The annual FOE survey, published in June, documented the environmental footprint of 17 cruise lines and 171 cruise ships, finding that a significant proportion of vessels continue to operate out-dated sewage treatment plants.

The FOE found that 40% of cruiseships continue to use 35-year-old technology, calling for an urgent upgrade to systems capable of preventing environmental damage from the discharge of poorly treated black, grey and galley wastewater streams.

"The FOE report paints a contrasting picture to the environmentally conscientious one offered by the cruise lines themselves," said Mark Beavis, managing director of ACO Marine. "That 40% of cruiseships are still using wastewater treatment technology developed in the 1980s suggests that some of these cruiseships are unable to meet current regulatory requirements. Certainly some of these vessels will be incapable of meeting the more stringent requirements set out in MEPC.227 (64), which limits the amount of phosphorous and nitrogen discharged in treated effluent."

While Friends of the Earth continues to push the U.S. Environmental Protection Agency to update its sewage treatment standards under the Clean Water Act, the environmental campaigner noted that an average cruiseship with 3,000 passengers and crew produces about 21,000 gallons of sewage and about 150,000 gallons of grey water each day.

The report can be viewed in full at www.foe.org/cruise-report-card.

Strainstall supplies advanced mooring solution to the deepwater oil and gas terminal at Pengerang



Strainstall, part of James Fisher and Sons plc, has been awarded a major contract with the Japanese Penta Ocean-Toa joint venture for its advanced mooring solution to be installed at the Pengerang Independent Deepwater Petroleum Terminal (PIDPT) in Malaysia. The phase two development of the terminal, comprising 11 new jetties, will see 74 mooring systems—along with Strainstall's innovative DockAlert™ berthing system—installed to provide safe and secure mooring and berthing operations.

PIDPT is the first independent deepwater terminal in Southeast Asia set to become a strategic facility that includes oil refineries, petrochemical plants and a crude and LNG import terminal and storage, in a major offshore trading area, which will support high demand in this rapidly growing region.

Having been involved in the project since 2012, Strainstall is delighted to have been selected for this phase two development at the terminal. Safe docking and mooring operations will be critical to the ongoing safety and productivity of PIDPT and Strainstall's quick release hooks and DockAlert™ systems will provide total assurance during terminal activities.

Strainstall's quick release mooring hooks feature an innovative remote control system, utilising its load monitoring expertise, that provides safe mooring line release under unsafe mooring loads, significantly increasing the safety of personnel, vessels and infrastructure. The company has already provided detailed consultation on the mooring arrangement of the jetties, providing advice on the optimum location and orientation of the hooks for mooring operations, to ensure successful delivery and implementation.

For more information, visit www.strainstall.com.

Trelleborg to showcase smarter approach to LNG

Trelleborg's marine systems operation showcased its SeaTechnik™ Universal Safety Link (USL) and the Integrated Ship-Shore Link (SSL) and Emergency Shut-Down system (ESDS) for the LNG Industry at SMM 2016 International.

The USL 8810 is specifically designed to support the growing LNG marine fuel and small-scale LNG market, while the innovative design of the Integrated SSL and ESDS provide significant installation cost reduction for ship

builders. Both the integrated SSL and ESDS also provide improved operator feedback and maintenance diagnostics for owners of large-scale LNG carriers. Trelleborg has also designed an ESDS system to support the USL 8810 for small-scale operations.

For more information, visit www.trelleborg.com.

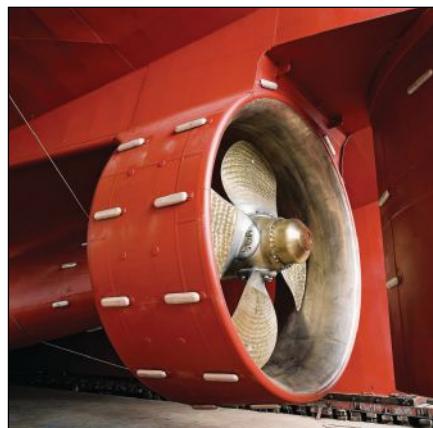
Damen's Optima propeller nozzle's proven advantages

Damen Shipyards Group is highlighting the advantages to be gained from the Damen Optima Nozzle to the North American inland shipping sector. The Optima is a propeller nozzle developed and manufactured by subsidiary Damen Marine Components (DMC).

"Looking at today's inland shipping operators in Europe, you'll see that everyone uses a nozzle," says DMC managing director Steef Staal.

One of the main reasons of the dominance of nozzles is the use of skew-type propellers, whose rounded profile successfully addresses the historical problem of sediment and debris blockage.

DMC designed the Damen Optima—a nozzle with a slightly longer and higher



er intake and a propeller positioned just aft of the centre line—to increase performance even further. Real-life results from the first launching customers confirmed what model testing had predicted: "The feedback we heard from operators on the subject of thrust, both forward and reverse, was very positive.

"It is better in other aspects too: Fuel use and exhaust emissions are decreased, thus reducing fuel costs and improving air quality."

For more information, visit www.damen.com.

Subsea Industries takes Ecospeed demonstrator vessel on the road

Shipowners, shipbuilders and representatives from the Green Award Foundation attended the first in a series of planned "roadshows" Subsea Industries has initiated to demonstrate the zero environmental impact and simplicity of cleaning hulls protected with its Ecospeed hard coating.

Taking place recently in Maassluis, just outside Rotterdam, guests boarded Subsea Industries' maintenance and dive support vessel to watch how vessels coated with Ecospeed can be cleaned effortlessly and legally in harbours, such as the Port of Rotterdam, which has banned the underwater hull cleaning of conventional hull coatings.

As divers set about cleaning the 22.7-m catamaran's hull, which had been coated with Ecospeed some 8 years ago, it was noted that the surrounding water remained clean with only fouling being washed off the vessel. There was no paint loss or toxic plumes emitted to otherwise contaminate marine life and sediments.

For more information, visit www.subind.net.



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Update on the uncabled bio-acoustic sonar instruments of Ocean Observatories Initiative

ASL Environmental Sciences Inc. (ASL) supplies the last of the un-cabled bio-acoustic sonar instruments for the NSF-funded Ocean Observatories Initiative (OOI) coastal and global-scale nodes in June 2016. Under the terms of the contract, ASL supplied 16 acoustic zooplankton and fish profiler (AZFP) instruments for the coastal arrays and 20 individual instruments for the global arrays. The two coastal arrays use a single bottom-mounted instrument while the four Global Arrays use one upward-looking and one downward-looking instrument mounted on the mid-water platform of the apex profiler mooring.

A Multi-Function Node (MFN) destined for the Coastal Pioneer Array, about 80 mi off Martha's Vineyard, Massachusetts, holds a variety of chemical, biological and physical oceanographic sensors including an ADCP, CTD sensor, oxygen sensor and CO₂ sensor.

In the fall of 2015, 7 AZFP's instruments that had been deployed on the coastal arrays were returned to the factory for calibration verification by WHOI and Oregon State University (OSU). All seven instruments had a 100% data recovery rate and a minor adjustment was made on the acoustic calibration of one channel of one of the instruments.

In 2016, the first AZFP instruments with 38, 70, 125, and 200 kHz channels will be deployed on the global arrays. These include the Argentine Basin, Station Papa, Irminger Sea, and Southern Ocean Arrays.

For more information, visit www.aslenv.com.

Liquid Robotics® and Hydro Systems Development delivers Japan's first long-term ocean observation network

Liquid Robotics®, and their Japanese partner, Hydro Systems Development (HSD), have successfully delivered the first fleet of Wave Gliders® to the Japan Coast Guard. Liquid Robotics and HSD will assist the Japan Coast Guard in deploying eight Wave Gliders for a multi-year mission providing autonomous observation and situational awareness of ocean currents, wave activity, and weather along Japan's coastlines. This is the first ocean observation network in Japan's history that will provide comprehensive and economical monitoring of Japan's ocean conditions.

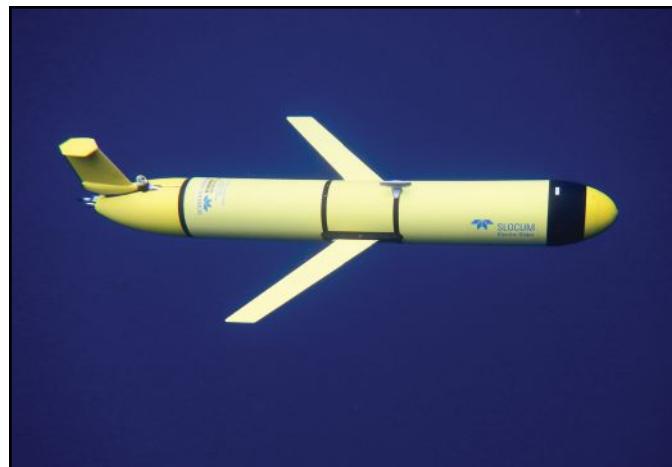
Wave Gliders are long-duration, environmentally friendly ocean robots that collect and communicate real-time ocean data without using fuel. This is the largest fleet deployment of Wave Gliders in Japan. Data collected by the fleet of Wave Gliders will provide real-time information for the Japan Coast Guard's operational use. Missions by four of the JCG Regional Branches are planned imminently.

With support from Liquid Robotics, HSD has led customer missions ranging from typhoon tracking to tsunami detection, to general oceanographic studies using Wave Gliders. The Wave Glider returned excellent results and recorded long-term, time-series data information that was not possible with ships. This data has led to a better understanding of the environmental conditions in and around Japan with improved national-level safety and disaster resilience.

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



U.S. IOOS-coordinated gliderpalooza deployments



GliderPalooza is a series of glider deployments that focus on specific variables, such as water temperature, salinity, chlorophyll, dissolved oxygen, and optical characteristics. Glider operators measure variables of interest from a variety of water depths within a targeted geographic area. This is one of several coordinated glider deployments organized by U.S. Integrated Ocean Observing System (IOOS®) Regional Associations.

GliderPalooza 2016 built upon the partnerships formed in 2015 and began in the spring. The first mission assessed the shelf stratification in the eastern Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS). Additional deployments will follow in the summer and fall and will zig-zag across the continental shelf from Massachusetts to New Jersey and south to the Chesapeake Bay region.

Among other objectives, the MARACOOS glider effort will be measuring the Mid-Atlantic Cold Pool, which is a mass of cold water trapped beneath the warmer surface waters in the summer. The Mid-Atlantic Bight Cold Pool, undetectable by satellite observation, has a large impact on the distribution of economically viable fisheries and affects the duration and intensity of hurricanes with the potential for landfall. Real-time data collected by these gliders will be harvested by the National Data Buoy Center and transmitted to the Global Telecommunications System (GTS), where data are made available for assimilation into local, regional and global ocean forecasting models. The data sets are also archived by the National Center for Environmental Information (<https://www.ncei.noaa.gov/>).

A major focus of the 2016 GliderPalooza effort is the application of Quality Assurance/Quality Control of Real-Time Oceanographic Data (QARTOD) algorithms to real-time glider data sets prior to being delivered to the U.S. IOOS Glider Data Assembly Center (DAC). These QA/QC tools are based on the recently published U.S. IOOS Manual for Quality Control of Temperature and Salinity Data Observations from Gliders, which provides guidance about specific QC procedures for data providers to follow while collecting data in real time. Adherence to these procedures ensures that the data submitted to the Glider DAC receive uniform quality control. "It was rewarding to work with the enthusiastic glider community during the development of this manual," said Mark Bushnell, the lead editor of the manual.

For more information about the U.S. IOOS Glider DAC, please visit <https://ioos.noaa.gov/project/underwater-gliders/>.

A tool for advancing environmental academic research

Researchers at the Institute of Oceanology in Qingdao, China are using the Signature55 current profiler to improve the understanding of El Niño and advance their environmental academic research.

"Information about Western Boundary Currents in the lower latitudes of the Pacific and their influence on low-frequency pulsing of warm currents are vital for scientific research. But so far we have had insufficient data about these patterns in connection with dynamic ocean circulation research and its relation to climate," says Yu Fei, senior researcher, doctor and director at The Institute of Oceanology, Chinese Academy of Sciences (IOCAS).

Data about the currents in these areas of the Pacific are important contributions to the World Climate Research Programme (WCRP) project entitled Climate and Ocean: Variability, Predictability and Change (CLIVAR).

CLIVAR's mission is to understand the dynamics, interaction, and predictability of the coupled ocean-atmosphere system. The program facilitates

observations, analysis and predictions of changes in the Earth's climate system. This enables better understanding of climate variability and dynamics, predictability, and change to the benefit of society and the environment in which we live.

The testing area is just near east of the Philippines in the Western Pacific. Scientists at The Institute of Oceanology in Qingdao will retrieve the current profiler in November 2016, after a deployment of approximately 1 year. The deployment is done with the Signature55 in a sub-surface buoy on a mooring line and the instrument is operated in a stand-alone measurement mode.

Yu Fei emphasizes that compared with other instruments of the same kind, the Signature55 has twice the current profile range and can profile currents up to 1,000 m range in the open ocean.

For more information, visit www.nortek.no.

Isolated coral reefs far from human activity are not healthier

For the world's coral reefs, the picture keeps getting gloomier. Although it's widely assumed that both local and glob-

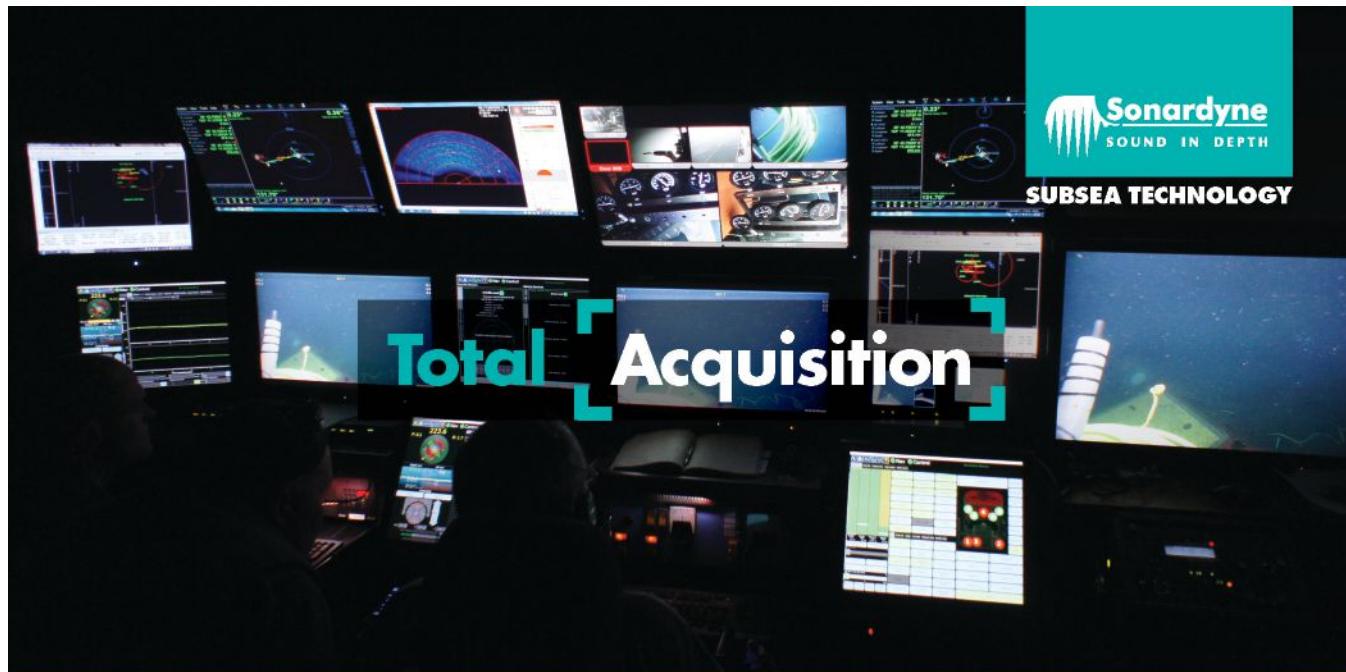
al factors are contributing to their decline, new research from the University of North Carolina at Chapel Hill shows that isolated reefs far from human activities are in fact not healthier than those in more densely populated areas.

The work, led by John Bruno, a professor of marine biology in UNC's College of Arts and Sciences, marks the first global test of the hypothesis that isolated reefs are suffering from less damage.

"We often mythologize isolated coral reefs as pristine and safe from harm," said Bruno. "In fact, coral loss on some of our isolated reefs is just as dramatic as coral decline on reefs adjacent to more densely populated islands."

Bruno and co-author Abel Valdivia (a former UNC-Chapel Hill graduate student, currently a research scientist for the Center for Biological Diversity in Oakland, Calif.), analyzed data from 1,708 reefs around the world from the Bahamas to Australia collected from 1996 to 2006. Reef isolation was calculated as the number of people living within 50 km of the reefs.

To view the paper online, visit www.nature.com/articles/srep29778.



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EU authorizes French support for NEPHYD

The European Commission has found French plans to support a tidal energy plant to be in line with EU state aid rules. The measure will promote the production of electricity from renewable sources, in line with EU energy and climate goals, without unduly distorting competition in the Single Market.

The NEPHYD (Normandie Energie PiloTe HYDrolien) tidal energy pilot farm will be located at Raz Blanchard, west of the Cotentin peninsula, in the English Channel. A subsidiary of the Engie group, selected by means of a tender procedure, will build and operate the plant for 20 years. It will be connected to the national power grid and serve as a demonstration plant to validate this developing technology. Tidal energy is a form of hydropower that converts energy obtained through tides into electricity. The technology offers significant benefits since it uses a predictable source of renewable energy.

The pilot plant will be composed of four turbines with nominal power of 1.4 MW each. Those turbines present several innovative features that are expected to significantly increase the performances of tidal farms, including rotating nacelles, variable pitch blades and submerged power electronics.

France plans to support the construction of the plant, through a direct grant and repayable advances, which will be reimbursed if the technology proves successful. Moreover, each unit of energy produced will receive a feed-in tariff.

The Commission's 2014 Guidelines on State Aid for Environmental Protection and Energy allow Member States to grant state aid for renewable energy, subject to certain conditions. These rules are aimed at reaching the EU's ambitious energy and climate targets at the least possible cost for taxpayers and without undue distortions of competition in the Single Market.

For more information, visit www.europa.eu.

SeaPlanner manages record amount of project data at Gemini offshore wind farm

SeaPlanner, part of the SeaRoc Group, has managed a record quantity of project data throughout the construction phase of the Gemini Offshore Wind Park.

Gemini, a Netherlands-based offshore wind farm is one of the largest in the world and has been supported by SeaPlanner since the beginning of 2015 when it was confirmed as the proprietary management system by operators, Van Oord.

As of 1 July 2016, SeaPlanner had recorded a staggering 105,395 personnel transfers on the project, of which 64,942 were handled as automated swipe card transfers—a method that significantly reduces administration time for the marine coordinators based in Eemshaven, Netherlands.

At 68 sq. km in size and located 85 km off the Netherlands north coast, the Gemini Offshore Wind Park presents a number of logistical complexities for maintaining the highest levels of safety and efficiency. Over the course of the construction phase, SeaPlanner has provided complete control and visibility to the project team with access to a significant amount of data.

For more information, visit www.searoc.com.



America's first offshore wind farm enters final construction stage



Deepwater Wind has embarked on the final stage of construction of the Block Island Wind Farm, a complex operation that will feature some of the industry's most innovative offshore wind technology and a world-class team of dozens of workers and specialists.

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—America's first offshore wind farm—remains on-schedule to be fully constructed this summer and commissioned this fall.

In July, the Big Max cable lay vessel (under a contract with LS Cable and its subcontractor Durocher Marine) completed installation of all cables for the project, including the four inter-array cables connecting the five wind turbine foundations and the export cable connecting the wind farm to a new substation on Block Island.

In addition, National Grid completed the installation of the sea2shore submarine cable connection between Block Island and mainland Rhode Island in June.

All 15 turbine tower sections and 15 blades, supplied by GE Renewable Energy and its blade manufacturer LM Wind Power, have been delivered. These components are being shuttled from ProvPort to the project site by two Montco Offshore liftboats—the L/B Paul and the L/B Caitlin—that arrived at Quonset Point in July.

GE has completed manufacturing of all turbine components. The last major components to be completed—the five nacelles—began their journey across the Atlantic from the manufacturing facility in St. Nazaire, France to the project site on 15 July.

For more information, visit www.dwwind.com.

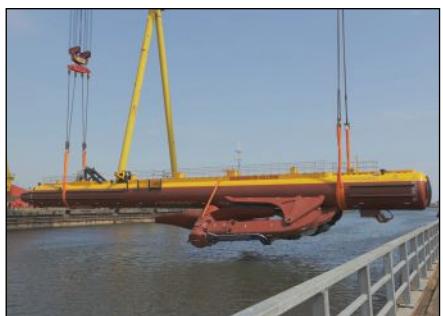
Moog Focal Technologies supplies electrical slip ring for Scotrenewables Tidal Power LTD SR2000

Focal Technologies, a Moog Inc. Company, has been awarded the contract to supply Scotrenewables Tidal Power Ltd with a 6.6-kV electrical slip ring for their new tidal turbine.

Scotrenewables Tidal Power Ltd recently launched the 2-MW SR2000. The 550-tonne machine underwent preliminary tow trials in Belfast Lough, Ireland, before being towed to Orkney, Scotland, to commence a grid connected test program. The SR2000, noted as the world's largest energy gen-

erating tidal turbine, will go live in the next 3 months once the turbine is connecting into the grid.

The SR2000 utilizes a mooring system that allows the tidal generator to weathervane about the mooring point to maintain a heading into the tidal stream to maximize power generation efficiency.



The Focal 6.6-kV slip ring transmits 2 MW of power and control signals across the turret mooring system to the export cable on the seabed and an integrated absolute rotary encoder facilitates disconnection/connection operations between the SR2000 and the mooring system.

For more information, visit www.moog.com/marine.

Polenergia obtains Poland's first environmental permit for offshore wind farm

Polenergia SA is the first operator in Poland to obtain from the Regional Directorate of Environmental Protection (RDOŚ) the environmental permit for the construction of an offshore wind farm Baltic Środkowy III. The planned capacity is 600 MW and it will be one of the largest wind farms in the Baltic Sea.

The decision is a green light to start working on the technical design of Poland's first wind farm in the Baltic Sea. In total, 120 wind turbines with a total capacity of 600 MW will be located 23 km north off the coast. The capacity of a single turbine will be up to 5 MW, and its height will amount up to 275 m. The diameter of the blades will be up to 200 m. These will be the largest wind turbines ever in Poland. Due to excellent wind conditions in the Baltic Sea, the wind farms will be more efficient and provide a stable supply of electricity.

The Roadmap provides for a 3-year period to prepare the technical design and to obtain building permission. Commencement of construction is expected in 2019. The first electricity is expected to flow to the Polish coast within 5 years (2021-22). The operational life span is planned for 25 years.

For more information, visit www.polenergia.pl.

Open sea ocean energy testing sites to receive European funding

A new European program will fund open sea testing sites in four countries. The €11 million Funding Ocean Renewable Energy through Strategic European Action (FORESEA) project brings together Europe's leading ocean energy test facilities to help demonstration of tidal, wave and offshore wind energy technologies in real-sea conditions. The project is funded by the Interreg NWE (North-West Europe) program, part of the ERDF (European Regional Development Fund).

