# Ocean News & Technology

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## DECOM
## Adapting to the Challenge

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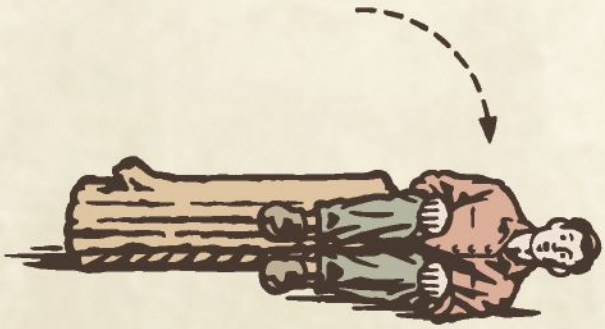

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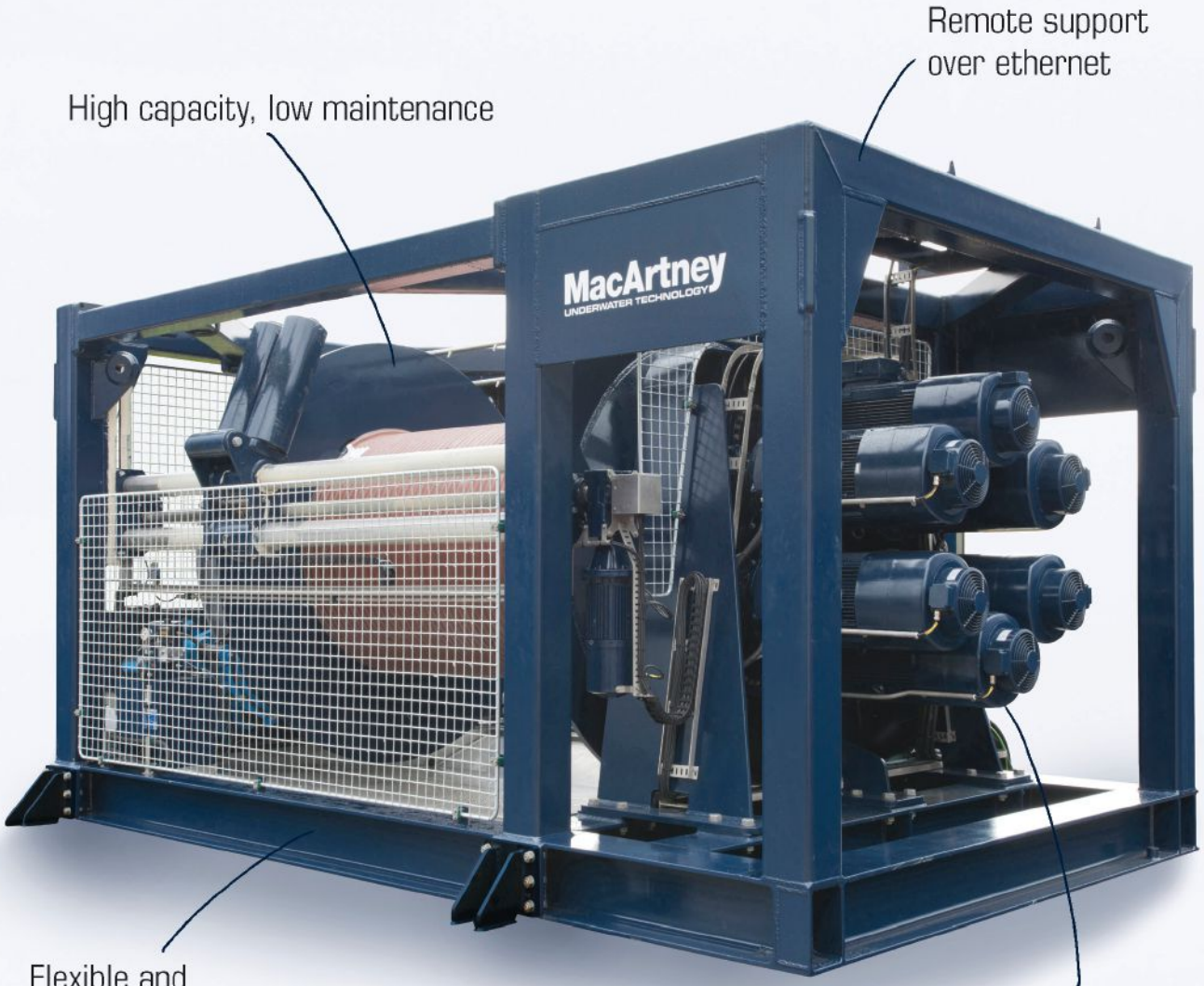