Led by the European Marine Energy Centre (EMEC), the FORESEA project will provide funding support to ocean energy technology developers to access Europe's world-leading ocean energy test facilities:

- MEC (Orkney Islands, UK);
- SmartBay (Galway, Ireland);
- SEM-REV (Nantes, France); and
- Tidal Testing Centre (Den Oever, Netherlands).

The test centers will be supported by European industry group Ocean Energy Europe, based in Brussels.

For more information, visit www.oceanenergyeurope.eu.

Trident Energy and 42 Technology make waves with improved PowerPod II design

Trident Energy—an independent developer of enabling technology for the offshore renewables industry—has announced today that a technology optimisation project with 42 Technology has exceeded all expectations in improving the performance of the company's novel linear generator concept.

The re-designed concept, named PowerPod II, represents a major advance for Trident Energy and its WaveDrive project, which is aimed at developing a generic power take-off (PTO) system for use in a broad range of wave energy converter (WEC) devices. Trident's WaveDrive project was awarded almost £0.5M in development funding earlier this year from Wave Energy Scotland (WES) as a Stage 2 project in its PTO innovation call.

The new PowerPod II concept is based on a single generic design that can be adapted for use in different types of wave energy converters and certain tidal energy devices, potentially enabling higher manufacturing volumes, lower cost and faster commercial deployment. The new concept is similar in size to its predecessor but it generates 50% more electrical power on each stroke thus helping WEC developers implement more cost-effective and competitive systems.

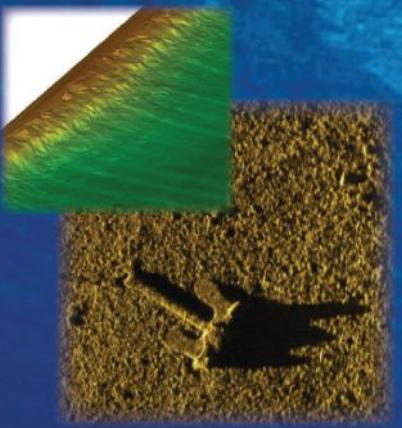
For more information, visit www.tridentenergy.co.uk.

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IMPROVED CURRENT PROFILING SYSTEMS FOR OFFSHORE RIGS

*By: Dr. Bruce A. Magnell, Scientific Director
Dr. Archie T. Morrison III, Senior Ocean Engineer
Oceanography and Measurement Systems
Woods Hole Group, Inc.*

Exploratory oil rigs (Mobile Offshore Drilling Units or MODUs) and production platforms operating in the Gulf of Mexico are subject to the requirements of BSEE Notice to Lessees (NTL) 2009-G02. When operating in water depths greater than 400 m, operators must collect and deliver to a public archive, real-time current profiles covering near-surface to the seafloor or 1,000 m. The profiles support real-time operational decisions and are used by industry and government engineers designing offshore vessels and platforms. The industry is particularly interested in high-speed currents extending over a large depth range. Woods Hole Group works with offshore operators and manufacturers to develop safer, more reliable measurement systems.

Profiling systems developed for the offshore industry over the past few decades commonly relied on the Teledyne RDI 38kHz Ocean Observer ADCP. The OO38 ADCP transducer unit is mounted on a frame ("sled") and suspended in the water from a Launch and Recovery System (LARS). Single- and dual-cable LARS systems are used. Dual-cable sleds are assumed to align with the hull, allowing use of vessel heading in place of the ADCP compass, which may be compromised by the magnetic field of the MODU. An expensive, 47-conductor cable is used in most existing systems to connect the transducer to the TRDI Ocean Observer Deck Unit, which communicates with a networked computer. Raw binary data and metadata are transmitted every 20 minutes to the National Data Buoy Center (NDBC) over the internet connection. Data displays may be provided at a limited number of locations on board.

Rig personnel are typically responsible for launch and recovery of the sled when the MODU changes location or maintenance is required. The OO38 cable is commonly attached to load-bearing wire rope with cable ties, manually applied during deployment and removed during recovery. Damage to the cable is not infrequent and the operation puts personnel at risk as they work at height over water. LARS winches, used to raise and lower the sled, can be difficult to maintain in the harsh marine environment. These safety, convenience, and reliability issues place a substantial burden on rig personnel. Cable damage, when it occurs, produces a data outage and consumes time and budget. The limited availability of real-time data displays on board (drill shack, bridge) and on-shore (operations centers, metocean contractor facilities) constrains data visualization, performance monitoring, and quality assurance.

Four years ago, Woods Hole Group began using TRDI's new Under Water Electronics Assembly (UWEA), an underwater version of the OO38 Deck Unit. The UWEA is mounted on the sled and connected to the rest of the system with only 7 power and data conductors. Furthermore, we integrated those conductors and the load-bearing wire rope by using electro-mechanical cables and slip-ring equipped winches. These advances, unique to Woods Hole Group, minimize risk to personnel, substantially reduce the time required to launch and recover the sled, and reduce the previous high likelihood of cable damage.



The orange housing of the TRDI OO38 UWEA is shown mounted on the instrument sled with an upward-looking workhorse ADCP and the downward-looking OO38 transducer.

The use of the UWEA, electro-mechanical cables, and slip rings provides much greater reliability and ease of operation, but attention to winch characteristics becomes more important. The long-term reliability of the electro-mechanical cables requires a relatively large-diameter winch drum and a clean cable lay during recovery. Level-wind systems are complex mechanisms, difficult to maintain; a repeated poor lay, even of armored cable, can break internal data and power conductors. Variable elevation and azimuth wire angles at the winch complicate level-winding operation.

Recognizing these problems, Woods Hole Group engineers teamed with a specialized machining partner and developed a new design, specifically intended for current profiling systems. The winch utilizes a large-diameter, helically grooved drum, capable of storing the entire length of cable in a single layer. A large-diameter idler controls the wire angle approaching the drum and reliably forces a clean lay with one passively moving part, independent of sheave block position, with no operator intervention. Installed on Woods Hole Group's latest current profiling system, the new design has proved reliable and greatly enhanced operator efficiency, safety and convenience. Personnel can operate the system with minimum risk and launch and recovery can be accomplished in minutes.



A view of the single lay, helically grooved drum and idler roller, a design unique to Woods Hole Group.

On most MODUs, a dedicated system control PC collects the instrument profiles, adds metadata, provides a display on the PC monitor, and transmits the measurements to NDBC. Unfortunately, the PC is seldom readily accessible to drillers or bridge officers, the personnel who stand to benefit the most from knowing the current structure under the keel in real-time. To help overcome this limitation, our systems provide a video output to the internal CCTV system, distributing text and graphic profiles throughout the rig, readily accessible to all personnel. Alternative time-series and other displays can be selected for CCTV distribution and the system supports data export in a variety of spreadsheet and graphical formats. In addition, Woods Hole Group personnel collaborate with client IT security personnel to establish secure remote access to the system control PC, enabling personnel to diagnose and resolve system issues quickly and without travel costs.

Rig personnel depend on real-time current measurements to guide operations and industry engineers and government regulatory agencies rely on historical data to develop design criteria and evaluate offshore structures. Woods Hole Group is working to enhance the operational and design utility of these data through the ongoing development of data visualization tools. These displays will be available on secure, client accessible websites, allowing client personnel anywhere, on or off the MODU, to visualize and analyze real-time and historical data. The displays created for the website also allow personnel to effectively monitor data quality and quickly resolve problems. The websites will also provide rig personnel with system documentation, including technical manuals and wiring schematics.

Looking forward, there are new instruments - such as the Nortek Signature 55 Acoustic Doppler Profiler - providing alternative solutions for MODU current profiling systems. Instrument selection requires consideration of factors such as profiling range, data quality, and cost. Woods Hole Group makes a point of designing systems and selecting instrumentation to successfully meet client measurement goals. Our team works closely with instrument manufacturers, to provide industry feedback and to understand the relative benefits of different products, so we can make the best choices for our clients.

Woods Hole Group is also designing a new single-cable LARS. These can be simpler and less expensive than dual-cable systems, but the ADCP is free to rotate, forcing dependence on the instrument compass, which is affected to an unknown degree by the magnetic field of the rig. To study this, we configured our most recent dual-cable system to record simultaneous rig and instrument heading measurements. Our team is actively analyzing this unique data set to determine the source and magnitude of compass errors. Our goal is accurate, empirically proven, current direction from a lower cost single-wire current profiling system. This will be one further step in Woods Hole Group's continuing development of safer, more reliable oceanographic systems for the offshore oil and gas industry.

Sound & Sea Technology, Inc. wins \$15M order for Navy seafloor cable project

The Naval Facilities Engineering Command (NAVFAC), Engineering and Expeditionary Warfare Center (EXWC) awarded a \$15 million contract to Sound & Sea Technology, Inc. (SST) to integrate and install an underwater cable system in support of the Seismo-Hydroacoustic Data Acquisition System (SHDAS). SST's engineering tasks will include installation of the system and shore landing. Previous work on this project has included the design and installation of the shore facility; design of the underwater system; fabrication, construction, integration, and testing all components of the system and the data acquisition and storage system; system Integration and testing of components; and documentation of all sub-systems.

This is the largest task order from the Navy that SST has been awarded. SST president, Judith Meggett remarked, "This contract award is the result of many years of successful support for NAVFAC EXWC and proven performance. Our team of ocean engineering professionals has years of experience installing seafloor systems. It is gratifying to be awarded this Task Order for a critical national system."

SST's Project Manager, Michael Harrison, commented, "Seafloor cables are a core business for SST. This is the latest in a series of successful seafloor system projects, and we look forward to supporting this project further." SST has participated in numerous complex ocean cable system projects for the U.S. Navy. Since 2012, SST has completed numerous tasks supporting the SHDAS program, including a desktop study, cable design, geophysical surveying, technology refresh, pressure vessel design and seismic monitoring seismometer production.

For more information, visit www.soundandsea.com.

VideoRay wins order from French Navy for autonomous ROV systems

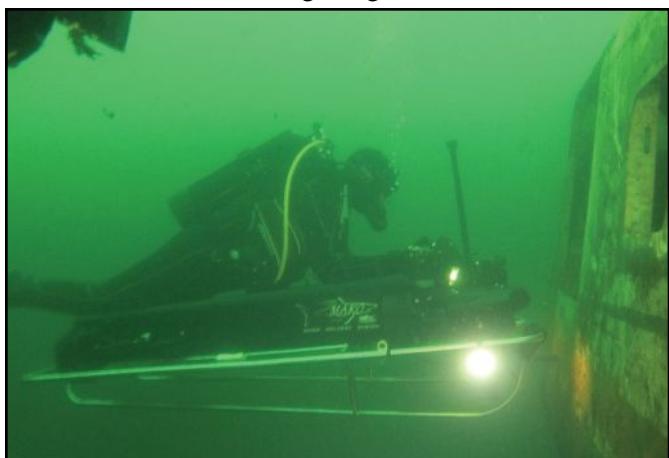
VideoRay has received an order for multiple Copilot RI Systems from the French Navy. These specialized systems, based on the VideoRay Pro 4 ROV with multi-beam sonar and Doppler velocity log positioning, are used to locate, re-acquire, and identify a range of underwater targets and explosive devices. SeeByte software makes this difficult operation easy, with minimal training compared to operations with less capable systems. The order was placed through NEOTEK, VideoRay's authorized business partner in France.

VideoRays are the most popular underwater robot in the world, selling more units than all competing manufacturers. It dominates the market for homeland security operations and defense, with large fleets in the U.S. Navy, U.S. Coast Guard, Norwegian Coast Guard, Saudi Border Guard, Taiwan Coast Guard, Korean Navy and the Dutch Navy, among others.

SeeByte, a subsidiary of Battelle, provides products and services to major government and commercial clients around the world. Battelle is a leader in maritime technologies, enabling rapid development and deployment of solutions for government and industry. CoPilot is the world's most advanced, easy-to-use, plug-and play software, and makes piloting an ROV a much simpler task. CoPilot assists EOD teams in a variety of applications—from re-acquiring and identifying targets, to salvage missions—so EOD teams can easily navigate a small compact vehicle through dangerous environments.

NEOTEK has more than 20 years of experience in the marine and defense industries and offers products that meet a high quality standard. VideoRay is proud to have partnered with NEOTEK throughout the lengthy evaluation and acquisition process.

For more information, visit www.videoray.com.

Royal Navy selects Shark Marine Technologies MAKO diver delivery system

Shark Marine Technologies Inc. is pleased to announce their MAKO diver delivery system was recently chosen by the Royal Navy. The recent acquisition of the system fully equipped with a Shark Marine Navigator diver-held sonar and navigation system provides the user with the ability to conduct underwater investigations, reconnaissance and object identification.

The MAKO powered by the Shark Marine's Navigator, will contribute to the success of MCM duties and amphibious operations. The system allows the operator to select the tools needed for the task at hand: multi-beam sonar capabilities for safer operation in poor visibility; navigation capabilities for mapping and tracking the divers progress; video recording capabilities for inspection and identification purposes as well as autonomous operation capable of completing activities with or without a diver. Hot swappable, neutrally buoyant batteries allow the MAKO continuous operation. Shark Marine's MAKO diver delivery systems equipped with the Shark Marine Navigator are currently in use by Navies, law enforcement and search and rescue authorities globally.

For more information, visit www.sharkmarine.com/Products/DiverDelivery.html.

**German Navy research institute takes delivery of a MacArtney FOCUS 2 ROTV system**

Developing new underwater technologies for the German Navy is of prime concern to WehrTechnische Dienststelle, WTD 71. Therefore, they have decided on a MacArtney FOCUS 2 ROTV system representing a highly stable and flexible instrumentation platform as the basic tool for their development efforts.

With the purpose of testing SAS sonar technologies for mine detection, a full-scale on-site demo of a Raytheon ProSAS installed on a FOCUS 2 ROTV system was organised for WTD 71. The advantages of the FOCUS 2 ROTV as a flexible instrumentation platform were recognised by the researchers at WTD 71, who instantly came up with new ideas for other applications enabling WTD 71 to benefit by

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the strong features of the FOCUS system for their research activities.

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Canadians, Norwegians test mine hunting technology during RIMPAC

Her Majesty's Canadian Ship (HMCS) Yellowknife left Canadian Forces Base (CFB) Esquimalt to participate in Rim of the Pacific 2016 off the southern coast of California. When the ship arrived in San Diego, the ship's crew welcomed four members of the

Royal Norwegian Navy and embarked their AUV, also known as the HUGIN.

Developed over the last fifteen years by Kongsberg Maritime and the Norwegian Defense Research Establishment, the HUGIN 1000 conducts autonomous, semi-autonomous and supervised mine hunting operations and can operate in waters as deep as 3,000 m.

Embarking the HUGIN and its equipment involved configuring the Yellowknife, a Maritime Coastal Defense Vessel, in such a way that had never been done before, including fitting two additional containers to the back of the ship. This meant that any response from the ship's company to commonly practiced emergency procedures, such as a man overboard or fire and flood control, had to be adjusted to fit the new layout.

The HUGIN is launched off the stern of the ship, directly out of its container using a hydraulic Launch and Recovery System (LARS). Once in the water, the HUGIN begins traveling on its pre-programmed course. Within a few minutes, it dives below the surface, conducting a survey of the ocean floor with its high-resolution sonar, or identi-



fying previously found objects with its onboard optical imaging system.

To recover the HUGIN, the ship maneuvers close to the AUV, which detaches its nose cone, then sailors attach a line to the AUV and use it to position the vehicle onto the LARS. Once the HUGIN is safely onboard, the team can begin its post mission analysis to read the data collected during the mission. After its first few deployments, it quickly became apparent just how effective the HUGIN system is at detecting and identifying objects on the seafloor. In the first week of the exercise, HUGIN had identified nine mines.

For more information, visit www.dvidshub.net.

28

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Photo Credit: AXYS Technologies

Sonardyne International Ltd.

sonardyne.com



Sonardyne is an independent UK manufacturer of underwater positioning and communications systems, exporting 80% of its products through seven regional centres. Founded by John Partridge in 1971 with a vision to improve the safety and efficiency of underwater navigation for divers through innovation in acoustic signal processing, hardware design, and custom engineering, Sonardyne remains a subsea pioneer, delivering an extensive product range across many industry sectors 45 years later.

Although perhaps best known in the oil and gas sector, Sonardyne's track record of innovative and reliable solutions for acquisition of precise data from the most demanding environments means that many of the world's leading oceanographic institutes are also customers. Underlying this is growing scientific emphasis on ocean observing systems, for which autonomous or remote monitoring of seabed infrastructure technology developed by Sonardyne for the offshore industry is readily transferrable.

Sonardyne's release transponders have long been workhorses for mooring instrument strings; however, Sonardyne can now provide the backbone of an *in situ* data collection and processing system through its Subsea Monitoring, Analysis and Reporting Transponder (SMART). Recovery of data is based on Sonardyne's 6th Generation (6G) Wideband 2 technology or via the BlueComm optical system capable of transfer rates of up to 10 Mb/s.

Similarly, the Autonomous Monitoring Transponders (AMT) (Figure 1), originally developed for monitoring seabed installations, is underpinning new capabilities in underwater geodesy to measure seabed tectonic deformation. Deployed in a network, AMTs measure ranges between each other and log these together with other sensor data, including pressure for up to 5 years. Most recently, AMTs have been deployed by Geomar on the submerged flanks of Mt Etna.

Following the Boxing Day Tsunami of 2004, Sonardyne worked with the Indian National Institute of Ocean Technology to establish an early warning system in the Indian Ocean. This comprises high-resolution bottom pressure recorders acoustically linked to surface buoys that then transmit data to shore. Since then, Tsunami detection systems have been supplied to Ecuador, Colombia, and Greece, the latter being cabled to shore rather than acoustically telemetered to the surface.

While ROV positioning instigated the adoption of Ultra Short Baseline (USBL) positioning by the ocean science community, Sonardyne's latest Ranger 2 range capability of up to 10,000 metres is applicable to a wide range of other scientific operations, including seabed coring, camera platforms, and towed bodies, which has led to its installation on many of the world's major research vessels, including the RV Neil Armstrong (Figure 2) most recently. At the other end of the spectrum, the Scout-Pro USBL also has scientific utility, as exemplified by the University of New South Wales' use for precise geo-location of sediment samples, underwater video transects, and biota collected by divers, typically in less than 10 metres.

Sonardyne's integrated navigation technology is also at the heart of new scientific capabilities such as Schmidt Ocean Institute's 4,500 metre ROV Sebastian, including a SPRINT inertial navigation system (INS) and Syrinx 600 kHz Doppler Velocity Log (DVL). Now in its third generation, SPRINT exploits the precision of acoustic positioning with continuous INS updates to provide robust positioning even in the most challenging acoustic conditions. This is complemented by Syrinx, which offers high altitude (<175 metre) capability associated with a 300 kHz DVL and the high precision of a 1200 kHz DVL, while an adaptive bottom lock and high update rate enable missions in even complex topography.

Sonardyne's product range has been built upon decades of working in the world's most challenging subsea environments, giving their clients—whatever sector they work in—the confidence to operate successfully in any water depth.



Figure 2. RV Neil Armstrong. (Photo courtesy of Woods Hole Oceanographic Institute).



Figure 1. Autonomous Monitoring Transponders (AMT) prior to deployment by Geomar.

A Worldwide Survey of Recent Ocean Observatory Activities: 2016 Update

Part 1—Europe and The Americas

Contributed by the Ocean Observing Systems Committee, MTS

This eighth annual update highlights new and existing ocean observing activities around the world. Thank you to all the contributors who are helping to raise awareness of the importance of these systems.

EUROPE

Offshore Communications Backbone – Cyprus

CSnet International continues to implement the Node Pod Maintenance Plan initiated in 2014, replacing the pod at Node 2 in October of 2015. The remaining two pods from the original deployment (at nodes 1 and 5) will be replaced sometime between late 2016 and the end of 2017. Other activities for the next 24 months include installation of the following sensor systems at various node locations:

- High-definition remote control video camera for benthic studies.
- Broadband ambient noise hydrophone/recorder (in support of the European Union Marine Strategy Framework Directive) to measure baseline ambient background noise and Cetaceous marine mammal monitoring. The sensor will interface directly to the subsea node via an Ethernet connection.
- Vertical profiler array crawler buoy instrumented with various sensors and interface modules (IM) to connect to the node.



Figure 1. CSNet's replacement Node Pod being prepared for installation.

PLOCAN – Canary Islands

The Oceanic Platform of the Canary Islands (PLOCAN) is a Spanish multipurpose technical-scientific service infrastructure to support research, technology development and innovation in the marine and maritime sector. It is financed and managed by a consortium comprising 50% contributions from the Government

of the Canary Islands and from the Spanish National Government (Ministry of Economy and Competitiveness). PLOCAN is a member of the Spanish Singular Scientific and Technological Infrastructures Network (ICTS).

The main aim of the PLOCAN consortium is the construction and operation of a fixed offshore platform that will underpin national research and technological development capacities at the cutting-edge of knowledge and within the framework of international competitiveness. The platform construction will be completed by the third quarter of 2016, and will be operative by the end of 2016. The platform will be located both close to the coast and near of the edge of the continental shelf, in shallow waters. The platform has a net surface around 2,500 sq. m of research capacity, space for laboratories, instrumented containers and capacity to accommodate researchers distributed in a multi-story building with a main dock of 1,000 sq. m.



Figure 2. Construction status (mid-July).

PLOCAN is able to provide access and multidisciplinary logistic support through its onshore facility and two marine test sites (Taliarte harbor and offshore). The facility and test sites are located in the NE coast of Gran Canaria Island. The onshore

testing facility has dedicated 400 sq. m equipped workshops for electronics and mechanical integration, repairs, storage and logistics, including a wet-lab with testing pool with target seawater. Also a dedicated control room for piloting and related issues is available. The harbor testing facility is located very close to onshore facility (just few meters with direct view between both) and has clear and calm waters with maximum depths of 8 m. It is an optimal place for the early sea trials.

The PLOCAN offshore test site area is 23 sq. km, located 3 nmi from the harbor testing area and also quite near to the major harbor of Gran Canaria Island (Las Palmas/Port). The area offers progressive depths from shore up to 600 m dedicated to study the behavior and efficiency of different types of maritime devices and technologies and contributing to speed up the process of their introduction into the market.

The marine area of PLOCAN test site was comprehensively studied with the view of offering an optimal space in terms of logistics, supported infrastructures and grid connection. In addition, the area has excellent environmental conditions facilitating from 9 to 12 months of operational window and optimal wind and wave energy resources for testing/demonstration operations, which ranges from 300-400 W/m² for wind power density and from 4 to 8 Kw/m of wave power.

The evacuation of the electricity produced during experimental assays in PLOCAN Marine Test Site will be done through its Electrical and Communication grid Infrastructure (ECI). In May 2016 PLOCAN published the public tender for the construction and putting into service of the ECI to operate in the PLOCAN Test Site. The ECI will be operative in 2017 and it will be composed by two main modules of 5 MW of electricity evacuation capacity. Module 1 will be dedicated to wave energy converter demonstrators, with five positions of 1 MW each. Module 2 will be dedicated to offshore wind technologies with one position of 5 MW. Regular sea-operations are covered by PLOCAN's own boats as part of the main equipment available.

A fleet of unmanned marine vehicles for survey and work applications up to 1,000 m and moored buoys suited with meteorological and oceanographic sensors are available in order to cover real-time monitoring needs in the area. In addition, a new glider school edition has been scheduled for November 2016. In 2016, the fleet has been enlarged with two new autonomous marine observation surface vehicles: a Waveglider SV2 from Liquid Robotics and a Sailbuoy from Offshore Sensing AS. Both vehicles, shown in Figure 3, are equipped with photovoltaic cells and use wind (Sailbuoy) and wave (Waveglider) alternative energy sources.



Figure 3. PLOCAN marine unmanned vehicles fleet and gliderlab facilities. Waveglider (front-left), Slocum glider (rear-center) Sailbuoy (front-right) and Seabotix vLBV950 (front).

NORTH AMERICA

Integrated Ocean Observing System® – U.S.

In concert with using observational technologies to collect and distribute physical and chemical oceanographic data, the U.S. Integrated Ocean Observing System is expanding into the world of observational biological data through partnerships in two multi-agency programs: the U.S. National Animal Telemetry Network (ATN) (<https://ioos.noaa.gov/project/atn/>) and the Marine Biodiversity Network (MBON) (<http://www.marineton.org/>).

The U.S. National Animal Telemetry Network (ATN)

The ATN is a multi-agency partnership (NOAA, the Office of Naval Research (ONR), the Bureau of Ocean and Energy Management (BOEM), along with select academic laboratories) to advance the national capacity to observe and track the movements and behavior of aquatic animals. Animals are particularly adept at helping scientists identify critical habitats, spawning locations, and important oceanographic features (e.g., fronts, eddies and upwelling areas). Their movements also provide important insights into regions of the oceans that are difficult and expensive to monitor (e.g., offshore environments, Arctic). As a result of these animal observations, refined spatial models of animal dynamics help to inform federal and state resource managers to, among other things, improve the basis of conservation and sustainable-use fishery management policies.

Animal observations are collected using telemetry devices ("tags") which yield detailed data regarding animal responses to the coupled ocean-atmosphere and physical environment through which they are moving. Sensors carried by animals have recently come of age and by integrating them with the tag technology they can collect high resolution physical oceanographic data at relatively low costs. Data collected by them include depth, temperature, light, salinity, acceleration, acoustics, and the animal's physiological parameters (heart rate, oxygen, and body temperature).

These data are collected in near-real time with acoustic and/or satellite tags or with archival tags that store data or later transmit to an array of sensors or satellites. The acoustic tag is attached to an animal and its location is detected and recorded when the animal swims by an acoustic receiver that has been physically deployed, typically on a buoy. Satellite tracking tags are global in capability and are useful on marine animals that travel long distances and through areas where acoustic receivers are not deployed. Archival tags are placed on the animal and require the animal to be recaptured for any data to be downloaded off the tags. These "mark - recapture" studies generally seek to collect archived information on fish that can be analyzed to answer more detailed questions on an animal's health over a period of time.

An example of how the ATN can help to inform fisheries conservation efforts is in the 5-year Action Plan (2016-2020) recently implemented by the NOAA/National Marine Fisheries Service and the U.S. Fish and Wildlife Service for the recovery of the Pacific Leatherback Sea Turtle, one of eight species identified by NMFS as among the most at-risk of extinction. One of the five recovery actions specifically identified in the Plan is to form a better understanding of their migration globally, including the movements of hatchlings and how foraging habits and oceanographic features influence lifelong migration behavior. Because of the complexity and range of their migration patterns the Action Plan specifically identifies the need for sustained partnerships to support satellite telemetry research in order to better understand the Pacific Leatherback migration habits and pelagic threats.

The Marine Biodiversity Observation Network (MBON)

In addition to tracking fish and mammals, IOOS is part of a multi-agency, public-private partnership with the NOAA Office of Ocean Exploration and Research, NASA, Shell Oil, and BOEM to initiate the first U.S. network to monitor marine biodiversity at scales ranging from microbes to whales. Biological diversity, or biodiversity, is defined as the variety of life encompassing variation at all levels of complexity—genetic, species, ecosystems, and biomes—and including functional diversity and diversity across ecosystems. The partnership is composed of regional networks of scientists, resource managers, end-users, and IOOS Regional Associations working to integrate data from existing long-term programs to improve our understanding of changes and connections between marine biodiversity and ecosystem functions. MBON is currently supporting three demonstration projects working in several locations: the Arctic shelf and Chukchi Sea, the Santa Barbara Channel, and National Marine Sanctuaries in the Florida Keys, Monterey Bay, Flower Garden Banks, and Channel Islands.

The Arctic is experiencing the dramatic temperature increases taking place in the ocean, leading to significant changes in marine ecosystem structure and function. It is only through analysis of long-term datasets that scientists can distinguish natural variability and regular cycles from change driven by climate change or other stressors; Arctic MBON (AMBON) researchers are building on recent efforts to extend much-needed long-term monitoring data and fill gaps in coverage. A primary goal of the AMBON project is to develop a sustainable model of continuous biodiversity observation from genetic to organismal to ecosystem levels. These biodiversity observation efforts will continue to add to the essential time series collection of environmental and biological data. Along the Arctic shelf and Chukchi Sea, researchers are building on recent efforts to fill the vital long-term monitoring data and fill gaps in coverage.

The Florida Keys, Flower Garden Banks, and Monterey Bay National Marine Sanctuaries are home to diverse marine environments, encompassing deep sea, continental shelves, estuaries, coral reefs and more. The Sanctuaries MBON project, among other things, is advancing technology for biodiversity assessments in these sanctuaries and other areas through refinement of emerging environmental DNA (eDNA) molecular methods and autonomous sample collection. These eDNA methods along with ongoing fish and vertebrate surveys collected by various agencies and non-governmental organizations are now being used to evaluate habitat diversity and diversity across trophic levels. This work helps to detect invasive species and improves understanding of overall system health.

The Channel Islands National Marine Sanctuary off Santa Barbara, California, within the Santa Barbara Channel MBON, is home to a rich array of marine species and considered an ecologically significant place with tremendous biodiversity. In collaboration with the Sanctuaries MBON project, the Channel Islands demonstration project is testing novel methods for monitoring biodiversity, including automated image analysis and genomics to help fill key gaps in our knowledge of the marine biosphere. While underwater imagery taken from autonomous vehicles can be useful, much of it is analyzed manually, which is time consuming and expensive. Scientists working with the Santa Barbara Channel MBON are developing image analysis techniques (some involving Convolutional Neural Network computing) that automatically classify features found in this imagery.

All three of the MBON demonstration projects are also

using seascape maps produced with satellite imagery of ocean color (chiefly from the MODIS-Aqua polar orbiting satellite). Unique distributions of satellite-derived chl-*a*, normalized fluorescence line height (an indicator of phytoplankton physiological state), sea surface temperature, and light are analyzed using a neural network model to create seascape regions. By connecting remote sensing measurements with in situ data scientists can compare how biodiversity of different trophic levels is influenced by changes in ocean chemical and physical properties derived from ocean color data.

Data Access Centers and Web Portals Help Make Biodiversity Connections

Critical to efforts in both of these programs is a centralized cyber infrastructure and capability. The goals are to develop an integrated network within each of these programs to facilitate the broader use of the data collected, to integrate standardized biological parameters collected by varied methods, and to integrate those with physical, chemical and other oceanographic data parameters. The ATN is doing this in a centralized Data Access Center (DAC) where data is interoperable with other DACs or data servers. Similarly, the MBON portal will provide real-time, delayed-mode, and historical data for in situ and remotely-sensed physical, chemical and biological observations of organisms from microbes to whales, including presence, abundance, productivity, genomic, phenology, and other relevant ecological process measurements or indices. Utilizing novel molecular (eDNA) technologies and biogeographical seascape classifications combined with traditional environmental research tools and coordinated experiment results, this network of integrated information enables the scientific community to describe relationships of biodiversity and organism abundance and linkages to system productivity and ecosystem services.



Figure 4. The IOOS ATN webportal showing the tracks of fish, turtles, and marine mammals monitored by the program. Users can select their own criteria to yield custom data maps. To view the portal, visit <http://oceangoing.pfeg.noaa.gov/ATN/>.

Southern California Coastal Ocean Observing System

Many local, state and federal partners are involved with the Under Keel Clearance Project: Jacobsen Pilots, Tesoro, the National Ocean Service, the National Weather Service, State of California Oil Spill Prevention and Response, the U.S. Army Corps of Engineers and the California Department of Parks and Recreation. The Marine Exchange of Southern California serves as the administrator for the project. Data from these buoys are available through the custom CDIP display for the Marine Exchange http://cdip.ucsd.edu/custom_pages/marine_exchange, the NOS PORTS website <http://tidesandcurrents.noaa.gov/ports/index.html?port=ll>, and NWS National Buoy Data Center (NDBC) website www.ndbc.noaa.gov.

Worldwide Survey of Recent Ocean Observatory Activities

Alaska Ocean Observing System

Pursuing Ice and Water Level Observations Where Conventional Methods Fall Short

Accurate ice and water level observations are fundamental for ice and storm-surge forecasting, informed emergency response, ecosystem management, safe navigation, and efficient mapping/charting. Alaska's extensive and remote shorelines in particular are critically under-instrumented for water level observations, and pose observational challenges including the threat of ice, lack of coastal infrastructure and rapid coastal erosion that render conventional water level sensing technologies inadequate. In an effort to increase ice and water level observing capacity across the state, AOOS is working closely with the NOAA National Weather Service (NWS) and numerous national and statewide partners to develop and trial new methodologies and technologies, and identify appropriate alternatives to expensive NWLON tide gauges, especially for regions that experience shore-fast ice, making in-water systems impractical.

Real-Time Ice Freeze-up Detection Buoy Trials

The IOOS Ocean Technology Transition program supported University of Alaska Fairbanks (UAF) oceanographer Peter Winsor and industry partner Pacific Gyre to develop a new buoy that inexpensively and accurately predicts the onset of fall ice formation. The buoy was deployed late summer of 2015 and successfully reported real-time temperature and salinity structure of the Chukchi Sea shelf prior to and during the 2015 freeze-up. An expendable surface float was remotely released from the buoy on 6 November 2015 as the entire water column became isothermal and isohaline and as satellite imagery indicated the main ice pack was less than a day from over-riding the mooring. Subsurface sensors remained and continue to record data internally until the mooring is recovered. An identical system is planned for 2016 with support from NWS, IOOS and AOOS. 2016 data will live-stream to the NOAA NWS GTS (Global Telecommunication System) for evaluation in real-time ice forecasting models.

Sea Level Pressure Observations on the Beaufort Shelf

AOOS through UAF Jeremy Kasper will make year-round sea level observations in the Beaufort Sea using a bottom-mounted SBE 16+ CTD equipped with a highly accurate Paroscientific DigiQuartz® pressure sensor. During deployment, a new approach for accurately surveying water levels over subsurface, moored pressure sensors using a GPS antenna and an Aquatrak ultrasonic water level sensor will be implemented. This is important as it allows data from the sensors to be referenced to a vertical datum and provide an absolute measure of sea level at the time of deployment. A waves equipped acoustic Doppler current profiler will be co-located on the mooring to provide valuable data for understanding the combined effects of storm surge and shelf waves on coastal habitat inundation and erosion. Sea level data will be utilized by NOAA and USGS for validating area storm surge model simulations.

LiDAR Imagery of the Yukon Delta

AOOS is partnering with the Western Alaska Landscape Conservation Cooperative and numerous other agencies through a USGS grant to gather LiDAR imagery over the Yukon and Kuskokwim River Delta. This area is one of the most vulnerable regions in Alaska, with over 35 communities highly susceptible to coastal flooding associated with storm surges owing to the shallow bathymetry, orientation and low topographic relief along the coast. In 2016, LiDAR imagery will be used to derive spatially expansive, high resolution elevation data for this region, providing the quality level data necessary for emergency response planning and resource management.

Real-Time Autonomous Ultrasonic Water Level Sensors

With continued support from AOOS, the Alaska Department of Natural Resources (AKDNR) is maintaining six and installing three new bridge-mounted Iridium satellite telemetered, ultrasonic gages (iGages™) over tidal rivers in nine remote Alaska communities.

These low-cost water level devices were developed and tested by the NWS and have an estimated accuracy of ± 5 cm in rivers. They are battery and solar powered, easy to deploy, and produce real-time data useful for issuance of timely and accurate forecasts and warnings for hazardous weather and flooding.

Data from operational stations are currently available on the AOOS data portal (Figure 5).

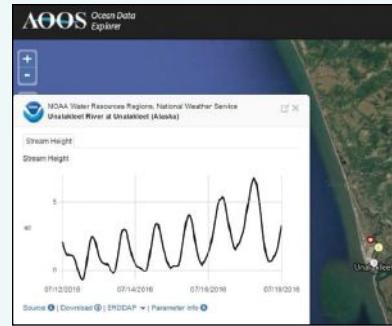


Figure 5.

Rapid Water Level Sensor Deployment During Storms

AOOS is collaborating with UAF and AKDNR to develop and test a rapid deployment mounting system that will allow residents in coastal communities impacted by fall-winter storm surges to quickly deploy water level sensors during storm events. Each mount will be equipped with a Hobo Bluetooth water level sensor and deployed at a surveyed location by a trained community member from each of three western Alaska villages during the 2016 storm season. The Hobo sensors are capable of recording data at 1 Hz for the duration of a storm event, providing high resolution water level data that are easily retrieved from the sensor using a Bluetooth equipped smartphone, tablet or computer. After data are quality controlled, they will be made available to the AOOS data portal and the NWS for use in storm-surge forecast model validation and improvement efforts.

Water Level Observing Using GPS Reflectometry

AOOS is researching the efficacy of two land-based GPS/GNSS reflectometry water level measurement techniques in cooperation with federal (NOAA NWS) and private industry research associates (UNAVCO's NSF-funded Plate Boundary Observatory Program and ASTRA, LLC). A pilot project in eastern Cook Inlet near Anchorage is planned for 2016 that will evaluate reflectance data collected using an ASTRA GPS receiver by comparing data to nearby NOAA NWLON tide station data. UNAVCO, a national non-profit geodetic research consortium, is collaborating with AOOS on identifying continuous GPS/GNSS sites in remote Alaska that would satisfy both geophysical research and water level monitoring objectives. In 2016, AOOS is supporting UNAVCO to perform reconnaissance at candidate sites for a near-future, shared-support installation.

ONC's VENUS and NEPTUNE – Canada

Now in its tenth year of operation, Ocean Networks Canada (ONC) continues to expand its observatory footprint on all three of Canada's coasts to deepen our understanding of the planet. ONC manages cabled observatories off the coast of western Canada, a community observatory in Cambridge Bay in the Arctic, and a series of newly installed community observatories and radars along the Pacific coast from Vancouver to Prince Rupert. ONC also delivers data from a tidal energy wave facility in the Bay of Fundy.



Figure 6. Map showing ONC's expanded footprint.

Ten Years of Ocean Observation

Over the last decade, Canada has invested \$278 million in ONC's ongoing mission to support ocean discovery through observatory technology. Over 5,000 sensors deployed in diverse ocean environments are connected 24/7 and deliver data in real-time via 900 km of Internet-connected, fibre-optic cable, cellular links, or by satellite connections. These data are made available to researchers and the public for free via ONC's powerful online data management system, Oceans 2.0.

Smart Ocean Systems™

Launched in April 2014, Smart Ocean Systems™ made significant progress in 2015 and 2016 to operationalize ONC's technology and data delivery technologies and expertise. The installation of ocean monitoring stations from Vancouver to Prince Rupert enables evidence-based decision-making on ocean management, disaster mitigation and environmental protection. An additional community observatory will be installed in Port Alberni later in 2016.

Fraser River Delta Dynamics Lab

In March 2015, ONC successfully laid 1 km of fibre-optic cable with high bandwidth capabilities to ONC's delta dynamics lab, replacing the original electrical cable deployed in 2008. The delta dynamics lab received further upgrades in April 2016, including a new instrument that measures suspended sediment and a piezometer, which measures pore pressure, an indicator of liquefaction. According to Natural Resources Canada's marine geoscientist Gwyn Lintern, "ONC has become one of the very few organizations worldwide capable of measuring live underwater events."

ECHO: Monitoring Shipping Noise

In September 2015, ONC partnered with the Port of Vancouver to install an underwater listening station in a major shipping lane within the Strait of Georgia. The enhancing cetacean habitat and observation (ECHO) program is a Vancouver Fraser Port Authority initiative that aims to better understand the impact of ship noise on whales throughout the southern coast of British Columbia.

Mobile Observing Systems

In 2015, ONC expanded its mobile observing systems to include data collected from three BC Ferries. With instruments that measure the properties of the surface ocean and a weather station on deck, scientists can now observe the ocean surface continuously while ferries transit the Strait of Georgia between Vancouver and Vancouver Island.

Wiring the Abyss

Major expeditions off the west coast of Vancouver Island in 2015 and 2016 succeeded in expanding and upgrading ONC's cabled NEPTUNE observatory in the northeast Pacific. With thanks to the coordinated efforts of C/S Wave Venture, E/V Nautilus and remotely operated vehicles (ROV) Hercules and Argus, a total of 18 km of steel-armoured, fibre-optic cable was laid on the ocean floor, connecting instruments at Endeavour and Clayoquot Slope.

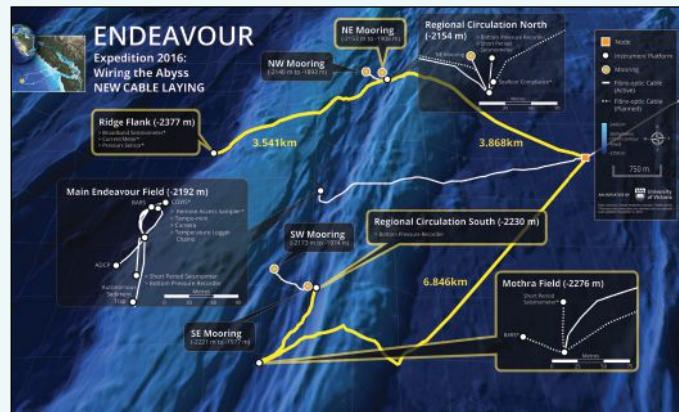


Figure 7. Endeavour now has 15 km of new fiber optic cables (outlined in yellow).

At Barkley Canyon a redesigned, trawl-resistant node was redeployed and connected after a trawling incident damaged the node in January 2015. An upgraded Wally, the benthic crawler, was also deployed at Barkley Canyon, along with an autonomous sediment transport mooring at the canyon head.

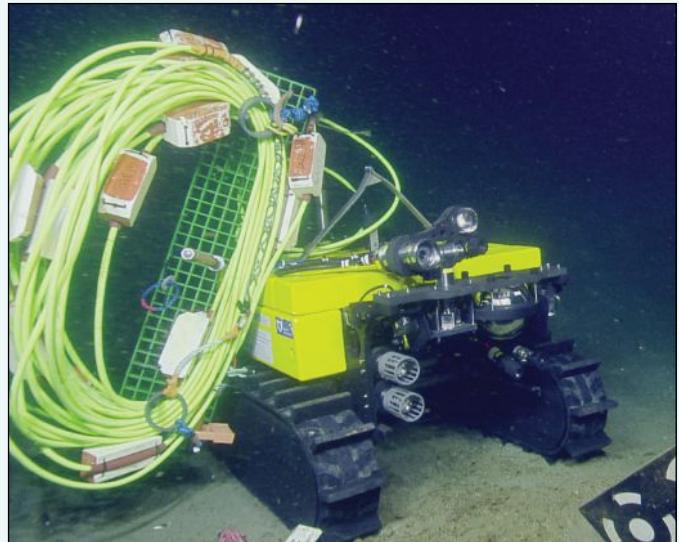


Figure 8. Wally now has an innovative 3-D imaging system that can detect changes in the seafloor down to a 1 mm resolution.

ONC deployed and connected four seismometers and four regional circulation moorings at the Endeavour segment of the Juan de Fuca ridge, including a first seismometer on the Pacific Plate. A tsunami array that was deployed at Cascadia in 2012—and suffered breaks in the fibre optic communication paths—was brought back to life using an innovative new communications solution. Originally proposed by Woods Hole Marine Systems, ONC is now successfully transmitting data to Oceans 2.0 via the power conductors in the failed fibre optic cable.

Worldwide Survey of Recent Ocean Observatory Activities

Earthquake Early Warning System

ONC's tenth anniversary expedition also laid the groundwork for an earthquake early warning system, thanks to a \$5 million investment from the Government of British Columbia in February 2016. A new Titan accelerometer at Barkley Canyon was the first of several seismic sensors that will be deployed on the Cascadia subduction zone over the next 5 years. These sensors will improve the accuracy of primary "P" wave detections that can provide British Columbians with up to 90 seconds of advance warning of damaging ground shaking from the secondary "S" wave.

Canada's Arctic

In September 2015, ONC returned to Cambridge Bay, Nunavut for the fourth time to maintain and upgrade the underwater platforms and above-ground weather station that monitors the Arctic Ocean. The platform now hosts a dozen sensors measuring oxygen, temperature, salinity, CO₂, pH, nitrates, sound, ice thickness, a new high definition underwater video camera, and an Ocean Tracking Network acoustic fish tag receiver. The dockside weather station includes a reflected sunlight sensor and video camera.

Based on the success of this community observatory, ONC plans to install a similar system on the seafloor where the Churchill River enters Hudson Bay, as part of the new Churchill Marine Observatory. ONC is also leading a timely collaborative project to improve our understanding of sea ice processes, particularly those critical to Arctic transportation. Funded by Polar Knowledge Canada's 'Safe Passage: Sea Ice Research for Arctic Resource Development and Northern Communities', it will document the variability of ice cover in Cambridge Bay, Dease Strait, and Deception Bay in Hudson Strait.

ONC is an initiative of the University of Victoria, funded by the Canada Foundation for Innovation, Government of Canada, Government of British Columbia, CANARIE and IBM Canada.

Ocean Tracking Network – Canada

The Ocean Tracking Network, the world's largest aquatic animal tracking network, is a global research and technology development platform headquartered at Dalhousie University.

OTN's mission is to generate knowledge on the behavior, movement and distribution of aquatic animals to advance the conservation and sustainable use of marine and freshwater species. It currently serves over 400 international researchers from 21 countries. These are working with electronic tagging systems (acoustic telemetry, radio telemetry, satellite telemetry, and data loggers) to track animal movements and habitat use and link them to environmental drivers. OTN users come from academia (universities and research institutes), federal management agencies and stakeholder groups (e.g., lands, water and natural resource agencies, fish and wildlife agencies, First Nations), industry (e.g., manufacturing and test facilities, fishing organizations, renewable power, national space agencies) and the private sector (e.g., aquaria, museums, tourism associations).

OTN's global acoustic tracking receiver infrastructure is comprised of over 1,300 units and supports over 200 projects. These supplement approximately 20,000 additional compatible units deployed globally by independent research teams, many of them formal partners of OTN and linked through compatible data systems. OTN addresses critical questions of both regional and global relevance, such as migratory pathways of aquatic species, identification of marine 'hotspots' for consideration of marine protected areas, and the monitoring of offshore oil and gas infrastructure impacts on vulnerable habitats. OTN supports coastal communities, fisheries managers and policy makers, guiding informed aquatic management decisions across all

levels of government. In partnership with marine industry partners, government and researchers, OTN operates a fleet of autonomous marine gliders to track aquatic animals, collect oceanographic data, and continuously develop its technology research. OTN operates Slocum Electric Gliders and Canada's first Wave Glider, which carry animal tracking devices. The Wave Glider is also used to harvest data from moored acoustic receivers, and to transmit the data back to base, reducing ship time costs and increasing safety of field personnel. OTN gliders have recently been equipped with passive acoustic monitoring systems to identify the presence of marine mammals such as right whales from their calls, and with sonar systems to document whale food supplies.