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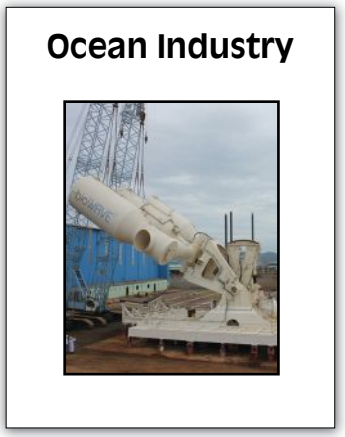


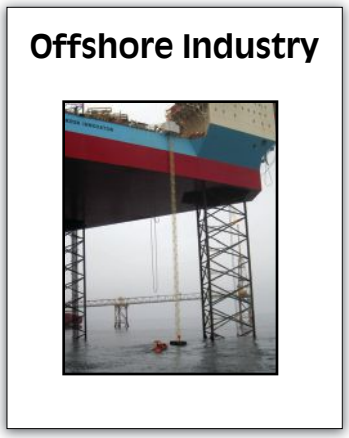




**Cover Photo**


A PB40 PowerBuoy, built by Ocean Power Technologies, floats three-quarters of a mile off of Marine Corps Base Hawaii drawing electrical power from the ocean's waves. (Image courtesy U.S. Marine Corps Base Hawaii)

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- Maritime Security

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True innovation makes a difference

# Use of Oceanographic and Meteorological Analyses for Risk Reduction in the Oil, Gas, and Fishing Industries

*By Dr. Mitchell A. Roffer, President, Roffer's Ocean Fishing Forecasting Service, Inc.*

Optimizing the transport of energy industry platforms and structures requires both minimizing the impact of unfavorable ocean currents and winds while maximizing the advantage of favorable currents and winds. Similarly, locating concentrations of fish requires that one finds favorable current and habitat conditions. Using proven met-oceanographic analyses that are based on high-resolution, multi-spectral satellite imagery, numerical model guidance and simulation analysis, along with *in-situ* data, one can use the information needed for tow route optimization, rig monitoring, and fish finding.

Integrated oceanographic analyses are at the foundation of many consulting services that provide the ability to "look out the window" to see and critically understand what is happening at the needed temporal and spatial resolutions. Knowing the actual flow and movement of the ocean and weather fronts by watching the currents directly from repeated and looped satellite images validates and thus, increases the effectiveness of the numerical models and simulators. Multiple complementary tools are used to more accurately describe the ocean state.

The integrated analysis approach provide coverage of rapid moving features, water mass boundaries or fronts, and other oceanographic features that the models poorly resolve or are outside the model domain. Similar to the satellite data, the models provide 7 day coverage, but do not suffer directly from the cloud cover that can impair one's ability to observe the conditions clearly from infrared or ocean color imagery. Using all of these tools allows one to identify routine errors in the oceanographic models to accurately define the state of the ocean. Most oceanographic models ingest satellite altimeter data which only provide 5 to 7 day rolling mean conditions with broad spatial resolutions (~20 km), not the near hourly 1-4 km data that the polar orbiting Earth environmental satellites provide. Thus, the best consultants integrate all the data and do not rely just on the ocean models or historically mean information derived from the Admiralty charts.

When selecting a company to provide services one should select the practitioners that draw from time-tested synoptic analysis skills and advanced satellite image analysis techniques, numerical weather and current models, and vessel simulators. Many companies only offer partial services for deep water drilling and construction, ocean tows/transports, and seismic operations. Time and spatial resolution is critical for avoiding unfavorable conditions as errors of just a few kilometers can make the difference of being in a favorable 3 to 4 knot current versus fighting one or in the case of fishing being on the fish and catching or not.