OTN has developed a sophisticated system to store and make accessible data from electronic tagging studies. The data system has been recognized as an Associate Data Unit of the International Oceanographic Data and Information Exchange (ADU-IODE), the only one globally for marine animal electronic telemetry. The data platform has seen a rapid and sustained increase in its user base—acoustic detection records have grown from 1.3 million in 2010 to 120 million in 2015 (200% growth rate per year), and the number of investigators using the platform has increased at an average rate of 16% per year since 2010. The data system is expanding globally through the development of regional tracking data nodes built on the open architecture of the OTN system and linked to the OTN data structure. This includes nodes for Africa (the Indian Ocean and South Atlantic Ocean, South African Institute for Aquatic Biodiversity, Rhodes University); Europe (VLIZ, Belgium); South America (beginning in Brazil, Federal University of Rio Grande); the U.S. (nested within U.S. Integrated Ocean Observing System (IOOS)), as well as for the Canadian-U.S. Great Lakes Acoustic Observation System (GLATOS), and the Australian



Figure 9. Charts showing increase of detection records and investigators over time.

IMOS Animal Tracking program. This regional approach improves data quality assurance and quality control (QA/QC) as the veracity and validation of raw data is best done locally. By building the international systems to common templates, OTN assures fully operational and coherent internode transfers of information.

OTN is a Canadian partner in the Horizon 2020 funded European AtlantOS ocean observation project, and works closely with U.S. IOOS. The OTN has been supported primarily by the Canada Foundation for Innovation (CFI), the Natural Sciences and Engineering Council of Canada, and by contributions from international partners. OTN's core funding from CFI is up for renewal in March, 2017.

See Part 2 - Asian and Oceania in next months ON&T.

For more information about this update article or to make a contribution, contact dkocak@mtsociety.org.



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OFFSHORE INDUSTRY

Fugro deploys additional resource for largest seep-hunting survey



Fugro has deployed multi-purpose offshore survey vessel Fugro Gauss to join the Fugro Brasilis offshore Mexico, to help complete the world's largest seep-hunting survey for multiclient geoscience data company, TGS.

Both Fugro vessels are using hull-mounted multibeam echosounders (12 kHz on Fugro Gauss and 30 kHz on Fugro Brasilis) and subbottom profiler systems to map an area of approximately 625,000 sq. km in the deep waters of Mexico. The data acquired will assist in identifying sites where deep hydrocarbon-rich fluids are escaping to the seafloor and will be used to target hundreds of sites for coring and geochemical analysis.

"Fugro has a dedicated centre of excellence in Houston for seep-hunting," explained Jim Gharib, Fugro's Global Product Line Manager for Seep Studies. "The team includes several of the world's leading geoscience experts responsible for bringing seep-hunting to the offshore industry. Our recent successes include nine seep data collection and geochemical analysis projects in the Gulf of Mexico, the Caribbean and Southeast Asia."

The survey is being conducted for TGS as part of its industry-funded, multi-client "Gigante Survey," which also includes a regional 2D seismic survey of approximately 186,000 km, gravity and magnetic data and a regional seismic structural interpretation. TGS aims for this project to be the most comprehensive and modern offshore Mexico dataset that ties into its existing U.S. Gulf of Mexico regional 2D grid. The survey is designed to assist exploration and production companies in their evaluation of prospectivity offshore Mexico during forthcoming licence rounds. Interest in this area is high following the denationalisation of Mexico's oil and gas market after seven decades of government control.

For more information, visit www.fugro.com.

Technip awarded MSA for SCT&E LNG's Monkey Island project

Technip has been awarded a Master Services Agreement (MSA) by SCT&E LNG, Inc. for their proposed 12 mtpa(1) Liquefied Natural Gas (LNG) export terminal located on Monkey Island, in Cameron Parish, Louisiana.

The MSA will be utilized to execute engineering services necessary to develop the project, including the Front End Engineering Design (FEED) and supporting the Federal Energy Regulatory Commission (FERC) process.

in this section

Offshore Industry Headlines	37
Upstream Oil & Gas	42
Underwater Intervention	46
Maritime Communications	52
Subsea Cables	56

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.

"The industry continues to lead the way on emissions reductions because it is good for the environment and good for business," said API managing counsel John Wagner. "Even as oil and natural gas production has risen dramatically, carbon emissions have fallen, thanks to industry leadership and investment in new technologies. Greater use of clean, affordable natural gas has pushed carbon emissions from power generation to their lowest level in more than 20 years.

"Consumers and businesses are seeing significant savings through lower energy costs largely driven by the revolution in U.S. shale energy production. The implementation of duplicative and costly regulations could discourage natural gas production, disrupt our progress reducing emissions, and increase the cost of energy for American consumers."

In addition to API, several industry groups and a coalition of 14 states have filed to sue the EPA, calling on the D.C. Circuit Court of Appeals to assess the EPA's rule on the grounds that the agency has exceeded its statutory authority.

Bibby Offshore continues North Sea success with multimillion pound contract win

Bibby Offshore, a leading subsea services provider to the oil and gas industry, has announced a multimillion pound contract win with an independent UK-based E&P company, to provide air diving, and ROV inspection and construction services across five of its North Sea assets.

The contract, which commenced in June 2016 and is to be completed by the end of the year, will see Bibby Offshore utilise several vessels including its construction support vessel Olympic Ares, diving support vessel Bibby Topaz and subsea support and construction vessel Olympic Bibby.

The vessel based engineering work involves Bibby Offshore installing a cathodic protection system on one platform and performing air diving services to complete routine and non-routine inspection, repair and maintenance support at three other facilities. The company will also carry out routine pipeline inspection surveys at all five assets.

OFFSHORE INDUSTRY HEADLINES

Research & Development • Environmental Assessment • Discovery

The total liquefaction capacity for the SCT&E LNG project is 12 mtpa and will be achieved through three identical 4 mtpa natural gas liquefaction trains, with the necessary utilities, storage, and marine facilities.

For more information, visit www.technip.com.

Claxton awarded decommissioning contract

Claxton, an Acteon company, has been awarded a contract with Statoil to provide “rigless recovery” of seven abandoned wells on the Huldra platform, located in the Norwegian Continental Shelf.



The contract was finalized in July 2016, and work is scheduled to commence in December 2016 with the project due for completion within 21 days. Claxton is responsible for a full scope of decommissioning work, including project planning, severance, and full multiple string recovery.

Laura Claxton, managing director said, “Claxton performed the world’s first rigless platform well abandonment campaign on the Esmond, Forbes and Gordon field in the North Sea in 1995 and have completed more than 280 cutting and recovery projects since.”

Conductor and casing severance for the Huldra project will be performed using the latest evolution Claxton recovery tower and its abrasive cutting system ‘SABRE.’ The SABRE unit and all ancillary equipment are NORSOX compliant to Z-015, with the recovery tower having a safe working load of 300 Te with a modular system footprint design that minimises rig-up time and complexity.

For more information, visit www.claxtonengineering.com.

Wood Group awarded subsea master service agreement extension by Apache

Wood Group has been awarded an extension to its master service agreement (MSA) contract with Apache Corporation in the North Sea. Wood Group will continue to deliver subsea engineering and consultancy services in support of Apache’s routine operation and maintenance works as well as detailed engineering for future subsea developments across its entire North Sea portfolio: the Forties and Beryl areas, Scottish Area Gas Evacuation (SAGE) pipeline, and the onshore SAGE facility at St Fergus.

September 2016

38

Ocean News & Technology

The first targetless DP sensor optimised for positioning and station keeping at a wind turbine



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- No false reflections – immune to ‘walk-off’ incidents
- Additional form of redundancy
- Small and lightweight sensor design
- DP feed for approach and station keeping
- Operating range of up to 300m

Effective immediately, the contract includes two 1-year extension options. Wood Group has held this service agreement with Apache since 2012 and supported on a number of key projects in the North Sea, including the Forties Subsea Isolation Valves (SSIV) project, the Aviat development and most recently the Ness Nevis development.

Robin Watson, Wood Group chief executive said: "The extension of this contract to provide our technical solutions support across Apache's North Sea portfolio is testament to our strong, collaborative working relationship with Apache and their confidence in our high standard of service delivery. We look forward to bringing Wood Group's breadth of subsea consultancy and detailed engineering knowledge and expertise to support this key client in enhancing and optimizing their current assets and effectively delivering future subsea developments in the North Sea."

For more information, visit www.woodgroup.com.

Shell announces Fort Sumter discovery in Gulf of Mexico

Shell announced a new exploration discovery in the deep water U.S. Gulf of Mexico. The initial estimated recoverable resources for the Fort Sumter well are more than 125 million boe. Further appraisal drilling and planned wells in adjacent structures could considerably increase recoverable potential in the vicinity of the Fort Sumter well.

Fort Sumter was safely drilled in the Mississippi Canyon Block 566, located approximately 73 mi (117 km) offshore southeast of New Orleans, in a water depth of 7,062 ft (2,152 m) to a total vertical drilling depth of 28,016 ft (8,539 m) measured depth. The block is 9 sq. mi (23 sq. km) in size and is operated by Shell (100%). An appraisal sidetrack well was later drilled to a depth of 29,200 ft (8,900 m) measured depth.

Shell's material discovery in this heartland builds upon recent Norphlet exploration success at the Appomattox (2010), Vicksburg (2013), and Rydberg (2014) discoveries, bringing the total resources added by exploration in the Gulf of Mexico for Shell since 2010 to around 1.3 billion boe.

Shell global deep water, which is a growth priority for the company, currently produces around 600,000 boe per day, and production is expected to increase to about 900,000 boe per day by the early 2020s from already discovered, established reservoirs.

For more information, visit www.shell.com.

Aberdeen Drilling Consultants awarded contract by BP

Aberdeen Drilling Consultants (ADC) has been awarded a contract by BP to provide engineering services globally.

ADC will provide support in more than 14 countries worldwide. It will deliver rig site assessments at all stages of operations, technical and marine assurance audits, dropped object / incident investigations, oversight of brown-field upgrades to drilling facilities, and

oversight of repairs and upgrades to rigs during Special Periodic Surveys.

The company credits an ongoing commitment in training and development, despite ongoing market conditions, as a major contributing factor to this recent award. Having developed an internal training programme for employees, it has also launched a series of virtual training courses, which have been accredited by the International Association of Drilling Contractors.



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BP Trinidad and Tobago and Atlantic sanction Trinidad onshore compression project

BP Trinidad and Tobago LLC (bpTT) and Atlantic LNG (Atlantic) announced the successful sanction of the Trinidad Onshore Compression (TROC) project.

After finalization of key project agreements between the Atlantic shareholders, the National Gas Company of Trinidad and Tobago and other directly impacted upstream stakeholders, the TROC Project received final approval on 26 July 2016.

The project is 100% funded and owned by bpTT and will be operated by Atlantic. It is designed to increase production from low-pressure wells in bpTT's existing acreage in the Columbus Basin using an additional inlet compressor at the Point Fortin Atlantic LNG plant. Additional upgrades will be made to bpTT's upstream facilities as well as those of third parties to accommodate operations of the compressor.

The majority of the construction work will be handled by Atlantic with

BP and other shareholder representation. The mechanical completion and commissioning of the TROC compressor at Atlantic will take place over the next few months and start-up is planned for early 2017. When it comes on stream, the TROC project has the potential to deliver approximately 200 million standard cubic feet of gas per day in 2017.

BP Trinidad and Tobago regional president Norman Christie commented: "The TROC project is another demonstration of bpTT's long-term commitment to Trinidad and Tobago. It is also a clear example of bpTT, the Government and many key players in the oil and gas industry cooperating to improve production and revenue for Trinidad & Tobago. The investment by bpTT has been significant and will result in increased gas accessibility from our offshore fields to help alleviate the current gas supply shortfalls. We are pleased that the project is progressing and look forward to the start-up of the compressor in early 2017."

For more information, visit www.bp.com.

ExxonMobil to acquire InterOil

Exxon Mobil Corporation and InterOil Corporation recently announced an agreed transaction worth more than \$2.5 billion, under which ExxonMobil will acquire all of the outstanding shares of InterOil.

"This agreement will enable ExxonMobil to create value for the shareholders of both companies and the people of Papua New Guinea," said Rex W. Tillerson, chairman and chief executive officer of Exxon Mobil Corporation.

"InterOil's resources will enhance ExxonMobil's already successful business in Papua New Guinea and bolster the company's strong position in liquefied natural gas."

InterOil Chairman Chris Finlayson said, "Our board of directors thoroughly reviewed the ExxonMobil transaction and concluded that it delivers superior value to InterOil shareholders. They will also benefit from their interest in ExxonMobil's diverse asset base and dividend stream."

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

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Deep Down receives orders valued at over \$3 million

Deep Down, Inc., an oilfield services company specializing in deepwater and ultra-deepwater oil production distribution system support services, announced it has received orders for flying leads and umbilical accessories, valued at over \$3 million, directly from two major operators.

The equipment is scheduled to be delivered and deployed in the Gulf of Mexico in the first half of 2017.

Ron Smith, chief executive officer of Deep Down, Inc. stated, "These awards represent a major milestone for the company. We have previously provided similar equipment for the same operators through original equipment manufacturers, but this is an example of the opportunities available due to the low oil prices, where the operators are realizing significant savings by coming directly to us."

For more information, visit www.deepdowninc.com.

Shell to lay off 200 GoM rig workers

Shell has said that it plans to cut about 200 jobs from its Gulf of Mexico deepwater operations.

"We are making these changes in order to remain competitive and better position Shell's Gulf of Mexico projects for future growth," spokeswoman Kimberly Windon told the AP.

The personnel affected will come from nine facilities and reduces Shell's workforce in the region by 25%. Earlier this year, Shell announced plans to trim its workforce by 2,200 persons worldwide.

API: U.S. energy model shows more oil and natural gas production creates jobs, benefits consumers, and reduces emissions

API president and CEO Jack Gerard highlighted the benefits that come from increased oil and natural gas production after Democratic Presidential Nominee Hillary Clinton delivered her remarks at the party's convention.

"The production of energy resources holds great promise for our nation when it comes to creating jobs and benefitting consumers. It's estimated that women and minorities will fill an exceptional number of the nearly 1.9 million jobs projected in the oil, natural gas, and petrochemical industries by 2035. And last year, American families saw higher household disposable income from increased energy production," said Gerard. "Americans understand that pro-growth energy policies will create jobs and shrink the income inequality gap and it's up to our nation's leaders to follow the will of the American people."

A recent poll found that 77% of vot-

ers, including 94% (R), 73% (I), and 64% (D), strongly support increased production of oil and natural gas resources located in the U.S. and 69% of voters, including 86% (R), 69% (I), and 57% (D), are more likely to support candidates who want to produce more domestic U.S. oil and natural gas resources. The same poll found that 71% of voters, including 83% (R), 67% (I), and 60% (D), oppose legislation that could potentially raise energy costs on American consumers.

API is the only national trade associa-

tion representing all facets of the oil and natural gas industry, which supports 9.8 million U.S. jobs and 8% of the U.S. economy. API's more than 650 members include large integrated companies as well as exploration and production, refining, marketing, pipeline, and marine businesses, and service and supply firms. They provide most of the nation's energy and are backed by a growing grassroots movement of more than 30 million Americans.

For more information, visit www.api.org.



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Deep Casing Tools deploys first system in Iraq

Casing and completion tool specialist Deep Casing Tools has continued its Middle East expansion with a successful deployment of its unique drillable turbine technology in Iraq.

The company's 7 in. Turbocaser Express™ high-speed reaming system was deployed recently for a client who had experienced previous liner running issues. The Turbocaser Express™ reamed through multiple problematic areas overcoming reactive shale and limestone stringers. Following a successful cement program, the Turbocaser Express™ was quickly and successfully drilled out with a PDC (polycrystalline diamond compact) bit and the next section was drilled during the same run.

For more information, visit deepcasingtools.com.

Osbit delivers £3M worth of equipment for installation on Siem Helix 1 vessel

Leading UK offshore engineering company, Osbit Ltd has successfully completed and loaded out £3 million worth of well intervention equipment to Helix Energy Solutions, for installation in Schiedam on Helix's chartered Siem Helix 1 vessel.

The multi-million pound deliveries are a major milestone in a series of projects awarded to Osbit last year, to supply around £11 million worth of equipment for the Siem Helix 1, Siem Helix 2 and Q7000 vessels.

The equipment, weighing over 300 t in total, consists of a BOP Maintenance and Storage Tower, Intervention Tension Frame and Moveable deck. The three systems will be installed on to Siem Helix 1 this week, ahead of the vessel being deployed in Brazil on a long-term well intervention services charter for Petrobras. A second suite of identical systems will follow later in the year for the Siem Helix 2 vessel.

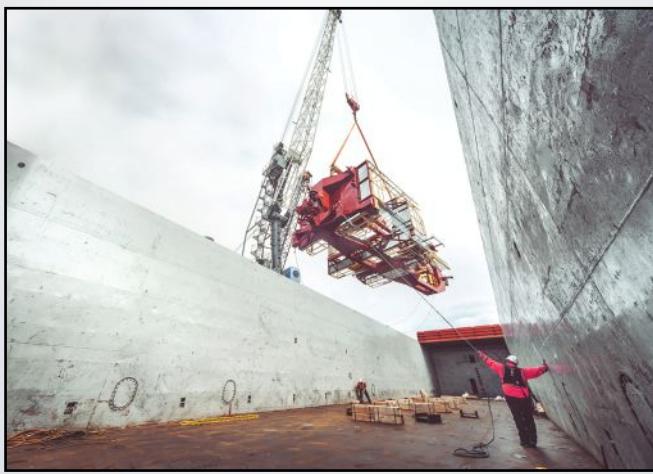
The Maintenance Tower offers a safe environment to assemble and maintain subsea equipment, incorporating a 125-T capacity lifting system to enable progressive assembly of stack modules.

The Intervention Tension Frames (ITF) represents a significant advance in safety and operability of coiled tubing and wireline operations on the vessels. Developed in close collaboration with Helix, each ITF provides a safer working environment from which coiled tubing and wire line operations can be conducted. The ITF has three platform levels for personnel to safely and efficiently conduct operations using dedicated skidding systems.

Continuous safe access to the ITF is possible via telescopic gangway, also designed and built by Northumberland-based Osbit. The gangway links the ITF to the Maintenance Tower and removes the need for engineers to use rope access methods to operate the well intervention systems mounted within the ITF.

The Moveable Deck, which will be installed adjacently to the Maintenance Tower, is a specialised mezzanine deck to provide an additional support and work area over the vessel's moon pool.

For more information, visit www.osbit.com.

**Large deposits of gas hydrate found in Indian Ocean**

The deepwater vessel Chikyu as deployed during NGHP-02 was designed by the Japanese government for international scientific drilling operations (Image: JAMSTEC).

A research partnership between the Government of India, the Government of Japan, and U.S. scientists has resulted in a discovery of "large deposits of potentially producible gas hydrate" in the Indian Ocean.

The international team of scientists was led by the Oil and Natural Gas Corporation (ONGC) of India on behalf of the Ministry of Petroleum and Natural Gas India, in cooperation with the U.S. Geological Survey (USGS), the Japanese Drilling Company, and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC).

The USGS said it has assisted the Government of India in the discovery of large, highly enriched accumulations of natural gas hydrate in the Bay of Bengal, the first discovery of its kind in the Indian Ocean that has the potential to be producible.

"Advances like the Bay of Bengal discovery will help unlock the global energy resource potential of gas hydrates as well as help define the technology needed to safely produce them," said Walter Guidroz, USGS energy resources program coordinator.

The scientists from India, Japan, and the U.S. conducted ocean drilling, conventional sediment coring, pressure coring, downhole logging and analytical activities to assess the geologic occurrence, regional context and characteristics of gas hydrate deposits offshore India.

"The results from this expedition mark a critical step forward to understanding the energy resource potential of gas hydrates," said USGS senior scientist Tim Collett, who participated in the expedition.

"The discovery of what we believe to be several of the largest and most concentrated gas hydrate accumulations yet found in the world will yield the geologic and engineering data needed to better understand the geologic controls on the occurrence of gas hydrate in nature and to assess the technologies needed to safely produce gas hydrates."

For more information, visit www.usgs.gov.

Drilling for replenishment of Snøhvit gas

The Songa Enabler drilling rig has started drilling a new injection well for CO₂ gas on the Snøhvit field off the coast of Hammerfest. Next, a production well will be drilled for replenishment of gas for Hammerfest LNG.

Snøhvit is still the only LNG project in the world capturing and storing CO₂ separated from the well stream in a dedicated formation offshore.

So far more than four million tons of CO₂ from Snøhvit have been stored. The stored CO₂ is being monitored in order to ensure that it does not mix with the main producing reservoir. A new CO₂ injection well is now required.

After the new CO₂ injector is installed, the rig will move on to drill the first new production well at Snøhvit since the field came on stream in 2007. The drilling campaign is planned to last until Christmas.

The CO₂ solution project was established in 2013 in order to build and install a new CO₂ injection well, replacing the original injector that over time would leak CO₂ into the gas reservoir on the Snøhvit field.

"Hammerfest LNG needed replenishment of gas in order to maintain the high production and capacity utilization at the plant, while ensuring sustainable CO₂ storage. This project is therefore important to Statoil," says Geir Owren, asset owner representative for the project.

In the summer of 2015 an extensive marine campaign was performed. Pipelines and a template for the CO₂ project were installed and tied in to the existing subsea facility on the Snøhvit field. The new subsea facility was built and installed without injuries and well within the budget of NOK 2.5 billion.

"The distance to the Barents Sea presents extra challenges with regard to mobilization and sailing time, which requires careful planning, thorough preparations, and close cooperation with the suppliers. We are pleased both with the equipment suppliers and marine operations, which resulted in successful project implementation," says project leader Sveinung Øvreteit.

The next big development step for Hammerfest LNG is the development of the Askeladd field, which is part of the plan for development and operation of the Snøhvit license. It is expected to come on stream in 2020/2021. This development step will help ensure full utilization of the capacity at Hammerfest LNG.

For more information, visit www.statoil.com.

DNV GL wins in-service verification work for Wintershall Noordzee BV

DNV GL has been awarded a 5-year contract to provide in-service verification work for Wintershall Noordzee B.V.'s (WINZ) RAVN and A6-A platforms.

The two platforms based in the North Sea are the unmanned RAVN in the Danish sector and manned A6-A in

the German sector. RAVN is the first field in Denmark that Wintershall Noordzee will transition to the production phase as operator. The A6-A platform is undergoing a major overhaul, with WINZ extending it to include an oil processing plant alongside the current gas condensate facilities.

DNV GL's scope of work will cover

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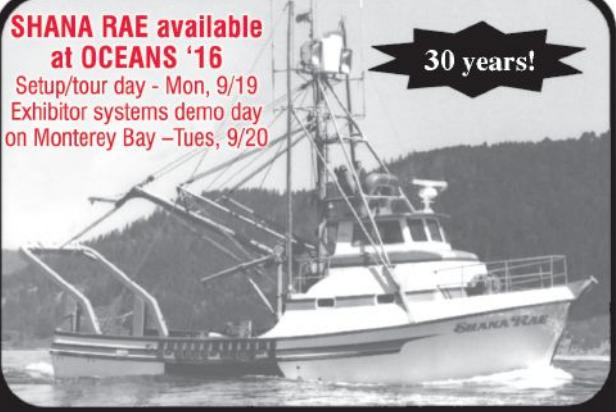
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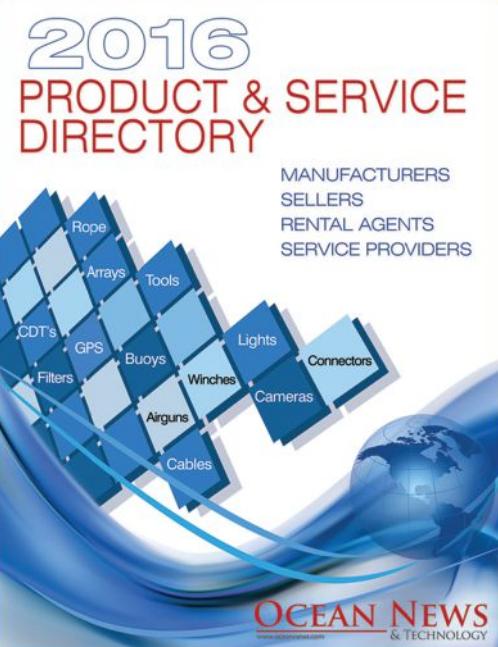
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the Independent Verification of Management of Safety and Environmentally Critical Elements (SECEs). This will include independent verification activities as detailed in the Written Scheme of Verification for RAVN and the A6-A installations. This involves a combination of onshore review of assurance records (i.e., certification, maintenance activities and integrity management activities), physical survey and witness of off-shore/site activities. The main focus will be on the onshore review activities with a tailored offshore scope.

The work undertaken will be based on new EU Directive (2013/30/EU) on Safety of Offshore Oil and Gas Operations, which aims to reduce the risk of major accidents associated with offshore oil and gas operations. The Directive requires owners and operators to prevent and mitigate the impact of major accident hazards through the implementation of a systematic and effective approach to risk management.

For more information, visit www.dnvgl.com.

Kongsberg wins EPC contract for two heavy lift/accommodation units

Kongsberg Maritime has been awarded significant offshore EPC contracts with China Merchants Heavy Industries (CMHI). The contracts, worth more than NOK 520 million, cover deliveries to two semi-submersible heavy lift & accommodation vessels—OOS Serooskerke and OOS Walcheren—to be built at CMHI (Jiangsu) in Haimen, China for Serooskerke Shipco BV / Walcheren Shipco BV in the Netherlands.

Kongsberg Maritime, together with its wholly owned subsidiary Kongsberg Maritime Engineering (KME), will execute the project. KME will provide all engineering, procurement and project management while Kongsberg Maritime will supply a ‘full picture’ system delivery. The vessels are based on a similar design to the OOS Gretha (pictured) currently operating for Petrobras in Brazil. Due to the heavy lift capability, the vessels are well positioned to enter the de-commissioning market of offshore production platforms worldwide.

The contracts include supply and integration of the electrical, telecom and integrated control systems; project management; interface management; and engineering services at all stages. In addition, a significant technology scope of supply includes: switchboards, frequency converters, automation, navigation & DP systems, radio and satellite communications, networking and on-board entertainment, safety technology and



monitoring systems such as the advanced environmental monitoring system. The engineering and construction phase is estimated to be 3 years for the first vessel and the delivery of the second vessel will be 9 months later.

"We are very pleased that we can supply a tailor made EIT (Electrical, Instrument and Telecom) solution for the yard and owner with a large scope of both in-house and procured technology," says Egil Haugsdal, president, Kongsberg Maritime.

"The current market conditions are challenging, the competition is strong and we are very pleased to have secured these contracts. It is a clear demonstration of our capabilities in this field and the project will keep employees engaged both in Norway and China," says Haugsdal.

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

New personnel transfer carrier from Reflex Marine

Reflex Marine, a global leader in safe marine access solutions, launches its latest innovation, WAVE-4.



The company's dedication to safety and innovation over the last 20 years has led to the improvement of safety standards for personnel transfers across the globe. Now Reflex Marine are adding a new device to their range to meet the needs of their diverse client base.

WAVE-4 captures over 20 years of learning, experience and feedback from the industry. This new personnel carrier for standing passengers offers fall prevention and impact protection and has floating and self-righting capabilities.

All Reflex Marine carriers are subject to the most rigorous testing of any personnel transfer carrier in the industry. Testing and verification ensures passengers are protected from the four

key risks of personnel transfer by crane, falling, heavy landings, side impacts and immersion.

The company put considerable focus into improving the ownership experience, making the product more durable and simplifying inspection and maintenance. High costs and significant product downtime was common feedback from owners

of existing standing transfer devices.

Reflex Marine clients can now benefit from a full range of transfer solutions for different sea states, crew volumes and preferences. Clients continue to be supported globally by the company's network of approved partners.

For more information, visit www.reflexmarine.com.

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Next Geosolutions surveys Roman Mediterranean ports

Next Geosolutions, an independent geoscience and engineering service provider, has secured a €1.25 million (£1 million) mapping and survey contract with Naples Port Authority for the Archaeological Sites Mapping Project, based in the Port of Naples.

The project, which commenced in July and is due for completion by December 2016, will see Next Geosolutions carry out marine survey techniques including high-resolution bathymetry, morphology, shallow geology and magnetometric surveys of the Port's internal waters. The interpretation of the sea bed will provide a foundation for accurate mapping on a large scale.

Carlo Pinto, Next Geosolutions sales and marketing director said: "Securing this contract with Naples Port Authority is of strategic importance to Next Geosolutions and enables us to further develop our capabilities within the marine survey market. It reinforces our key objective: to fully appreciate our clients' requirements and provide them with high quality solutions."

"Application of geophysical survey techniques is best practice for detailed mapping of archaeological features on known archaeological sites, and within the Port of Naples, previous underwater and aerial surveys have shown numerous submerged archaeological remains."

Marine archaeologists and professional divers will use their knowledge and expertise to evaluate Next Geosolutions findings after excavation and exploration of the underwater sites. There is the possibility that findings may range from the Roman Imperial Period to WWII.

Mr. Pinto continued: "This is an exciting workscope for Next Geosolutions; we're delighted to have the opportunity to contribute to this project and have combined methodologies and innovation to ensure invaluable results for our client."

For more information, visit www.nextgeosolutions.com.

All Oceans new ROV

All Oceans Engineering of Aberdeen, Scotland went public in February 2016 with the fact that they were developing a new small ROV. They didn't say how big it was, but they did qualify it as reinforcing the company's position at the forefront of Fly-out ROV systems and technology.

They added that it would also be available as a surface deployed system. They have now released details of their new vehicle, the MAC-ROV, and a range of deployment options.

For more information, visit http://alloceans.co.uk/downloads/Introducing_the_MAC-ROV_-_D.pdf.



Mediterranean excursion for Applied Acoustics' deep tow sparker



The Applied Acoustics deep-tow sparker, the DTS-500, has recently been deployed in the Mediterranean Sea, off the continental slope of Majorca, working on a project with SOCIB, the Balearic Islands Coastal Observing and Forecasting body. Assisted by SOCIB's oceanographic instrumentation technician, Carlos Castilla Álvarez, the DTS-500 was deployed in deep water, up to 500 m, at a distance up to 1 km from the SOCIB research vessel.

"We achieved greater than 60 m penetration and with increased data resolution, up to 15 cms, the sub-bottom profiling results were excellent across the full-working depth range of the DTS-500," stated project leader, Neil MacDonald.

"We also deployed multiple positioning beacons, the new Applied Acoustics' new 1100 Series, on both the tow-cable and towfish and used the recently launched Nexus 2 USBL positioning system with similar excellent results," he added.

Designed for high and ultra-high resolution geophysical surveys, the DTS-500 operates from a single industry standard coaxial tow cable up to 2,000 m in length and has long-life durable electrodes and integral hydrophone receiver.

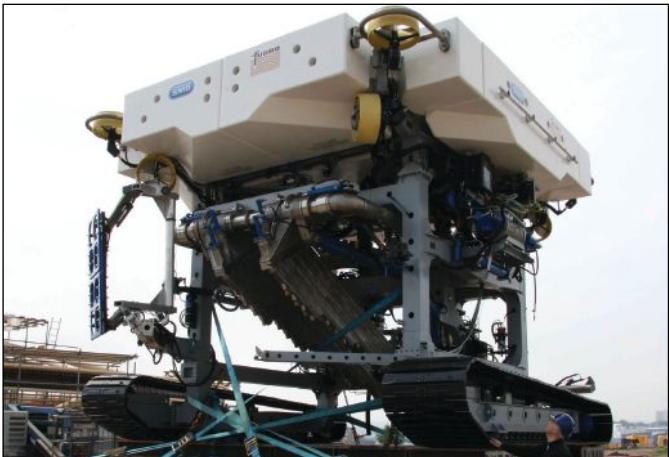
The complete system consists of a rack mount surface console, cable and robust towfish. It easily interfaces with standard data-loggers and benefits from all the full safety interlocks expected from the company that has been at the forefront of this technology for more than 20 years.

For more information, visit www.appliedacoustics.com.

Fugro deploys its Q1400 trenchers at three North Sea oil and gas projects

Following successful delivery of recent cable-lay and trenching projects for the renewables sector, Fugro has secured three contracts for its trenching services for oil and gas clients. The contracts will see its high performance Q1400 trenching systems deployed in the North Sea over the next 12 months.

At the Wintershall-owned Maria development in the Norwegian sector of the North Sea, Fugro will deploy the Q1400 trenching system under a contract with Subsea 7. At Det norske's Ivar Aasen development, the system will be deployed for EMAS CHIYODA Subsea in June. For both



projects, the trencher will operate in jetting mode for burial of pipelines, power cables and umbilicals.

In the UK sector, a contract with Bibby Offshore will see Fugro's Q1400 trencher operating in both jetting and cutting modes to bury a new umbilical at the BP ETAP redevelopment.

"Since launching the Q1400 system in 2012, Fugro has successfully completed numerous trenching projects at oil and gas developments and more recently at offshore wind developments. We are looking forward to continuing to demonstrate how our trenching capabilities can bring benefits to clients in both sectors," said Mike Daniel, construction and installation manager at Fugro Subsea Services.

For more information, visit www.fugro.com.

SeaTrepid awards ASV & Denith with build of 6 USVs and 2 USV LARS

SeaTrepid has developed a multiple autonomous vehicle program that has been branded "Ocean Infinity." The program will conduct wide area high-resolution surveys in shallow to ultra-deep waters resulting in a force multiplier of up to 6x above traditional methods. The flotilla, made up of six AUVs and six USVs, has the ability to be deployed from a single Host Support Vessel (HSV) to perform different mapping and exploration operations subsea. Developed with a modular design for rapid response, two complete AUV systems can be sent anywhere in the world in order to commence emergency operations while the HSV is in transit to the emergency location.

In January 2016, SeaTrepid initiated the development of the AUV program with the procurement of six 6,000 m Hugin AUVs manufactured by Kongsberg Maritime (KM). In early July, SeaTrepid awarded ASV Global Ltd. a contract to design and build six USVs for tracking of the subsea vehicles. Simultaneously, SeaTrepid awarded Denith Engineering with the design and build of two USV launch and recovery systems (LARS) for the deployment and recovery of the ASV-designed USVs. Each USV LARS will accommodate three USVs per system.

The USVs are designed with two diesel powered engines per vehicle featuring endurance of greater than 140 hours. The USVs will be equipped with KM Marine Broadband Radios (MBR) for radio frequency telemetry between the HSV and USV, and KM HiPAP 502s for acoustic telemetry and positioning between the USV and AUV. The USVs will



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include advanced collision avoidance and standard navigation sensors. Dan Hook, managing director, ASV Global said, "We are delighted to be supplying six new USVs into this ground-breaking project. The SeaWorkers have been designed specifically as a ruggedized workboat, capable of carrying large payloads and handling varying weather conditions and water depths. The ASView™ Control System will allow for the reliable and safe operation of the six vehicles."

Denith Engineering has designed a slewing davit LARS capable of rotating 180° with three carriages for deck storage of the USVs. Robert Denovan, founder and CEO of Denith stated, "We feel that a new challenge is a gift from our clients to drive our continual improvement."

SeaTrepid is offering a turnkey solution that is a flexible survey sensor delivery system from the surface to the deep ocean seafloor. This innovative program offers a cost-efficient method by lowering the vessel supported operations cost (per unit area surveyed). The program is projected to be launched mid-2017 with first operations off the coast of Africa.

For more information, visit www.seatrepid.com.

University of Haifa orders Saab Seaeye's most powerful ROV

Israel's University of Haifa has ordered a Saab Seaeye Leopard, the most powerful electric ROV of its size in the world.

The University says that having no other technological platform like it in Israel, the Leopard will be a key resource for a new deep-sea research centre which opened recently.

The purchase was enabled thanks to the generous support of The Leona M. and Harry B. Helmsley Charitable Trust to the University of Haifa. The ROV will serve the entire marine research community in Israel through the national consortium of universities, colleges and government research institutes called the Mediterranean-Sea Research Center of Israel (MERCI).

The 3,000 m-rated Leopard will make the consortium the first entity in Israel to offer such a resource to anyone looking to work in both shallow and deep water.

The focus will be on scientific study, education and research including environmental monitoring, marine archaeology and other types of marine research, says Ben Herzberg, chief engineer from The Helmsley Charitable Trust Mediterranean Sea Research Center, Leon H. Charney School of Marine Sciences at the University of Haifa.

He also sees it being of interest to operators in Israel's relatively new oil and gas sector, along with other collaborative projects.

In choosing the Leopard, says Ben Herzberg, they evaluated a range of ROVs from different manufacturers.

"We opted for the Leopard, not just because of its technological excellence and Saab Seaeye being the largest manufacturer of electric ROVs in the world, but also because uni-

versities and scientific users we contacted gave Saab Seaeye the best and most positive feedback."

He adding, "They had a more trusted reputation for robust and reliable systems, compared with other ROV manufacturers, and they offered the best service."

For the University of Haifa, the Leopard's 11-strong thruster power and iCON intelligent control architecture allows them to handle a variety of systems of heavy and variable loads by providing flight stability, including pitch and roll stabilisation, even whilst working in strong cross-currents and also gives them precise manoeuvrability inside complex structures.

To offer the University of Haifa a variety of user options, the Leopard's iCON building-block capability and large open payload bay with sliding trays for rapid reconfiguration and easy maintenance, allows more interchangeable tooling and survey sensors to be fitted than ever before possible in a vehicle of its size.



As iCON independently manages each intelligent device on the vehicle, including auto redundancy, it will help keep the ROV working, even with multiple equipment damage.

The operator also has greater information through iCON, making maintenance simpler and providing remote internet access for upgrades and support.

For more information, visit www.seaeye.com.

Italian Coast Guard acquire VideoRay PRO 4 ROVs

VideoRay announces that it has delivered VideoRay Pro 4 ROVs to the Italian Coast Guard, along with sonars and accessories. These will be used for many of the same tasks that the U.S. Coast Guard, which standardizes on Pro 4 systems, have accomplished for several years. A focus will be search and recovery operations, potentially dangerous tasks for which the Italian Coast Guard is frequently called upon.

VideoRays are the most popular underwater robot in the world, selling more units than all competing manufacturers. It dominates the market for homeland security operations and defense, with large fleets in the U.S. Navy, U.S. Coast Guard, Norwegian Coast Guard, Saudi Border Guard, Taiwan Coast Guard, Korean Navy and the Dutch Navy, among others.

Representing VideoRay in this highly competitive tender was iROV Underwater Services of Treviso. The managing director of iROV, Mauro Stasi, was in charge of the ROV operations during the Costa Concordia wreck removal project, where VideoRay ROVs played a crucial role. During this operation, over 50,000 hours of video were recorded by the

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VideoRay fleet over 2 years, with most operations running 24 hours a day.

For more information, visit www.videoray.com.

Unique Group's diving & life support division sells two innovative ABS Nitrox dive-ROV systems

Unique Group's Diving & Life Support team has announced orders for two of its HYRDA ABS Nitrox Surface Dive-ROV Systems to its client in Nigeria.

The systems sold each comprise a Dive-ROV control and chamber container, machinery container, air and nitrox 10 ft HP gas storage containers, two single basket LARS and a SRP boat. The systems will be ABS Classed and compliant with the latest IMCA, OGP and ExxonMobil requirements.

As an independently owned global company, Unique

Group leads the way in providing engineering expertise, sales and rental equipment and the latest technology for the diving, marine, survey, pipeline and subsea market sectors.

The Diving & Life Support division is a specialist division focusing on the design, build and installation of commercial and military diving equipment. Unique's Hydra team spent time engaging with their client to provide a diving system design that reduces the cost of the assets as well as the operation.

Bob Elshove, sales director at Unique Group's Hydra division, which is based in South Africa commented, "We are very pleased to have received this order and look forward to seeing these systems make the journey offshore and working. Through engagement with our client we are producing innovative diving systems that will reduce our client's operational costs."



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The Dive-ROV control and chamber container is fitted with a 1500 chamber and a control space with both a nitrox dive control suite and a ROV control station for a Seaeye Falcon ROV system. The control space is technically and ergonomically designed for effective co-operation between diving and ROV operations.

The machinery container is fitted with a Nuvair nitrox generation unit, two L&W HP air compressors, a Unique Hydra Tools HPU, a technician's workbench and spares storage.

Each system is supplied with two 10-ft HP gas storage containers, one for air and one for nitrox. This enables the operator to switch easily between air and nitrox diving.

The SRP Boats supplied are 7.5-m Rhino HDPE rugged workboats with diesel outboard engines. They are specifically designed for diving operations and have Unique Hydra SRP systems fitted.

For more information, visit www.uniquegroup.com.

2D imaging sonar selected by National University of Singapore's Bumblebee AUV robotics team

Teledyne BlueView is proud to support National University of Singapore's (NUS) Bumblebee Autonomous Underwater Vehicle (BBAUV) team with the M900-90 multi-beam imaging sonar. BBAUV designs and builds water-based autonomous vehicles for competition and research purposes, and to help bolster student interest in engineering, since its founding in 2012.

BBAUV has been taking part in the Singapore Autonomous Underwater Vehicle Challenge (SAUVC) and ONR's International RoboSub Competition held in San Diego and plans to take part in RobotX this year to be held in

Hawaii. BBAUV managed to clinch 2nd place amongst 40 international teams at RoboSub 2015, largely due to the P450-E imaging sonar used last year.

This year, BBAUV has designed and developed a new vehicle, the Bumblebee 3.0, and one of the main enhancements is the addition of the new M900 imaging sonar. This will double the field of view (FOV) and the range and azimuth resolutions, and its compact form factor will allow the vehicle to be more streamlined. Our sonar imagery is fused together with camera imagery from a Guppy Pro camera. This is done by using a particle filter based track before detect approach, and precise calibration, allowing Bumblebee to localize multiple objects in the water in 3D space with immense accuracy. The M900 will provide even better results for our algorithms.

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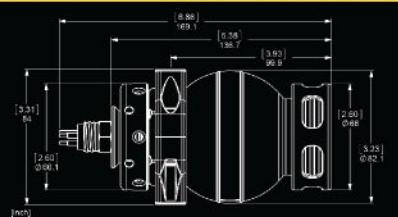
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MMA Offshore enhances maritime network connectivity

SpeedCast International Limited has been awarded by MMA Offshore Limited (MMA) a multi-year service agreement to provide high throughput connectivity across MMA's expansive global offshore vessel fleet. MMA is one of the largest marine service providers in the Asia Pacific region. Under the service agreement, MMA will be using SpeedCast's unrivaled Ku-band and C-Band global maritime network and value added maritime communication services. SpeedCast will act as a one-stop-shop for MMA communication services at sea.

Before engaging SpeedCast, MMA deployed a mixture of satellite communication services offered by various service providers.

SpeedCast will provide MMA global connectivity through its global Ku-band and C-Band network comprising of 35 different satellite beams, ensuring exceptional redundancy and network resilience as well as maximum coverage. The new services will allow fast, reliable connectivity for MMA to run business applications, data services and voice services for their crew and clients onboard.

For more information, visit www.speedcast.com.

Navarino commits over 1,200 vessels onto new Fleet Xpress service

Navarino, one of the world's leading providers of satellite communications solutions to the merchant marine market, has entered into a new agreement with Inmarsat to integrate Fleet Xpress into Navarino's existing service portfolio. Through the agreement, Navarino will bring more than 1,200 vessels to the Fleet Xpress service over a 6-year period.

Fleet Xpress, the Global Xpress maritime solution, sets a new standard in broadband maritime communications. The service delivers the highest levels of reliable high-speed broadband connectivity and exceptional performance across all of the world's oceans as well as facilitating innovative 'Connected Ship' applications.

Navarino has a global reputation for providing high-quality satellite communications products and services for the maritime industry, including the Infinity solution with a client base of more than 500 shipping companies worldwide and covering all types of merchant vessels. It has an established and steadily growing international resellers' network and offers installation capability at major ports around the world, fully supported by strategically located certified technical centers.

For more information, visit www.inmarsat.com.

Eutelsat concludes agreement with SpeedCast to sell stake in Wins

Eutelsat Communications and SpeedCast International Limited have signed an agreement whereby SpeedCast will acquire Eutelsat's 70% stake in Wins Limited for a consideration based on a total enterprise value of approximately €60 million.

Held through Skylogic, Eutelsat's wholly owned subsidiary, Wins is a provider of maritime connectivity services to passenger vessels in the Mediterranean region as well as through its German subsidiary DH-INTERCOM, a provider of principally L-band connectivity and VSAT solutions to merchant vessels. In a consolidating market, the transaction will enable Wins to benefit from the scale of a leading global network and satellite communications service provider.

For more information, visit www.eutelsat.com.



Marlink, Telemar join forces



Apax Partners has signed a definitive agreement to acquire Telemar Group from its current shareholders.

The combined activities of Telemar and Marlink will create the world's leading maritime communications, digital solutions and servicing specialist for all customer segments at sea including shipping, offshore, cruise & ferry, yachting and fishing. Marlink and Telemar customers will benefit from an unmatched integrated servicing offering, covering all existing maritime communication and navigation technologies. The newly combined group will generate US \$450 million in revenues with more than 800 employees worldwide serving at least 1 in 3 vessels operating globally.

The new group will be positioned to deliver unrivalled service excellence and support for maritime customers through an enhanced global footprint and worldwide sales and service locations. With a global 24/7 helpdesk, specialized competence centers, local presence on all continents and a network of 1,000 service points staffed by highly qualified, certified service engineers, the group will support the global maritime business to operate smarter and safer.

Earlier this year, Apax Partners completed the acquisition of Marlink, transforming it into a provider of tailored communications solutions that enable both maritime and enterprise customers to digitalize their own operations at sea and on land. The technology expertise and service delivery commitment of Marlink and Telemar, combined with established and strong satellite network operator and bridge electronics manufacturer relationships, enables the new group to bring the power of broadband communications, maritime bridge technology and service excellence to its customers globally to further optimize vessel operations and enable the digital vessel of tomorrow.

For more information, visit www.marlink.com.

Inmarsat Government awarded U.S. Navy satellite services contract

Inmarsat announced that its wholly owned subsidiary, Inmarsat Government, has been issued modification P00001 to lift the stop-work order issued due to a bid protest filed on the initial award. Inmarsat Government remains the awardee on the single award indefinite-delivery/indefinite-quantity contract issued against solicitation HC1013-14-R-0004 announced 8 September 2015. This contract supports the U.S Navy's Commercial Broadband Satellite Program (CBSP) Satellite Services Contract (CSSC). The single award consists

of a base 1-year period with four 1-year option periods through 2021.