Accurate analyses and forecasts should start with the best depiction of the recent ocean conditions. The best forecasts are really nowcasts that start with synoptic analyses prepared from real-time infrared, ocean color, chlorophyll, altimeter, radar, current meter, and meteorological data. Using an ensemble approach of ocean model simulations with the real-time data provides the best forecasting approach. The real-time data including feedback from the captains should be used to validate and correct the simulations.

Geographic coverage and spatial and temporal resolution should be customized and varied to meet the needs of the clients in a cost-effective fashion. Getting large cookie cutter-type products usually do not provide the detail needed by the client. The time schedule for support is a function of the needs of the client. In most areas of the ocean, receiving validated updates three times a week is satisfactory for the oil and gas operations, while daily analyses are more important for fishing operations. Sometimes for oil and gas operations other more dynamic and dangerous areas may require more frequent updates.

For both the oil and gas and fishing operations the customer should select service providers that blend the oceanographic analyses with the current models, vessel simulators, and operational experience at sea. Make sure you select a team that is able to verify and improve the models, extend the range of coverage and optimize route guidance. This allows the client to minimize delays and save time. Accurate and reliable analyses can save 7 days on a 40-day tow and reduce fishing searching time by 85%.

For response and horsepower forecasts the simulator is used to forecast the speed and response of the vessel during transit. For fixed operations, simulators are used to model and forecast the heave, pitch, roll and orientation. The best simulators predict the full electrical power demand on cruise ships which requires tracking the weather and currents as well as the variation throughout the day. For dynamic-positioned operations, this same technology can be used with the oceanographic analyses to optimize the scheduling of power between station keeping and drilling. Finally with fish forecasting species-specific forecasts are critical, as are mechanisms to communicate directly with the analysts to update the conditions for both tactical and strategic planning.

It's a big ocean out there and conditions can change rapidly, but there are great technology and service providers to improve your operational efficiency.

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# DECOM

# ADAPTING TO THE CHALLENGE

*3 pile and conductor, water abrasive cut 15 ft BML – Piles intact*

Several quality services and a great project management team ensure a well-coordinated and proficient large-scale decommissioning project. High pressure water abrasive cutting has proven successful in reliability, time savings, and safety and is environmentally friendly. Today, the well cutting process is less challenging with newer technology in water abrasive cutting methods and procedures. Not all wells are as seen on well schematics and not all conductors and piles are as seen on reporting. It takes experience.

What makes cutting spreads teamed with project management so valuable, as offered by Offshore Technical Solutions, LLC (OTS), is the ability to adapt to unforeseen situations. In 2015 alone, OTS modified standard tooling to complete jobs in over 670 ft of water, with cameras added, and mobilized to cut a 94-in. caisson that turned out to be a 144-in. caisson. All jobs were successful. OTS and other water abrasive cutting companies do not rely strictly on abrasive cutting, they also manage, operate and adapt diamond wire saws, dredging units, shears, conductor slot recovery and alternative P&A equipment.

With a combined experience of over 65years, OTS has seen high pressure water abrasive cutting systems evolve from an unknown to a higher cost new technology to a service of choice by the major operators and general contractors. As with many technology evolution cycles, hybrids are developed, front-runners are decided and standards are set. OTS has found that consulting with clients on water abrasives as their first choice option and combining additional removal tooling such as diamond wire saws or guillotine saws when required can equate to a successfully completed project with lower vessel cost, minimized risk, and overall lower project cost.

Federal and state governments recognize and often require non-explosive solutions—meaning, water abrasives and mechanical methods strictly. At times, explosives are considered cheaper and faster to many project leaders. There are pros and cons to many decisions and each is dependent on the project at hand. Again, the combination has to be utilized with a well-constructed plan, having as the end results for the client: zero accidents and cost effectiveness.

OTS offers "slot recovery" in conjunction with reliable cutting services. Slot recovery is the removal of wells for wave load reduction or for drilling a new well using the same structured bay on the platform. This is not new to the industry, however, convincing and training PMs of the value in combining all services to complete the job with total confidence is a work in progress.

*BA A 23-A, 8 pile removal*


*Water abrasive cut through a grouted multistring 9-5/8 in. - 36 in 177 ft of water."*

The planning and hiring of service companies to go onsite is where OTS and other top decom companies aspire to help the client make a valuable, safe, and cost savings decision. Profit, as the professional audience knows, is sometimes decided on one project and other times over a campaign of removals in one or even several fields. To minimize downtime and properly keep the services in good order requires specialized skill sets and maintenance practices. To specialize in cutting services, which can make or break a project, is where the OTS management and supervision teams aim to have total effectiveness—leaving the client with minimal concern after making a choice of services.

Training the appropriate technicians and supervisors to operate mechanical, water abrasive or other cutting equipment is not unachievable. It has been recognized by service companies and the barge/liftboat contractors that properly trained personnel can make or break a project, as with many industrial fields. To train these persons requires total attention to detail of the particular service provided. To drive that point home, consider that a water abrasive cutting unit is designed to cut through several inches of steel, grout, water and other unknowns (seen in photo). With that in mind, what would be expected of how this affects the assets that power the cut? Obviously, these factors are costly and require specialized engineering and operation.

Taking the process a step further, camera systems, electronic umbilical, diver and ROV support equipment all can be used to enhance the project success—with scientific and calculated precision. Ensuring that process can be repeated from site-to-site requires specialization. OTS believes that technicians should be cross-trained for all of these operations to support the client. That being the philosophy, the company also requires personnel to understand that there is a point where OTS allows the client to do what they do best and are specialized, trained and experienced in doing. Diving, crane operation, construction and cementing are a few examples where cross-training is not beneficial to the company. ISN and other safety regulating bodies have helped make sure the service companies define specialization and the accompanying training necessary.

Combined cutting services, specialized training, and project planning buy-in are proving year after year to be the safest and most cost-effective ways to take on the decommissioning challenge. Breaking new boundaries and starting to support the mature offshore asset global markets can be made easier by combining the services available from the start.

Historical data from Offshore Technology Solutions 2015 projects can be made available upon request to nick@offshoretechnical.com.

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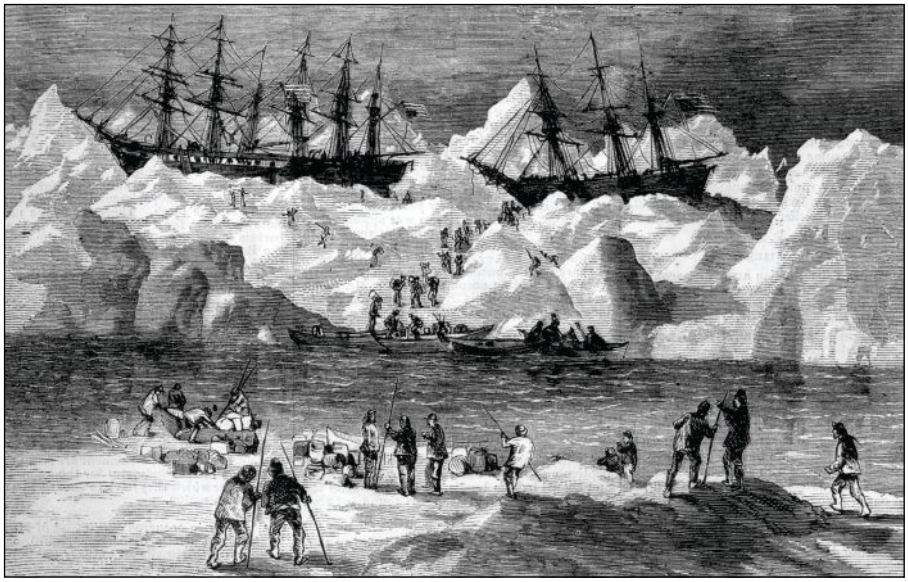
# OCEAN INDUSTRY

## in this section



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



*Abandonment of the whalers in the Arctic Ocean, September 1871, including the George, Gayhead, and Concordia. Scanned from the original Harper's Weekly 1871. (Credit: courtesy of Robert Schwemmer Maritime Library)*

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

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

The ships were destroyed in a matter of weeks, leaving more than 1,200 whalers stranded at the top of the world until they could be rescued by seven ships of the fleet standing by about 80 miles to the south in open water off Icy Cape. No one died in the incident but it is cited as one of the major causes of the demise of commercial whaling in the U.S.