Under the contract, Inmarsat Government will support the U.S. Navy's requirement to acquire worldwide commercial telecommunication services to include satellite capacity for mobile and fixed satellite transceivers on maritime, airborne and ground platforms as well as CT services, backhaul connectivity, monitoring and control and operations. CSSC will augment government-owned and operated telecommunication systems, providing significant improvement in data throughput and capacity redundancy to military satellite communications to meet critical mission requirements.

For more information, visit www.inmarsat.com.

Interschalt expands service network in South America

Interschalt has expanded its service network in South America through the addition of ITEC Electronica Maritima S.A.S, Colombia, and Telnav Telecommunicacoes Navais, Macaé, Brazil.

As authorized service partners, ITEC and Telnav Telecom will from now on perform the installation, commissioning, retrofitting and maintenance of Interschalt VDR systems as well as conduct annual VDR performance tests (APT) in accordance with IMO regulations. Both South American companies will also perform a broad range of maintenance work on navigation and communications equipment for their respective local market on behalf of Interschalt.

Other partnerships have been set up in addition to the service expansion in South America. In Europe, these new partners are Radio Ondas Maritime Services based in the Spanish harbor of Algeciras and S.C. ANCOM'96 S.R.L. in Constanta, Romania. In the United Arab Emirates, Elcome International of Dubai was added to a global partner network that consists of more than 50 authorized service partners in 36 countries.



Thanks to the partnerships, Interschalt customers profit from a reliable global quality. In this network, Interschalt focuses in particular on having high uniform standards. To provide continuous quality services, all technicians are trained and certified in Interschalt's own training center.

For more information, visit www.interschalt.com.

GEE completes acquisition of EMC

Global Eagle Entertainment Inc. (GEE) announced that it has completed its previously announced acquisition of Emerging Markets Communications (EMC), a leading communications services provider to maritime and hard-to-reach land markets.

The combination of GEE and EMC creates one of the world's largest providers of satellite-based connectivity and media to the rapidly growing global mobility market. GEE has established a strong track record of successfully delivering media content and connectivity to airlines, while EMC has become a top provider of connectivity to maritime and hard-to-reach land markets. When combined with EMC, GEE benefits from significant economies of scale and an enhanced global infrastructure that enables it to deliver a comprehensive portfolio of products to customers.

For more information, visit www.geemedia.com.

AST announces Long Range GSM for offshore

Applied Satellite Technology Ltd (AST) has announced AST Long Range GSM, a new cost-saving solution developed to extend the useable data range of GSM services whilst offshore. With the evolution of 2G/3G/4G GSM services and the future of 5G, the ability to receive and use these fast data services on a day-to-day basis, from anywhere, has presented a problem for the maritime industry, with limitations on offshore reach.

Satellite communications can be used when GSM signals become unstable or lost completely, but what if you could extend the useable data range of your mobile device by around 20 km further offshore?

AST carried out extensive on-board testing in order to increase the offshore range of GSM services using two specialist blue-tipped antennas and an on-board device. On one trial, test data confirmed that the useable data services of GSM failed at 3 to 4km offshore. However, by using AST Long Range

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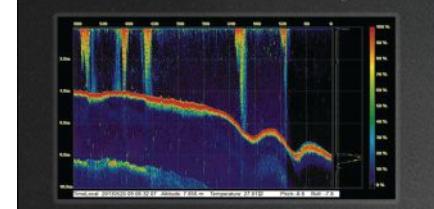


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useable GSM data facilities were seen to increase to an amazing distance of 25.94 km.

The fully integrated system also allows the user to switch to a satellite connection should it be required. Switching can be enabled simply using a control application that can be accessed via a mobile device, tablet or computer.

AST Long Range GSM offers both substantial cost savings by using a cheaper, higher speed data pipe (GSM service) for a longer period of time, and a resilient satellite communication fail over option.

For more information, visit www.ast-systems.us.com.

EMC unveils new suite of global marine VSAT services

EMC has announced a new global Ku-band VSAT package of connectivity and content for ships at sea, optimized for the next-generation high-throughput satellite (HTS) networks that are now being deployed.

"Designed with crew welfare as a top priority, the new EMC VSAT platform offers a combination of services and capabilities never before available from a single marine VSAT supplier," said Gilles Gillesen, president of EMC's commercial shipping business unit. "New features include our exclusive SpeedNet™ high-speed web browsing service, live TV programming delivered through the Ku-band network, video and entertainment on demand, and a powerful new account management portal—all wrapped up in a competitively priced package."

EMC's patented SpeedNet technology solves the age-old problem of latency in web access at sea. Using a proprietary intelligent protocol and global backbone, SpeedNet predictively fetches, compresses and pushes multiple layers of websites at once to local servers. The net result for the end-user is a browsing experience that mimics being on high-speed fiber. SpeedNet works in the background on mobile and desktop browsers to accelerate page load times dramatically. SpeedNet is built into all EMC ship installations as a standard feature, not an expensive option.

As an example, side-by-side comparison tests revealed the average time for accessing BBC.com's home page was only 4.6 seconds with SpeedNet and 21.2 seconds without it over the same satellite connection.

Starting this summer, EMC will begin broadcasting live TV program-

ming over the same Ku-band network that delivers voice and data services, using a single satellite antenna on board. The first two live TV channels to be offered are BBC News and Sport 24.

For more information, visit www.emcconnected.com.

GVF & Intellian launch certification for marine satellite communications operators

In response to strong demand for satellite-based maritime connectivity, the Global VSAT Forum (GVF) and Intellian—a leading manufacturer of stabilized communications platforms—have launched an Intellian Specialist Certification programme, including an initial course in terminal operation, GVF 562N, specifically for seafarers. Follow-on courses, intended for field technicians, will cover stabilized platform installation and maintenance.

Intellian's marine VSAT terminals offer global broadband coverage to vessels at sea. For maximum service availability, crew operators can now receive Intellian online certification training, enabling them to perform critical operational tasks after the installation technician has departed. In this way, Intellian will use the new course to support its partners throughout the world.

The new GVF 562N course, as well as its prerequisite GVF 561 (marine VSAT fundamentals), are included at no additional charge to all GVF Knowledge Center subscribers and site license holders. They are both delivered online, in a self-paced, interactive format.

For more information, visit <http://gvf.org/training>.

Ashtead secures deal with nCentric to supply cutting edge wireless technology

Ashtead Technology is to provide fast, reliable and more cost-effective broadband communications between rigs and vessels and onshore facilities following a worldwide agreement with a leader in remote communications technology.

The leading independent provider of subsea equipment rental, sales and services to the offshore industry has secured this worldwide agreement with Belgium and U.S.-based nCentric.

The deal will see Ashtead Technology supply seamless video streaming and data transmissions for large-scale, wireless dynamic mesh networks from its offices across the globe.

Tim Sheehan, commercial director at Ashtead Technology said: "Capturing data from remote locations is still a

major challenge for the industry. Today, most communications from oil and gas platforms and vessels to shore depend on expensive satellite links. The nCentric technology delivers a cost effective, efficient and reliable wireless network in large, hard-to-reach geographical areas."

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

nCentric's technology was a key component in the clean-up operation following the Deep Water Horizon disaster in 2010. By using 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 one another and create a reliable communication link.

For more information, visit www.ashtead-technology.com.

KVH offers Videotel's new Zika virus safety video free to all mariners worldwide

KVH Industries, Inc. announced that it is offering Videotel's new safety and training video about the Zika virus free to all mariners worldwide. The goal of the program is to increase awareness of the vitally important prevention measures that can keep seafarers and their colleagues and families safe. The World Health Organization (WHO) declared the Zika virus a public health emergency earlier this year. Given the global nature of the maritime industry, it is imperative that seafarers take precautions to prevent further spread of the disease. The prevalence of the Zika virus in such areas as Brazil has heightened concerns with the approaching Olympic Games in Rio de Janeiro next month.

KVH has created a dedicated website for downloading the free Zika safety video and an accompanying workbook. In addition, KVH multicast the training video to its IP-MobileCast customers on vessels across the globe, who will automatically receive the video for immediate viewing onboard. To spread the word quickly, the program includes emails targeted to a broad audience and a coordinated social media campaign.

For more information, visit www.kvh.com.

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Trelleborg introduces renewables cable protection system

Trelleborg's offshore operation recently launched its innovative protection system NjordGuard™ for the renewables market. The system is designed to protect offshore windfarm power cables in both monopile and J-tube applications.

John Deasey, renewables sales manager at Trelleborg's offshore operation based in the UK, said, "The way the industry thinks about energy and renewables has transformed and it is no longer just a concept but a reality. As the industry continues to move further offshore, we can short cut the development time needed for new concepts by transferring our oil & gas industry knowledge and expertise to renewable energy. As such, we are excited to introduce our new cable protection system NjordGuard™, specifically designed for the renewables market."

"The innovative protection system can be installed, removed and reused without the use of remotely operated vehicles or diver intervention, improving safety and reducing installation complexity," he continued. "The cutting edge solution also permits both a monopile and J-tube installation for wind turbine generators and offshore substation platforms without procedural variation."

NjordGuard™ is an innovative protection system designed and developed to protect offshore windfarm power cables. Manufactured from API 17L certified Uraduct® material for both internal and external components, the integrated system boasts class-leading impact and abrasion resistance. NjordGuard™ is designed with a smooth outer surface, which reduces drag and snagging risks. The system requires minimal assembly, is easily extendable and can be manufactured to meet any diameter cable.

For more information, visit www.trelleborg.com.

KCI designs unique offshore switch yard

With the quite limited number of kilometers on the Belgian coast line, transmission system operator Elia was thinking about doing something different, more efficient and cost effective than just bringing a cable to shore for every new wind farm. At the moment, there are already four offshore wind farms in Belgian waters and the number is foreseen to increase to nine in its final configuration.

In an international competition, KCI was awarded the Concept Verification and Basic Design of a so-called Offshore Switch Yard (OSY).

An Offshore Switch Yard could be seen as a central offshore power socket and is a completely new concept. It will combine the generation power from several offshore wind farms and bring it combined to shore.

Until now, all North Sea wind farms have been connected individually to onshore grids. But that is about to change with Elia's plan for a modular grid to which wind farms could be connected and will bring the power to shore through one single OSY. Creating a modular grid, is ideal from a technical, economic but also environmental viewpoint as it will facilitate shared use of the grid by many wind farms. Moreover, the idea for a modular offshore grid, does not limit itself to Belgian waters. Elia and its partners want to be at the basis of laying a direct current offshore grid in Europe.

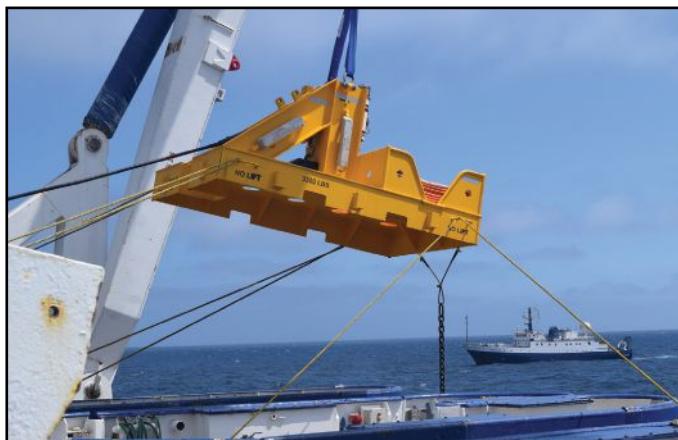
KCI has just finished the basic design of the OSY, the first design of its kind worldwide.

The outside of the OSY will look like a substation of which KCI has already designed many. The inside, however, is quite different. No transformer is needed inside the platform as the voltage of the offshore wind turbines has already been changed in the substations from medium to high voltage.

The platform will house 220 kV gas insulated switch gear and multiple submarine cable connections. Whereas a substation often has an export cable of around diameter 100 to 150 mm, the cable of the OSY will be much thicker.

For more information, visit www.kci.nl.

Global Marine completes NEPTUNE cable installation



Global Marine Systems Limited has successfully completed a complex, subsea installation project for Ocean Networks Canada on their NEPTUNE ocean observatory off the west coast of Vancouver Island.

An initiative of the University of Victoria, Ocean Networks Canada (ONC) monitors ocean environments off the west and east coasts of Canada and the Arctic for scientific research, society, and industry. One of these observatories is NEPTUNE, a subsea system that comprises an 815 km loop of fiber optic cable, which connects a number of instrument sites that undertake monitoring across a wide range of ocean environments. Global Marine's remit included the installation of four fiber optic cables with associated subsea plant on each end (mudmats).

The first phase of the project, which involved some cable recovery, was completed in October 2015. The second phase has just been completed; it presented a far greater engineering challenge. This required positioning the eight mudmats, each weighing approximately 1.8 tons, with great precision in water depths ranging from 1,240 to 2,320 m. This challenging project relied on the skill and experience of the officers and crew of the Wave Venture, who worked in combination with a second exploration vessel, Nautilus, who used its deep water ROV, Hercules, to provide touchdown monitoring of the mudmats and then connected them to the nodes and other instruments. Thanks to a high level of pre-project engineering planning and solution design, Wave Venture required only a single voyage to install the four cables and undertake some other related work.

Within the same voyage as the NEPTUNE cable installations, Global Marine also successfully completed an operation to reinstate connectivity to ONC's Barkley Canyon Node under the North America Zone cable maintenance contract. This work firstly saw the Barkley Canyon spur cable recovered with the assistance of Hercules, before Global Marine experts jointed it to the 75 m tail of the Barkley Canyon node, which was also on board Wave Venture having been previously recovered. The node itself is housed inside a protective Trawl Resistant Frame (TRF), which weighs approximately 9.2 tons in total, and this was then deployed to the seabed approximately 12 m from the Hydrates cable frame in 640 m of water, and subsequently plugged into the node by Hercules. Next, the Upper Slope Science cable was recovered ready for ONC technicians to re-terminate. Once terminated, this was then redeployed to within the required 20 m range of the node, and also plugged in by Hercules.

For more information, visit www.globalmarinesystems.com.



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- Towed HD video and still cameras
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- Meteorological measurements
- Acoustic Doppler current profiler data collection



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Nexans umbilicals to be used in Australian project

OneSubsea has ordered the umbilical and accessories from Nexans to develop the Greater Enfield development off the coast of Exmouth, Western Australia. The project, worth around 20 million euros, will be Nexans' first to be installed in Australia.

The umbilical will be manufactured at Nexans' plants in Halden and Rognan and will be delivered in January 2018. It

will be installed at a depth down to 915 m. To maximize the cost-effectiveness of the single unit umbilical it will comprise both dynamic and static sections.

The Greater Enfield Project is a joint venture between Woodside Energy Ltd and Mitsui E&P Australia Pty Ltd. The oil field is 60 km from the coast of Exmouth. The oil field will be developed using a 31-km subsea tie-back to the floating production storage and offloading (FPSO) facility. The six sub-

sea production wells and six water injection wells will produce around 69 million barrels of oil equivalent (MMboe). OneSubsea will supply sub-sea pumps for the project.

Nexans previously worked with OneSubsea on the Julia oilfield project in the Gulf of Mexico. Nexans designed, manufactured and supplied an integrated power umbilical solution and termination hardware. Production of the field started earlier this year.

For more information, visit www.nexans.com.

Hawaiki begins marine survey for 14,000-km cable

Following the commencement of a previously announced supply contract in March and a survey of landing sites from May to July 2016, Hawaiki Submarine Cable LP and TE SubCom, a TE Connectivity Ltd. company and an industry pioneer in undersea communications technology, launched a marine route survey on 4 August, a significant stage in the deployment of Hawaiki, the 14,000-km transpacific cable system scheduled for completion in mid-2018. Hawaiki will link Australia and New Zealand to the mainland United States, as well as Hawaii, with options to expand to several South Pacific islands.

The Hawaiki cable system will deliver more than 30 Tbps of capacity via TE SubCom's C100U+ Submarine Line Terminating Equipment (SLTE) and will allow for optional connectivity to islands along the route, utilizing TE SubCom's industry leading optical add/drop multiplexing (OADM) nodes.

Hawaiki will be the highest cross-sectional capacity link between the U.S. and Australia and New Zealand. As a carrier-neutral cable system, Hawaiki will usher in a new era of international connectivity benefitting businesses and consumers across the Pacific region.

The system was co-developed by New Zealand-based entrepreneurs Sir Eion Edgar, Malcolm Dick and Remi Galasso.

For more information, visit www.hawaikicable.com.

Trident extends strategic partnership with Matrix

Trident Subsea Cable announced the strengthening of its strategic partnership with Matrix Networks Pte. Ltd. and PT. NAP Info Lintas Nusa, the operators of the Matrix Cable System. The renewed partnership between Trident and Matrix allows for even greater collaboration as Trident progresses towards the development phase for its high capacity fiber optic subsea cable linking Perth, Jakarta and Singapore.

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SUBSEA CABLES

Singapore-based Matrix Networks Pte. Ltd. and Indonesian-based PT. NAP Info Lintas Nusa (Napinfo) collectively operate the Matrix Cable System, a neutral international subsea fiber optic cable carrier servicing the Jakarta to Singapore route.

Under the extended partnership, Trident will collaborate with Matrix through the shared use of network operations and Matrix's landing facilities in Singapore, Batam and Jakarta. This will allow Trident to connect four fibre pairs from Perth to the Matrix branching unit near Jakarta, with two fiber pairs each then linking to Jakarta and Singapore.

For more information, visit www.tridentsc.com.au

TE SubCom to upgrade Caucasus Cable System

TE SubCom, a TE Connectivity Ltd. company, and Georgian telecommunications provider Caucasus Online announced that they have signed a contract to perform a network upgrade to the Caucasus undersea cable system. The upgrade to the 1,200-km regional system will be completed over the next few years.

In service since 2008, the Caucasus Cable System was designed, manufactured and installed by TE SubCom. The system provides high bandwidth connectivity between Poti, Georgia and Balchik, Bulgaria, and successfully serves Georgian markets by providing direct access to Western Europe. Utilizing TE SubCom's 100 Gb/s coherent transmission technology, the system can now support over 9 Tb/s, more than seven times the initial design capacity. This latest upgrade will increase lit capacity to 780 Gb/s.

For more information, visit www.subcom.com.

Prysmian strengthens its cable installation capability

Prysmian Group announced the readiness of its new cable lay vessel, named Ulisse, for offshore cable installation operations, following an investment of over 20 million Euros. The Group can now rely on a fleet of three world class vessels—Giulio Verne, Cable Enterprise and Ulisse—as well as its extensive range of well-proven in-house cable protection equipment to provide an extended and strengthened submarine cable installation capability.

Following the purchase from the ship owner EOS, the flat top barge has been converted into a ca. 120 m by 33 m cable layer at the PaxOcean shipyard in Singapore. Renamed Ulisse, she now has an eight point spread mooring system, enabling her to meet the operating requirements even in harsh environmental conditions. The vessel will be capable of transporting 7,000 tonnes of cable in a 30 m diameter carousel and can be equipped with a carousel loading pick-up arm and a stern mounted cable chute for loading and surface lay operations.

The first project to be executed by Ulisse will be the Negros-Panay connection in the Philippines—awarded in December 2014 and worth a total of around Euro 90 million.

For more information, visit www.prysmian.com.



Ocean Engineering



Subsea Technologies



pCO₂ Analyzer

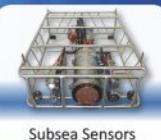
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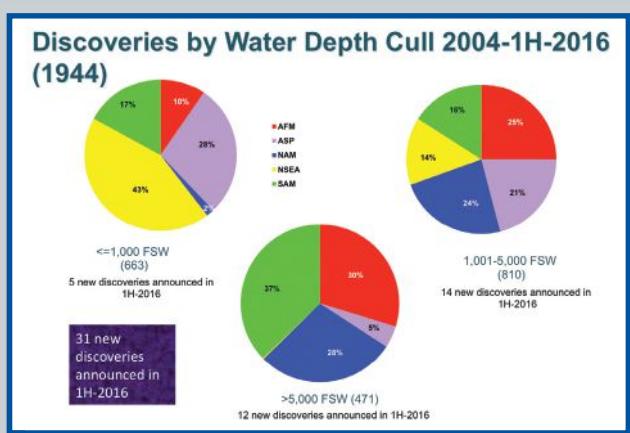
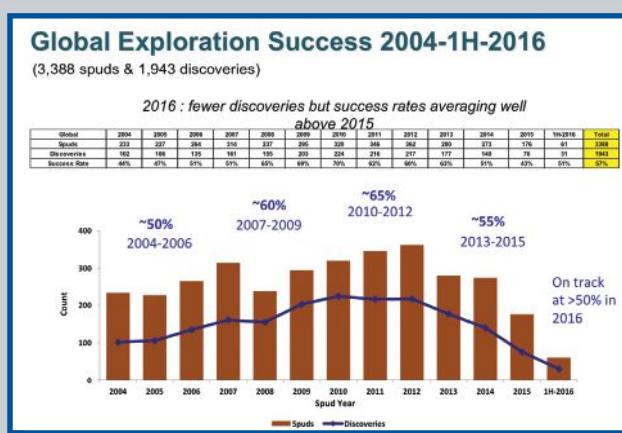
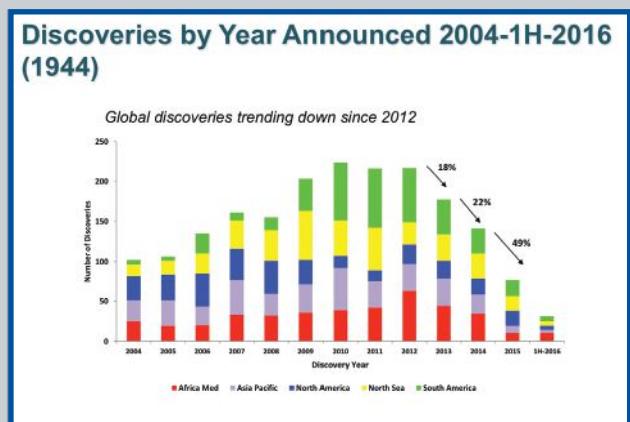
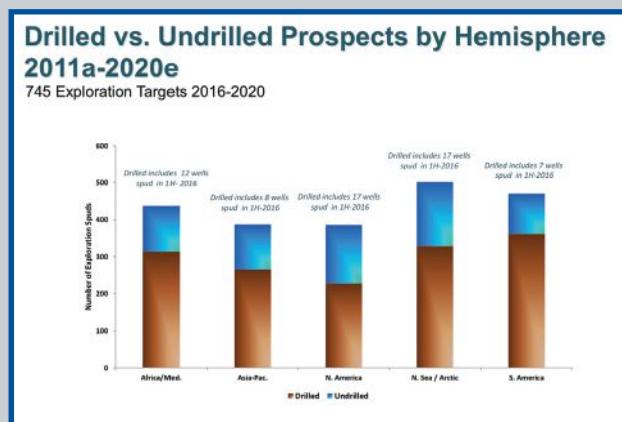
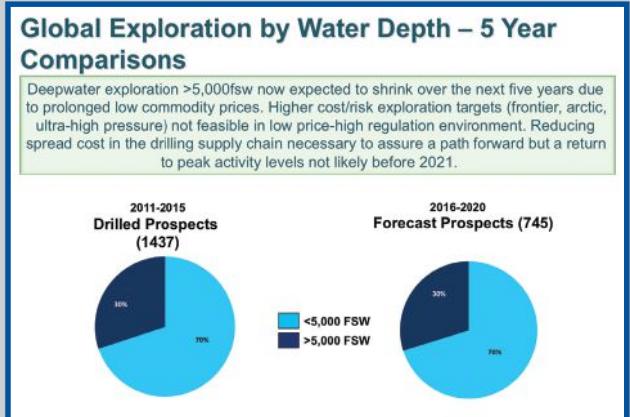
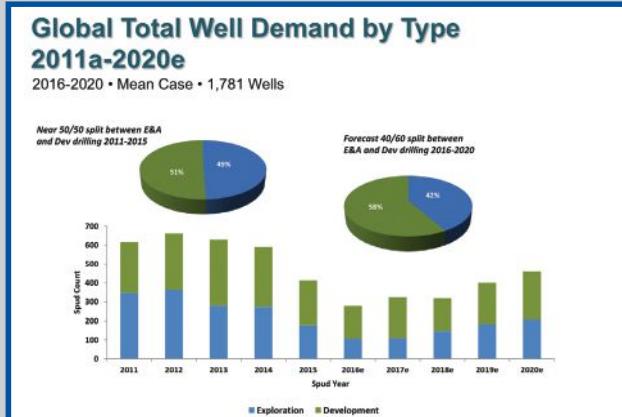
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OFFSHORE STATS & DATA

Quest Offshore Activity Report



Gulf of Mexico Data

Current Deepwater Activity

Operator	Area	Block	Lease	OCS Rig Name	Prospect Name	Water Depth (ft)
SHELL OFFSHORE INC.	WR	508	G17001	T.O. DEEPWATER THALASSA	STONES	9,554
SHELL OFFSHORE INC.	AC	857	G17561	H&P 205	Great White	7,819
SHELL OFFSHORE INC.	MC	392	G26253	T.O. DEEPWATER PROTEUS	APPOMATTOX	7,220
EXXON MOBIL CORPORATION	WR	584	G20351	MAERSK VIKING	Julia	7,148
EXXON MOBIL CORPORATION	WR	584	G20351	* WIRELINE UNIT (HOUma DIST)	Julia	7,148
MARUBENI OIL & GAS USA INC	DC	133	G10444	ENSCO 8505	King's peak	6,376
BP EXPLORATION & PRODUCTION INC	MC	822	G14658	T.O. DEVELOPMENT DRILLER III	Thunder Horse South	6,26
LLOG EXPLORATION OFFSHORE LLC	MC	257	G35325	SEADRILL WEST NEPTUNE		5,848
ANADARKO PETROLEUM CORPORATION	WR	51	G31938	DIAMOND OCEAN BLACKHAWK	Shenandoah	5,847
BP EXPLORATION & PRODUCTION INC	MC	776	G09866	SEADRILL WEST VELA	Thunder Horse North	5,636
BP EXPLORATION & PRODUCTION INC	MC	778	G09868	HELIX Q5000	Thunder Horse NORT	5,631
ENI US OPERATING CO INC	MC	773	G16647	* COIL TUBING UNIT (N.O. DIST)	Devil's tower	5,610
ENI US OPERATING CO INC	MC	773	G16647	NABORS POOL 140	Devil's tower	5,610
COBALT INTERNATIONAL ENERGY LP	KC	129	G30924	ROWAN RELIANCE		5,519
ANADARKO PETROLEUM CORPORATION	GC	859	G24194	NOBLE BOB DOUGLAS	HEIDELBERG	5,355
ANADARKO PETROLEUM CORPORATION	GC	903	G24197	DIAMOND OCEAN BLACKHORNET	HEIDELBERG	5,257
HESS CORPORATION	MC	726	G24101	STENA FORTH	Tubular Bells	4,611
BP EXPLORATION & PRODUCTION INC	GC	782	G15610	MAD DOG SPAR RIG	Mad Dog Phase 2	4,428
CHEVRON USA INC	GC	640	G20082	T.O. DISCOVERER INSPIRATION	Tahiti 2	4,292
CHEVRON USA INC	GC	640	G20082	T.O. DEEPWATER ASGARD	Tahiti 2	4,251
CHEVRON USA INC	GB	998	G31688	PACIFIC SANTA ANA		4,235
BHP BILLITON PETROLEUM (GOM) INC	GC	564	G34993	SEADRILL WEST AURIGA		4,226
UNION OIL COMPANY OF CALIFORNIA	MC	637	G15500	PACIFIC SHARAV	Bohr	4,066
NOBLE ENERGY INC	MC	292	G08806	ATWOOD ADVANTAGE	Raton South	3,406
MARATHON OIL COMPANY	GB	515	G20792	CAL-DIVE Q-4000	Ozona	3,287
SHELL OFFSHORE INC.	MC	851	G09882	NOBLE GLOBETROTTER		3,222
SHELL OFFSHORE INC.	MC	762	G07957	ATWOOD CONDOR	Deimos	3,144
SHELL OFFSHORE INC.	MC	807	G07957	OLYMPUS N88	MARS	3,039
CHEVRON USA INC	VK	786	G12119	NABORS 87	Petronius Compliant	1,754
HESS CORPORATION	GB	215	G09216	NOBLE PAUL ROMANO	Conger	1,458
LLOG EXPLORATION OFFSHORE LLC	MC	794	G34909	SEADRILL SEVEN LOUISIANA		1,386
WALTER OIL & GAS CORPORATION	EW	834	G33140	H&P 203	Hummingbird	1,186
W & T ENERGY VI LLC	VK	823	G10942	* WIRELINE UNIT (N.O.DIST)	Virgo	1,132
ENVEN ENERGY VENTURES LLC	MC	194	G02643	* LIFT BOAT (NEW ORLEANS DIST)	Cognac	1,024
FIELDWOOD SD OFFSHORE LLC	EB	160	G02648	* NONE RIG PA OPERATION (LJ)	Cerveza	940
FIELDWOOD SD OFFSHORE LLC	EB	159	G02645	* WIRELINE UNIT (L.J.DIST)	Ligera	924
FIELDWOOD SD OFFSHORE LLC	EB	159	G02646	* WIRELINE UNIT (L.J.DIST)	Ligera	924
WALTER OIL & GAS CORPORATION	VK	986	G14618	* NON RIG PA OPERATION	VK986	893
EXXON MOBIL CORPORATION	SM	6636	P00188	* WIRELINE (GENERIC)		842
ENVEN ENERGY VENTURES LLC	EW	873	G12136	* WIRELINE UNIT (HOUma DIST)	Lobster	773
WHISTLER ENERGY II LLC	GC	18	G05809	NABORS MODS 201	Boxer	760
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: 44

Current Deepwater Activity as of Tuesday, August 16, 2016

Activity by Water Depth

Water Depth (m)	Active Leases	Approved Applications	Active
0 to 200	1,108	36,341	2,181
201 to 400	74	1,136	21
401 to 800	150	904	10
801 to 1,000	206	580	9
1,000 & above	2,213	2,162	30

Rig Activity Report 12 August 2016

Location	Week of 07/22	Week +/- Ago	Week +/- Ago	Year Ago
Land	461	18	443	-382
Inland Waters	3	-1	4	-3
Offshore	17	0	17	-18
U.S. Total	481	17	464	-403
Gulf Of Mexico	17	0	17	-17
Canada	126	4	122	-85
North America	607	21	586	-488
				1095

Activity by Water Depth Information current as of Tuesday, August 15, 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

Monthly Stock Figures & Composite Index

Industry Company Name	Symbol	Close(Mid) August	Close(Mid) July	Change	Change %	High 52 week	Low
Diversified, Production Support and Equipment Companies							
Baker Hughes, Inc.	BHI	50.77	45.88	4.89	10.7%	58.23	37.58
Forum Energy Technologies, Inc.	FET	17.78	16.19	1.59	9.8%	19.32	8.34
Drill-Quip, Inc.	DRQ	56.98	59.20	-2.22	-3.8%	69.43	48.88
Halliburton Company	HAL	44.83	45.52	-0.69	-1.5%	46.69	27.64
Tenaris SA	TS	28.98	28.58	0.40	1.4%	29.74	18.53
Newpark Resources, Inc.	NR	7.23	5.84	1.39	23.8%	7.42	3.35
Schlumberger Ltd.	SLB	81.51	79.56	1.95	2.5%	83.04	59.60
Superior Energy Services, Inc.	SPN	17.42	18.18	-0.76	-4.2%	19.83	8.25
Weatherford International, Inc.	WFT	5.84	6.09	-0.25	-4.1%	11.49	4.71
Deep Down, Inc.	DPDW	0.83	0.97	-0.14	-14.4%	0.98	0.83
FMC Technologies	FTI	27.25	27.43	-0.18	-0.7%	37.18	22.30
Total Diversified, Production, Support and Equipment.....	339.42	333.44	5.98	1.8%	383.35	240.01	
Geophysical / Reservoir Management							
Dawson Geophysical Company	DWSN	7.56	7.68	-0.12	-1.6%	8.87	2.90
Mitcham Industries, Inc.	MIND	2.95	3.65	-0.70	-19.2%	5.00	2.24
Compagnie Gnrale de Gophysique-Veritas	CGV	24.98	24.00	0.98	4.1%	154.24	18.88
Total Geophysical / Reservoir Management.....	35.49	35.33	0.16	0.5%	168.11	24.02	
Offshore Drilling Companies							
Atwood Oceanics, Inc.	ATW	8.88	11.77	-2.89	-24.6%	19.65	4.82
Diamond Offshore Drilling, Inc.	DO	19.32	26.15	-6.83	-26.1%	26.72	14.18
ENSCO International, Inc.	ESV	8.59	10.40	-1.81	-17.4%	18.93	7.25
Nabors Industries, Inc.	NBR	10.03	9.77	0.26	2.7%	12.33	4.93
Noble Drilling Corp.	NE	6.34	8.42	-2.08	-24.7%	14.64	6.21
Parker Drilling Company	PKD	2.18	2.20	-0.02	-0.9%	3.64	0.98
Rowan Companies, Inc.	RDC	13.63	17.92	-4.29	-23.9%	21.83	10.67
Transocean Offshore, Inc.	RIG	9.95	12.31	-2.36	-19.2%	17.19	7.67
Total Offshore Drilling.....	78.92	98.94	-20.02	-20.2%	134.93	56.71	
Offshore Contractors, Services, and Support Companies							
Helix Energy Solutions Group, Inc.	HLX	7.96	6.56	1.40	21.3%	9.07	2.60
Gulf Island Fabrication	GIFI	9.21	6.96	2.25	32.3%	13.25	6.34
McDermott International, Inc.	MDR	5.06	5.05	0.01	0.2%	6.00	2.20
Oceaneering International	OII	28.32	30.89	-2.57	-8.3%	48.11	25.33
Subsea 7 SA	SUBCY.PK	11.25	10.38	0.87	8.4%	11.58	4.86
Technip ADS	TKPPY.PK	14.13	13.77	0.36	2.6%	15.13	9.69
Tetra Technologies, Inc.	TTI	6.22	6.30	-0.08	-1.3%	9.44	4.62
Total Offshore Contractors, Service, and Support.....	82.15	79.91	2.24	2.8%	112.58	55.64	
Offshore Transportation and Boat Companies							
Seacor Holdings, Inc.	CKH	55.37	56.53	-1.16	-2.1%	67.60	41.24
Gulfmark Offshore, Inc.	GLF	2.62	3.48	-0.86	-24.7%	9.04	2.50
Bristow Group	BRS	11.91	13.42	-1.51	-11.3%	37.61	9.17
PHI, Inc.	PHII	18.52	19.69	-1.17	-5.9%	29.00	13.05
Tidewater, Inc.	TDW	3.23	4.87	-1.64	-33.7%	18.10	3.18
Swire Pacific	SWRAY	12.04	11.78	0.26	2.2%	13.08	9.06
Hornbeck Offshore	HOS	5.50	8.76	-3.26	-37.2%	20.35	5.39
Total Offshore Transportation and Boat	109.19	118.53	-9.34	-7.9%	194.78	83.59	2

September 2016

62

Ocean News & Technology

Monthly Stock Figures & Composite Index

Industry	Close(Mid) August	Close(Mid) July	Change %	Change %	High 52 week	Low
Diversified, Production Support & Equipment Companies	339.42	333.44	5.98	1.8%	383.35	240.01
Total Diversified, Production, Support and Equipment	339.42	333.44	5.98	1.8%	383.35	240.01
Total Geophysical / Reservoir Management	35.49	35.33	0.16	0.5%	168.11	24.02
Total Offshore Drilling	78.92	98.94	-20.02	-20.2%	134.93	56.71
Total Offshore Contractors, Service and Support	82.15	79.91	2.24	2.8%	112.58	55.64
Total Offshore Transportation and Boat	109.19	118.53	-9.34	-7.9%	194.78	83.59
Total Offshore Source Index	645.17	666.15	-20.98	-3.1%	993.75	459.97

DISCLAIMER

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.

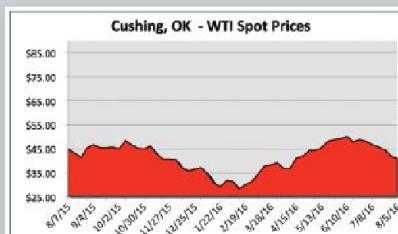
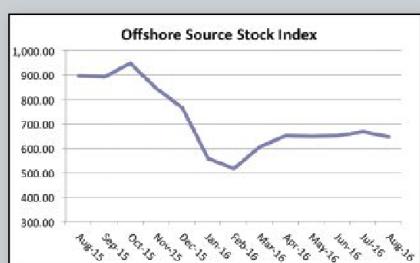
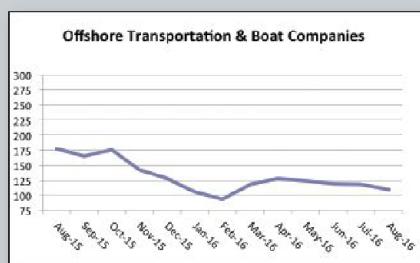
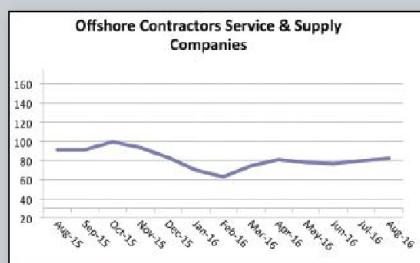
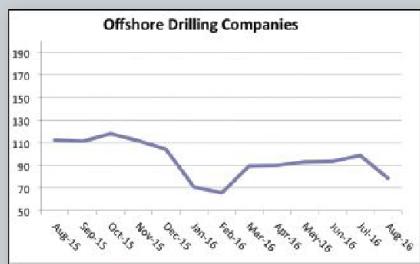
September 2016

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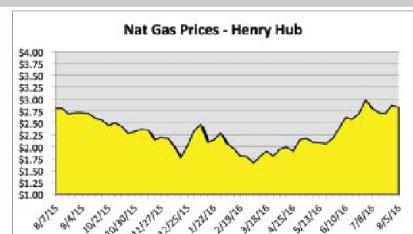
Ocean News & Technology

Oil & Gas Industry Trends

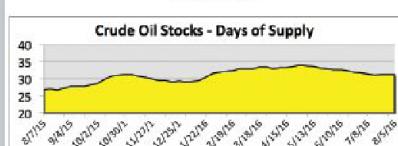
Monitoring the Pulse of the U.S. Offshore Oil & Gas Industry



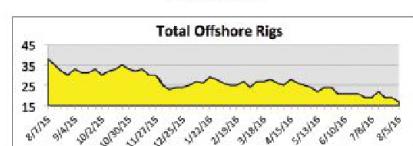
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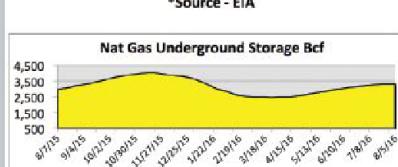
* NYMEX Close



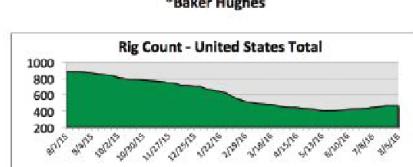
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*Baker Hughes



*Source - EIA



*Baker Hughes



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

New rapidCTD's Bluetooth connectivity delivers the fastest profiling on the go

Valeport's new rapidCTD uses automated wireless Bluetooth data transfer to deliver the highest quality CTD casts from underway profiling and eliminates the survey downtime normally associated with profile gathering.

Designed initially to operate autonomously with the Teledyne OceanScience rapidCAST automated underway profiling system, the new Valeport automated profiler offers SV casts without the requirement of an operator on deck and delivers near real-time sound velocity profiling data. Primarily for use with deployment systems and targeted at the shallow water survey market, the highly accurate rapidCTD incorporates Valeport's world-leading technology and can also be compatible with other winch systems.

The robust automated profiler includes a conductivity cell

designed for optimum flow-through, a fast responsive thermistor sensor and a 0.01% accuracy pressure sensor, synchronously sampling at up to 32 Hz to deliver the most accurate water measurements.

Bluetooth technology makes communicating with the rapidCTD fast and simple. Powered by a single C cell (1.5V Alkaline or 3.6V Lithium cell), the rapidCTD is fitted with a solid state, non-volatile flash memory capable of storing over 10 million lines of data—equivalent to 5000 profiles to 1,000 m with a 1-m profile resolution.

Valeport plans to further develop the rapidCTD by including an optional Fluorometer sensor and an enhanced, re-chargeable battery later this year.

The rapidCTD is available to order now.
For more information, visit www.valeport.co.uk.



Guidance Marine launches new Artemis® Mk6 microwave position reference sensor

Guidance Marine has launched the new Artemis Mk6 system. The Artemis system, first introduced to the offshore market in 1972 is the undisputed, world leading, long-range microwave position reference sensor and is still widely used today. The system is typically used in the offshore operation of offloading and transportation of oil between shuttle tankers and FPSOs. The Mk6 system is the most complete long range radar in Artemis product history.

Since becoming the custodian of the Artemis brand from CHL in 2015, Guidance Marine has extensively evaluated the Mk5 system and understood the needs of shuttle tanker and FPSO operators. The Mk6 system is the evolution of the Artemis Mk5 system and the latest offering in sensor technology from Guidance Marine. With the inclusion of the Mk6 system to an already growing product portfolio, Guidance Marine



believes its product range caters for a wide range of customer requirements and operations, positioning the company as a unique solutions partner for situational awareness and positioning sensors.

For more information, visit www.guidance.eu.com.

RJE International launches new and improved DPR-275 diver pinger receiver

RJE International, a specialist in mission critical products re-launched an all new and improved DPR-275 Diver Pinger Receiver and PRS-275 Pinger Receiver System.

The portable hand-held DPR-275 is a durable acoustic receiver with a wide span of frequency with both visual and audio, capable of detecting and locating an underwater sound source emitting a signal in the 5-80 kHz range. The durable DPR-275 has an improved LED display readout for greater visibility in poor conditions, and a rechargeable 9-volt lithium-ion battery that has a longer life and is easier to change. We also added an enlarged compass for convenient navigation, and a more rugged water-tight carrying case.

The DPR-275 receiver assembly operates to a depth up to 200 m (650 ft) and possesses a slight positive buoyancy. The receiver housing is constructed of black Acetal resin and hard anodized T6 aluminum, and will withstand prolonged exposure to salt water.



For more information, visit www.RJEInt.com.

Teledyne Marine deploys new electrical/optical conversion technology for ONC

Teledyne Marine recently introduced the Electrical/Optical Flying Lead (EOFL), a compact, in-line media converter solution for subsea data transmission networks. The EOFL converts a fiber optic signal through a fiber optic wetmate connector and produces an electrical Ethernet signal through an electrical connector on the other end. The conversion from optical to electrical is accomplished in a compact, 1-atmosphere internal pressure chamber that is rated to an exposure of up to 10,000 PSI external pressure. This technology allows data to be transmitted through deep water at lengths previously not possible with existing technology.

Ocean Networks Canada's (ONC), NEPTUNE observatory is a 500-mi loop of fiber optic cables and sensing instruments off the west coast of British Columbia, Canada. Wet mateable interconnect, or flying leads, to transmit data from the instruments to a shore station is critical enabling technology.

ONC selected four units of the EOFL to connect two cable runs planned for the NEPTUNE cabled observatory. The two instrument locations are 1 mile and 2.4 mi from their primary junction boxes in over 7800 ft of water. Installation was successfully completed in June 2016, and the four units are performing with no issues. "Some very happy scientists are now receiving real-time data from new science sites as a result of the successful deployment," says Adrian Round, director of Observatory Operations for ONC.

For more information, visit www.teledynemarine.com.

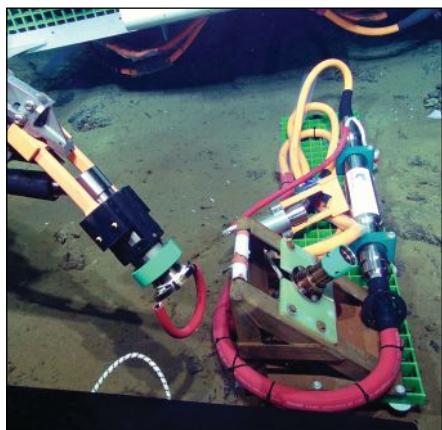


Photo: Ocean Networks Canada

SeaRobotics delivers USV for marine and aquatic research

SeaRobotics Corporation (SeaRobotics) has delivered the USV 2.5, an autonomous 2.5-m USV to the Center for Marine Science and Technology at North Carolina State University. The USV, built by SeaRobotics, was funded by an award from the National Science Foundation's Marine Lab Facilities Program. Given the diverse capabilities of the USV, it will be utilized as both an experiential-based teaching tool and to conduct basic and applied research in lake, river, estuary and coastal environments.

The USV 2.5 is equipped with an extensive suite of scientific instrumentation that will provide users with a wide variety of data. This instrumentation includes side-scanning and bathymetric sonars, a high-frequency sub-bottom seismic system, an acoustic Doppler current profiler, and sensors that record the temperature and conductivity of the waters being surveyed. In addition, the USV 2.5 measures the concentration of Chlorophyll-a and dissolved organic matter in surface waters.



This system leverages SeaRobotics' extensive expertise and history delivering USVs for high-precision bathymetry, water quality analysis, hydrographic survey, and many other applications. The USV was delivered with a fully integrated Edgetech 6205 multi-beam echo-sounder, motion reference unit, dual antenna RTK GPS, sound velocity probe, and HYPACK software.

"The USV will be used for seabed and water column mapping critical to an improved understanding of various marine and aquatic processes, including ecosystems dynamics, water quality, and shoreline stability," stated Del Bohnenstiehl, principal investigator on the NSF project.

For more information, visit www.searobotics.com.

Plastic/aluminum hybrid housing

Prevco's new hybrid takes the best attributes of plastic underwater housings and combines them with the practicality of having aluminum endcaps. Plastic is corrosion resistant and fairly low cost but is limited to shallow water (100 m) or oil-filled pressure compensated applications. Hybrid plastic tubes with aluminum or other metal endcaps are a great way to improve thermal conductivity.



The tubes are currently available with either a 7.36 in. ID (186.96 mm) or 9.25 in. ID (234.96 mm) and are generally stocked in 12, 18 and 24 in. (304.8, 457 and 609.59 mm) lengths. They can also be made in custom lengths. Just let us know your requirements and we will put it all together.

In addition, Prevco can also look at one-off custom designs in plastic and other materials depending on the depth and deployment scenario.

For more information, visit www.prevco.com.

Multiple corer for Taiwan

Accomplished sediment corer manufacturers Ocean Scientific International Ltd (OSIL) have built and equipped a 12-station multi corer system for use by the National Taiwan Ocean University (NTOU).