With less ice in the Arctic as a result of climate change, archaeologists now have more access to potential shipwreck sites than ever before. In September, a team of archaeologists from the Maritime Heritage Program in NOAA's Office of National Marine Sanctuaries scoured a 30-mile stretch of coastline in the nearshore waters of the Chukchi Sea, near Wainwright, Alaska. Previous searches for the ships had found traces of gear salvaged from the wrecks by the local Inupiat people, as well as scattered timbers stranded high on the isolated beaches that stretch from Wainwright to Point Franklin.

Using state-of-the-art sonar and sensing technology, the NOAA team was able to plot the "magnetic signature" of the two wrecks, including the outline of their flattened hulls. The wreck site also revealed anchors, fasteners, ballast and brick-lined pots used to render whale blubber into oil.

For more information, visit www.noaanews.noaa.gov.

*A small anchor and other objects that were observed during the Lost Whaling Fleets expedition. (Credit: NOAA)*

**Mitcham Industries acquires L-3 Communications Klein Associates**

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

**Saab Seaeye consollidates Hydro-Lek**

Following their acquisition of tooling maker, Hydro-Lek, Saab Seaeye is now consolidating the business into their own facilities at Fareham. The Hydro-Lek operation moves to Fareham 14 December 2015 from its site at Finchampstead and will become a business line within Saab Seaeye Ltd, effective 1 January 2016.

**ABS releases new guidance for certifying lifting appliances**

ABS has published a new edition of the ABS Guide for Certification of Lifting Appliances that includes construction and operation of modern lifting appliances.

The revised ABS Lifting Appliance Guide provides the marine and offshore industry with a clear and precise set of requirements that fully address the existing and new technologies. The input from industry experts, gathered over a two-year period, is reflected in the Guide's more precise requirements for crane machinery; electrical and control systems; structure, material, fabrication, nondestructive evaluation and testing.

Structural requirements for shipboard, offshore and heavy lift cranes have been completely revised and updated. New requirements have been added for subsea lifting, motion compensation systems, rope tensioning systems and computer-based control systems for cranes. Particular attention was given to updating requirements for personnel lifting. For the emergency recovery of personnel, three different levels of redundancy in the emergency recovery control systems of cranes have been established, corresponding to the personnel lifting notations PL, PL+ and PL++.

The revised Guide includes a number of class notations for ABS classed units with certified lifting appliances, including the CRC (Crane and Lifting Appliances Register Certificate) Notation, CGSU (Cargo Gear Self Unloading) Notation and SElev (Shipboard Elevator) Notation, while the CRC notation is now further supplemented with crane and lifting appliance specific notations, such as SC (Shipboard Crane), OC (Offshore Crane), HC (Heavy Lift Crane), SP (Special Purpose Crane), MRW (Man Riding Winch), RMP (Ramp and Moveable Platform), PL/PL+/PL++ (Personnel Lifting) and Subsea (Subsea Lifting).

**New $7 Million XPRIZE competition seeks to usher in a new era of ocean exploration**

At a keynote address on 14 December 2015, during the American Geophysical Union Fall Meeting in San Francisco, Dr. Peter H. Diamandis, chairman and CEO of XPRIZE, announced the launch of the $7M Shell Ocean Discovery XPRIZE, a three-year global competition challenging teams to advance ocean technologies for rapid and unmanned ocean exploration. As part of the total $7M prize purse, NOAA is offering a $1M bonus prize to teams that demonstrate their technology can "sniff out" a specified object in the ocean through biological and chemical signals. David Schewitz, Shell vice president of geophysics for the Americas, and Richard Spinrad, chief scientist at NOAA, joined Diamandis on stage to launch the new competition.

"Our oceans cover two-thirds of our planet's surface and are a crucial global source of food, energy, economic security, and even the air we breathe, yet 95 percent of the deep sea remains a mystery to us," Diamandis said. "In fact, we have better maps of the surface of Mars than we do of our own seafloor. The Shell Ocean Discovery XPRIZE will address a critical ocean challenge by accelerating innovation to further explore one of our greatest unexplored frontiers."

The three-year competition includes nine months for team registration, 12 months for initial solution development and 18 months to complete two rounds of testing and judging by an expert panel. In each round, teams will complete a series of tasks, including making a bathymetric map (a map of the sea floor), producing high-resolution images of a specific object, and identifying archeological, biological or geological features. Teams also must show resiliency and durability by proving they can operate their technologies, deployed from the shore or air, at a depth of up to 4,000 m.

"Spurring innovation and creating radical breakthroughs in ocean discovery are what excite us about collaborating with XPRIZE," Schewitz said. "Shell recognizes the need to leverage the full power of innovation: the capacity for doing things differently and better than before."

A $4M Grand Prize and $1M Second Place Prize will be awarded to the two teams that receive the top scores for demonstrating the highest resolution seafloor mapping, after meeting all minimum requirements for speed, autonomy and depth. Up to 10 teams that proceed to Round 2 will split a $1M milestone prize purse. And the $1M NOAA bonus prize will be awarded to the team that can trace a chemical or biological signal to its source.

"The goal of the $1M NOAA bonus prize is to identify technology that can aid in detecting sources of pollution, enable rapid response to leaks and spills, identify hydrothermal vents and methane seeps, as well as track marine life for scientific research and conservation efforts," said Spinrad.

The Shell Ocean Discovery XPRIZE is part of the 10-year XPRIZE Ocean Initiative – a commitment made to launch five multi-million dollar prizes by 2020 to address critical ocean challenges and make the oceans healthy, valued and understood. XPRIZE awarded the Wendy Schmidt Oil Cleanup XCHALLENGE in 2011 and the Wendy Schmidt Ocean Health XPRIZE in July 2015.

For more information, visit www.oceandiscovery.xprize.org.

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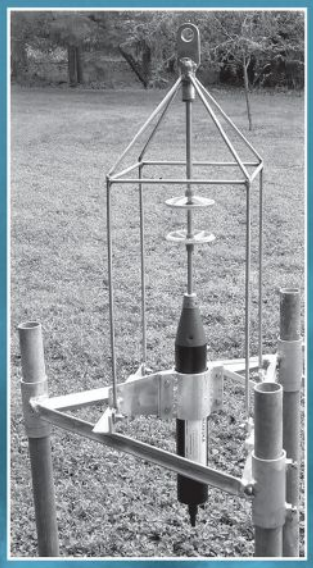

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## Delta Marine's Voe Earl working off the Port of Pra Voltri, for the Costa Concordia Salvage

# WORKHORSE VOE EARL EXCELS IN SALVAGE DEBUT

With dismantling of the ill-fated cruise ship Costa Concordia now well underway at the Port of Pra Voltri, Genoa in Italy, there is time for further reflection upon the extraordinary salvage operation that followed her sinking in January 2012.

Three months later a salvage contract was awarded to a joint venture consisting of Titan Salvage and Micoperi. Work began securing the vessel, constructing a support platform upon which to right it, and attaching buoyancy caissons to the out of the water port side.

Various workboat operators were subcontracted to work on the complex $1.2bn salvage of Costa Concordia, including UK based Dalby Offshore, which had recently observed Shetland based Delta Marine's Damen Multicat 2613 Voe Earl performing ship to ship transfer works in Great Yarmouth. Dalby chartered the vessel and Voe Earl arrived at the island of Giglio in August 2012, initially to provide rapid evacuation of plant away from the work site should there be sudden changes of weather as well as general marine assistance.

However, what Dalby and Delta Marine already knew, that Voe Earl was equipped to make a much broader contribution than simply providing emergency support, was quickly noticed by the salvage specialists on site, the majority of whom had never worked with a Multicat before.

No sooner had Voe Earl arrived on site than she was laying anchors and helping to position cables which would secure Costa Concordia on the sloping ledge where she lay and prevent the wreck from sliding into deeper waters.

The work site was crowded with vessels and there was no lay down area for storage in the tiny harbour at Giglio, with jack-ups being used to store plant and those jack-ups being serviced by crane barges. So the arrival of Voe Earl also quickly reduced unnecessary barge traffic as she was able to transport plant direct from the mainland to jack-ups and fabricated assemblies directly to the crane barges. She assisted cargo barges into position for arriving underwater platform components to be lifted by M30, the largest crane barge on site. Voe Earl also assisted the accommodation support vessel (ASV) Pioneer and numerous other supply vessels.