The hydrostatically damped multi corer is capable of collecting up to 12 high-quality undisturbed 600 mm long samples (including the overlying supernatant water). The corer is constructed from stainless steel and features detachable core assemblies, which enables the core tubes (or if necessary the entire core tube assembly) to be detached from the corer for analysis or storage.

The NTOU corer is equipped to handle two different diameters of core tubes: the standard 110 mm and the smaller 65 mm. The changeover process is swift and easy with only 1 bolt to undo to swap core tube assemblies, allowing a large number of samples to be taken in quick succession in any one mission. The core tubes are sealed top and bottom once the sample has been taken, allowing rapid retrieval of the corer without jeopardizing sample integrity.



The corers are easily customisable, and delivery times for the corers and spares are low, meaning last minute cruises can be catered for and systems can be kept in constant use for many years.

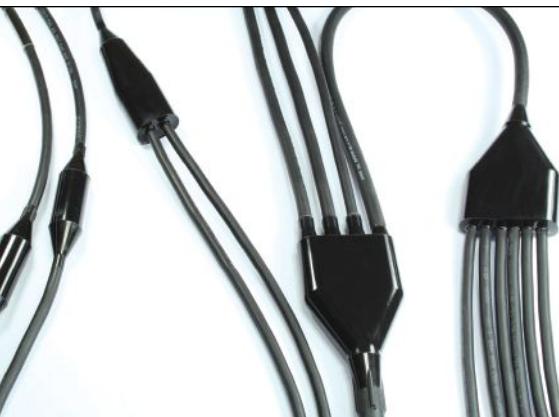
OSIL have an abundance of global experience in the construction and operation of a wide range of sediment coring equipment, including the industry standard Multi Corer and the unique giant piston corer which is capable of achieving cores up to 60m in length. OSIL also offer a full design, build and implementation service for all of their heavy offshore equipment.

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

STR design and manufacture bespoke cabling solution

Subsea Technology & Rentals Ltd (STR) have enhanced their reputation as specialists in developing high-quality bespoke technology for the subsea industry with the design and manufacture of a bespoke cabling solution for the Centre for Environment, Fisheries and Aquaculture Science (CEFAS).

STR were approached by CEFAS to produce a cable design to simplify their more complex operations and expand the capabilities of their recently pur-



chased STR SeaSpyder Telemetry Camera System.

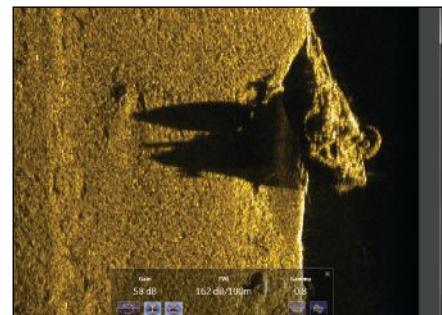
The cabling solution was designed in-house at STR to enable the SeaSpyder Telemetry System & fibre-optic mux to directly interface with 6 off STR underwater LEDs, an array of laser pointers and line generators, altimeter and depth compass. Together with the cables for Aris sonar, and the STR SeaSpectrumIP camera, this provided CEFAS with a fully mountable video inspection system for their sled.

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

EdgeTech 4125 side scan modernizes Boone County Water Rescue tools and goes into action

EdgeTech, the leader in high resolution sonar imaging systems and underwater technology, recently delivered a 4125 Side Scan Sonar system to Boone County Water Rescue and the system was immediately deployed in the region.

Boone County Water Rescue located in Burlington Kentucky has a long and successful history operating side scan sonar systems.



Recently, the organization purchased an EdgeTech 4125 side scan sonar. EdgeTech's 4125 System was designed with both the search & recovery (SAR) and shallow water survey communities in mind and utilizes EdgeTech's Full Spectrum® CHIRP technology. The system provides high-resolution imagery and dual simultaneous frequency operations resulting in exceptional range and resolution underwater even in challenging conditions.

After delivery of the EdgeTech 4125, the company also provided on-site training for Boone County Water Rescue. During training operations, one member of the team stated he had "never seen underwater image quality and resolution like the 4125 produces." Upon completion of the training session the Boone County Water Rescue team immediately started utilizing the new EdgeTech 4125 system weekly for bridge and pier surveys. Also very shortly after receiving the new equipment Boone County Water Rescue was

called on to find a missing person in a nearby waterway. Using the new equipment, the team completed their task without hesitation and brought emotional, but important closure for family members.

For more information, visit www.edgetech.com.

Underwater metal detectors help police and military

A growing number military dive teams and law enforcement agencies are putting underwater metal detectors to work in their search and recovery operations. They use these detectors for a variety of tasks, including locating explosive devices, searching for weapons and evidence, salvage operations, looking for lost anchors and chains, and for finding objects dropped from ships and piers. U.S. and Peruvian Navy divers have cooperated on several missions including the salvage of a sunken ship in Panama harbor. Peruvian Navy diver Rafael Jimenez Fonseca says, "Our team relies on JW Fishers Pulse 8X detector." So do the US Navy's Mobile Diving & Salvage Units, Underwater Construction Teams, Explosive Ordnance Disposal Units, SEALS, and the Israeli Navy dive teams.

Navy dive teams aren't the only ones using underwater metal detectors (UMD). The U.S. Air Force Rescue Wing, the USAF Reserve Command's premier combat search and rescue unit, is also employing these machines in their operations. The wing consists of over 1,500 airman trained and equipped to locate and recover U.S. armed forces personnel in both peacetime and wartime. They also provide rescue support to NASA Space Shuttle Missions, offer search and rescue support for civilians who are lost or in distress, and assist in humanitarian and disaster relief operations. The unit has acquired several of JW Fishers Pulse 8X detectors to aid in these missions.

Another service branch using the UMD is U.S. Army Corps of Engineers. The Lone Star Army Ammunition Plant in Texas occupies 15 thousand acres of land. It was established in 1942 during WWII to manufacture bombs, shells, fuses, boosters, and auxiliary ammunitions. The plant operated until 2005 when it was closed down under the Base Realignment and Closure Act. Now officials are working to clean up the site. Hank Domme, Ordnance and Explosives Safety Specialist, reports using the Pulse 8X in their EOD clearance operations.

For more information, visit www.jwfishers.com.

CyanoFluor handheld fluorometer easily identifies HAB conditions

Turner Designs' CyanoFluor is a new handheld fluorometer equipped with optics for detecting chlorophyll (Chl) and phycocyanin (PC) responses from natural water samples (in vivo fluorescence detection). CyanoFluor uses these responses to calculate and report a PC to Chl ratio that indicates whether the water sampled contains cyanobacteria, an algal group known to cause Harmful Algal Blooms (HABs).

This instrument can also be used to predict the onset of HABs. By monitoring the PC to Chl ratio over time, users can tell whether environmental conditions are changing, favoring cyanobacterial production, which may lead to cyanobacterial blooms that have the potential to be harmful (toxic). This monitoring effort will alert users to the onset of these types of blooms so the proper protocols can be implemented to prevent or reduce bloom effects.

The CyanoFluor provides raw fluorescence readings along with PC to Chl ratios so users can also determine algal abundances and report µg/L chlorophyll estimates that can be used for publications or stored as historic data for the system being monitored. The CyanoFluor is factory calibrated; no calibration standards or tools are required or necessary to calibrate this instrument. Solid state optoelectronics ensure the instrument will remain stable over time.

For more information, visit www.turnerdesigns.com.

WhisperPower now active in the commercial shipping and offshore sector

WhisperPower, established 8 years ago by the former founder of Mastervolt (and before that Victron Energy) has developed an exciting range of products for this sector. There is a wide choice of hybrid propulsion systems from 5 to 500 kW, robust industrial inverters for the conversion of DC power to AC, industrial battery chargers and compact generators.

For smaller vessels WhisperPower supplies the AC Power Cube range; powerful sine wave inverters are available in 4, 7 or 14 kVA for single- or three-phase output voltage. As a result, it is now possible to feed larger loads

from a battery buffer so that the generator can be switched off for longer periods of time. With the quick-charging DC PowerCube battery chargers, the battery can be charged up again quickly through the large on-board generator or by WhisperPower's specially developed efficient and silent Genvverter generators.

Alongside the power electronics, WhisperPower also supplies compact, silent diesel generators from 4 to 54 kVA with fixed or variable speed, depending on the model. All models can be supplied certified (CCRII, GL, DNV).

For more information, visit www.whisperpower.com.



Trelleborg's seal materials tested for optimal performance

Trelleborg Sealing Solutions has carried out a series of tests to show the importance of fluid type and seal material choice in "ensuring optimum seal performance and service life."

The world leader in engineered polymer solutions, which has been making highly developed seals for over 30 years, worked with fluid producer MacDermid to test the effect of water glycol fluids (HFC) on common seal materials.

Together the engineers for both companies tested seven seal materials, which were immersed in water glycol fluids at a range of elevated temperatures up to +200°C (+392°F).

Each seal and fluid combination was tested for hardness change, tensile strength change, strain change and volume change. All physical changes were documented using before and after photos.

For more information, visit www.tss.trelleborg.com.

Guidance Marine launch first local position reference sensor that does not use targets

Guidance Marine, experts in designing and manufacturing local position reference sensors and the leading sensor supplier to vessels in the oil and gas industry, have launched a new type of sensor that is changing the way that vessels operate around wind farms. RangeGuard is the first sensor from Guidance Marine that does not use physical targets. It uses radar reflections from its surroundings to calculate precisely the vessel's range to the nearest object in its field of view. Combining the information from two sensors allows range and bearing to be calculated and input into the DP system of a vessel.

Guidance Marine presented a paper at the Royal Institute of Naval Architects conference Design & Construction of Wind Farm Support Vessels, on 30 March titled "A New Era



RangeGuard Sensor.

in Position Referencing". Business development manager, Dr. Sasha Heriot, described a collaboration between Bernhard Schulte Ship Management, Marine Technologies and Guidance Marine where two RangeGuard sensors were installed on the Bernhard Schulte managed vessel, the Ocean Zephyr.

Hendrick Busshoff, offshore marine superintendent at Bernhard Schulte Ship Management trained as a Master mariner in the offshore oil and gas industry before moving to offshore wind. He recognised the differences in vessel operation in a wind farm compared to an oil field and identified the need for a new type of position reference sensor.

Guidance Marine installed two RangeGuard sensors on the starboard side of the Ocean Zephyr. The 24GHz radar sensors send out a low power signal and the radar reflections from their field of view are detected. By combining information from two sensors, the location of the wind tower relative to the vessel can be calculated precisely.

Data was collected during a sea trial to the BARD 1 wind farm in August 2015. Although the sensors were not connected into the DP system, the sensors successfully recorded the movements of the vessel. The next stage of the project is now underway at Marine Technologies to connect the sensors into the DP system of the ship.

After the promising results obtained during the trials on the Ocean Zephyr, Bernhard Schulte decided to make full use of the potential of RangeGuard and install a fully DP integrated system on their SOV new build Windea La Cour. The technologically advanced vessel is scheduled to set sail in Q2 2016 and the RangeGuard system will ideally complement and expand the capabilities of the ship.

For more information, visit www.guidance.eu.com.

Teledyne RESON deepwater solutions

In 2014 Teledyne RESON acquired the business from ATLAS Hydrographic GmbH. Since then Teledyne RESON has integrated the acquired ATLAS Hydrographic business and its multibeam echosounders into the Teledyne RESON business and our suite of deepwater echosounders.

The well-known brands, HydroSweep and ParaSound are now being developed, manufactured and serviced out of the Teledyne RESON business entities. The products are marketed and sold under the Teledyne RESON brand name, delivering high-quality and unique deepwater solutions based on the acquired technological platforms.

Teledyne RESON's high-performance deepwater hydrographic survey offerings are available in a number of different configurations ranging from mid-ocean depth to full-ocean depth performance. The recognized industry brands are highlighted below:

- HydroSweep Multibeam Echosounders features include multi-

ping capabilities and sub bottom profiler functionality built into the system as well as optional ice protection of the transducers. The growing market for survey vessels going to the arctic regions can now be better serviced by Teledyne RESON.

- SeaBat Multibeam Echosounders are high-resolution multibeam echosounders ranging from easily installed portable or hull mounts, to the ultimate flexibility of advanced modular systems design, allowing customers to tailor the system configuration to their resolution requirements and budget. Key features include variable swath coverage, beam uncertainty measurement, water column data.

- ParaSound Parametric Sub Bottom Profiler systems are a hull-mounted parametric sub-bottom profiler, offering rapid high resolution sub-bottom as single profile or in multi-beam mode at an operational cost-efficiency that only a hull-mounted system can provide. It is able to penetrate the seabed more than 200 m in water depths as deep as 11,000 m.

For more information, visit www.teledyne-reson.com.

Magseis selects Sonardyne acoustics for S78 Red Sea seismic survey

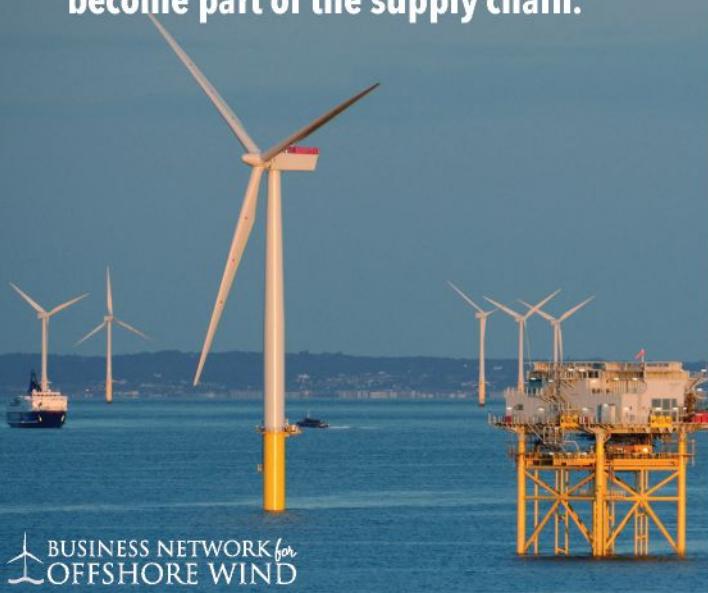
Norwegian seabed seismic services company Magseis has selected acoustic positioning equipment from Sonardyne International Ltd. UK to support its upcoming deepwater ocean bottom seismic survey of the Red Sea.

Working in partnership with BGP on behalf of Saudi Aramco, the S78 project is expected to last 9 months and will involve the deployment of a large network of ocean bottom recording nodes, each of which will be accurately positioned using Sonardyne's Ranger 2 USBL and Small Seismic Transponder (SST) technologies.

Seismic surveillance surveys conducted using stationary receivers deployed on the seabed are becoming increasingly commonplace as geophysicists generally agree that this method delivers the highest possible definition imagery.

However, any uncertainty in node positions can blur these pictures and make the underlying reservoirs more difficult to spot. Sonardyne's Ranger 2 USBL installed on a surface vessel, coupled with SSTs fitted close to each

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node, overcomes this problem by providing high-quality, repeatable positioning in all water depths.

For this summer's Red Sea survey, Magseis will deploy its proprietary Marine Autonomous Seismic System (MASS), which uses thousands of small nodes to create a grid pattern of receivers on the seabed.

Since it is vitally important that the cables are laid in the correct positions to meet the client's exacting standards and also to avoid becoming entangled with subsea infrastructure, Magseis will attach its new SSTs near the nodes at regular intervals along the cable. As the equipment descends through the water column to the seabed, each SST will be tracked in real-time using the Ranger 2 GyroUSBL transceiver permanently installed on the vessel.

Being small, low-cost and depth rated to 2,000 m, SSTs are perfectly suited to withstand the demanding operational requirements of large-scale ocean bottom seismic surveys. They can



even be left attached to the cables when they are recovered and reeled on to a drum, helping to minimise back deck manual handling operations.

Magseis has also ordered Sonardyne's Lightweight Release Transponders (LRTs) and rope canisters to enable recovery of seafloor equipment following data acquisition. When commanded to do so, LRTs float back up to the surface, enabling the equipment to which they are attached to be hauled up.

For more information, visit www.sonardyne.com.



rugged and come fully self-contained. They offer rapid and easy installation due to the fact there are no external cables or power required. The light unit can be monitored through optional GSM monitoring and controlled via optional GPS synchronization. The obstruction light is virtually maintenance free and has integrated solar panels and a user replaceable battery, which will exceed 5 years of service.

For more information, visit www.avlite.com.

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Danos announces the hiring of **Tom Broom** as executive account manager. In this role, Broom will be responsible for overseeing and maintaining Danos' long-term relationship with Shell. In 2015, Broom retired from Shell after a 35-year career, most recently serving as director of coastal issues for Shell Exploration & Production Company.



Broom

Subsea technology company Sonardyne International Ltd. UK has named **Graham Brown** as its new sales and marketing director. With immediate effect, Brown is responsible for leading the sales and marketing strategies across the entire company including oil and gas, ocean science, defence and maritime security market sectors. Brown has worked for Sonardyne for over 14 years and has held a number of senior positions within the organisation.



Brown

2H Offshore has announced the appointment of **Yann Helle** as managing

director. Helle replaces Tim Eyles, who is moving to the role of vice president with parent company Acteon. Helle, who previously held the position of technical manager, will have responsibility for the leadership and development of 2H globally, focusing on evolving and expanding new business opportunities particularly life extension, abandonment and marginal field developments.



Helle

ValvTechnologies, Inc. announced the appointment of **Joe Kelly** as regional director, Europe, Africa and Middle East. Based in the UK, Kelly will have senior management responsibility for leading sales growth in the regions. With more than 35 years' experience in the valve and automation industry, he brings significant global business management and sales experience to the company.

Ocean Energy Europe has elected **Thierry Kalanquin** (DCNS) and **Simon de Pietro** (DP Energy) as its new co-presidents. The pair will combine the expertise of an industrial-scale technology manufacturer and a prominent renewable energy developer to help steer

Europe's ocean renewable energy industry sector to commercial readiness.

Hoover Container Solutions' chairman and CEO, **Donald Young**, has been nominated and elected to the Petroleum Equipment & Services Association advisory board for a 3-year term.

Leading specialist in well diagnosis, EV has announced the appointment of a new chief executive officer. Bringing over 28 years' industry experience to the role, **Fraser Louden** has held a number of positions within a range of oil and gas service companies, including 17 years with Schlumberger in global management and leadership posts. His career has also seen him work as managing director, and subsequently as chief executive officer of READ Well Services.

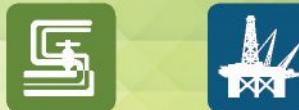
Oceaneering International, Inc. has completed its acquisition of **Meridian Ocean Services**, an international business that uses ROVs to perform surveys on mobile offshore drilling units and floating production systems that satisfy the underwater inspection in lieu of dry-docking requirements of all major classification societies.

Centurion Group and **ATR Group** are to merge to create a global player in the oil and gas rental equipment and ser-



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vices market. The group, which will have a combined turnover of over £100 million, will operate from bases in the UK, Netherlands, Caspian, Singapore, Australia and the U.S.

Apax Partners has signed a definitive agreement to acquire **Telemar Group** from its current shareholders. The combined activities of **Telemar** and **Marlink** will create the world's leading maritime communications, digital solutions and servicing specialist for all customer segments at sea including shipping, offshore, cruise & ferry, yachting and fishing.

Hoover Container Solutions, Ferguson Group and CHEP Catalyst & Chemical Containers announce that they are merging to form **Hoover Ferguson Group**.

JFD, part of James Fisher and Sons plc, is pleased to announce the acquisition of **LEXMAR**. **LEXMAR** was founded in 1996 in Singapore and specialises in the design and manufacturing of in-built and modular saturation diving systems, and is an established provider of diving equipment and services to the offshore industry.

Unique Group, the leading integrated subsea and offshore solution provider, through its subsidiary Unique Maritime Group (SEA) PTE Ltd, completed the

acquisition of **Oceanvision PTE Ltd** and **Oceanvision Equipment Services PTE Ltd**. **Oceanvision** will now be part of the Unique Group of Companies and is the third acquisition that Unique has made in the last 9 months.

Communication and safety at sea specialist **Ocean Signal** and leading manufacturer of marine electronic equipment **AMI Marine** have formed a new partnership to collaborate on product development for the large commercial vessel sector. Combining the specialist knowledge and extensive technical background of two of the UK's most experienced marine companies, the cooperation facilitates a unique capability to incorporate the latest technology within new solutions to fulfil demand for next generation, mandated equipment.

Aquatec Group has expanded their global network to introduce **Casco Antiguo** as a representative for the distribution of their established underwater instrumentation for oceanographic, environmental and coastal applications in Central and South America.

Intertek has invested a further £800,000 in its Manchester corrosion and materials centre to offer world-leading facilities for innovative research, consult-

ing and testing services. Production and Integrity Assurance (P&IA), part of Intertek Exploration and Production, announced a £1.2 million investment in the centre last year and has since expanded the site to 40,000 sq. ft, making it one of the largest integrated materials engineering consultancy and testing facilities in the world. It has now been re-named The Manchester Technology Centre.

Subsea training facility, **The Underwater Centre**, has introduced a new hydraulics course that will provide candidates from a wide range of industries an introduction to fluid power systems.

Forum Energy Technologies has expanded its specialist syntactic foam manufacturing capabilities with the opening of a new plant near Houston. The 6-acre facility in Bryan, Texas, brings Forum's Syntech product line closer to clients in the oil and gas industry and has the capacity to support future growth.

YSI has published its first edition of **Mission: Water**, a 64-page magazine that features the organizations and researchers who tackle the world's most challenging water issues, the latest trends in instrumentation and research applications, and environment-focused educational resources.

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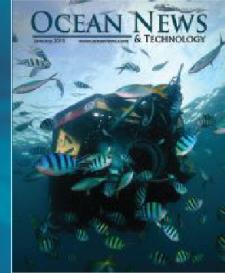
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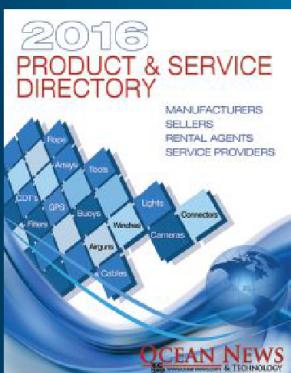
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EofE Ultrasonic Co., Ltd	53	www.echologger.com
EvoLogics GmbH	83	www.evologics.de
FORUM Energy Technologies, Inc. (F.E.T.)	9	www.f-e-t.com
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Govt N&L - Dept of Business, Tourism, Culture	7	www.btcrd.gov.nl.ca
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Hydroid	5	www.hydroid.com
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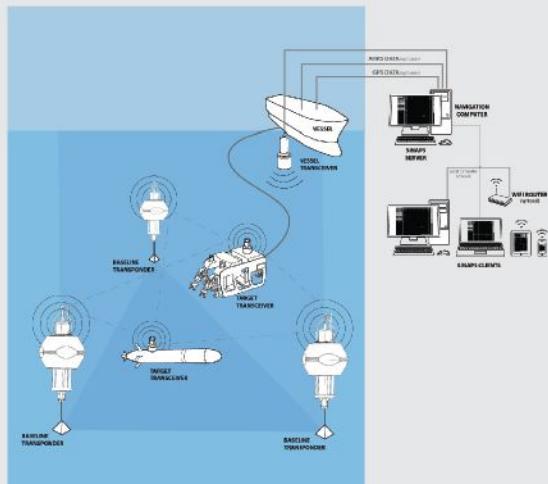
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