"Voe Earl was like a bumblebee," said Delta Marine's operations manager Neil Spanswick, "You should see its AIS track, it was flying all over the site. Clients were changing work schedules based on what Voe Earl could do."

On site logistics proved to be the vessel's bread and butter but among those additional activities were provision of harsh weather ferry services for site personnel, numerous dive support activities, and even a bit of direct salvage work using Voe Earl's 100t anchor handling winch to help remove Costa Concordia's 65 tonne rudders whilst manoeuvring beneath the wreck's overhang, which was denying access to crane barges.

By the end of 2012 it was deemed necessary to charter another Multicat from the Delta Marine fleet. Voe Venture arrived on 21 January 2013 and spent that entire year on site before proceeding onwards to South Africa to participate in the salvage of the grounded and broken bulk carrier MV Smart.

Prior to float off of the Costa Concordia, Voe Earl rescued the tug Aran, which had suffered engine failure during gales just off Giglio harbour and had to be towed to a sheltered area on the north of the island.

Voe Earl continued working on the Costa Concordia salvage until November 2014, by which time the wreck was parbuckled, prepared for towage and escorted to Genoa by a fleet of workboats which included Voe Earl.


During the float off Voe Earl had assisted in laying two sets of piggy backed anchors connected to the stern of the wreck which held it in place until pulled by tugs around to the east for final departure. Voe Earl then disconnected the hold-back anchors and followed the tow with an oil pollution kit on board in the event of spills. A noxious gas sensor was mounted on the wheelhouse as well as an infra-red camera to monitor the wreck and personnel onboard the wreck during the tow.

The float off and tow to Genoa was undertaken in July 2014 but Voe Earl remained chartered and on site until November as the post-departure site clean-up and general demobilisation of the world's largest ever salvage operation continued.

By project's end Voe Earl and Voe Venture had achieved much more than merely contributing to a successful operation. They had shown the salvage world the scale and range of contribution which vessels such as Delta Marine's Multicats were capable of making.

Their involvement in the Costa Concordia salvage operation also inputs to future workboat design, the initial manifestation of which will be the first of class Damen Renewables Service Vessel (RSV) 3315 which Delta Marine has been developing in cooperation with the Damen Shipyards Group over the past two years. Although developed specifically for the marine renewable energy sector, when the first RSV 3315 is launched early in 2017 it will have just a bit of salvage experience pulsing in its veins.

**MSI to deliver three AXYS buoys to assist safe passage through the Port of Melbourne**

Metocean Services International (MSI) has signed a contract with Port of Melbourne Corporation for two TRIAXYS Directional Wave Buoys and an AXYS WatchKeeper current, wave and met buoy. All three buoys will be built by AXYS Technologies in British Columbia, Canada, before being freighted directly to the Port of Melbourne.

The Port of Melbourne is Australasia's largest maritime hub for containerized, automotive and general cargo. It is a key economic asset for businesses and people across Victoria and southeastern Australia. With 2.6 million containers and 350,000 new motor vehicles handled each year, safe passage is paramount for the 3,000 ships that visit annually. The AXYS buoys will be a key component in providing real-time current, wave and meteorological data to the port management system covering 100,000 hectares of port waters.

The TRIAXYS™ Directional Wave Buoy is a solar-powered precision instrument incorporating advanced technologies that make it an easy-to-use, reliable and rugged buoy for accurate measurement of directional waves. The sensor unit is composed of three accelerometers, three rate gyros, a fluxgate compass, and the proprietary TRIAXYS™ Processor.

The AXYS WatchKeeper™ buoy is a 1.7 m diameter polyethylene buoy specifically designed for deployments in coastal areas, lakes, reservoirs and rivers. The WatchKeeper™ hull is internationally proven as an aid to navigation (AToN) and can be deployed in water depths from 20 to 500 m. Custom configurable with a wide range of sensors for monitoring meteorological and oceanographic parameters, it derives its wave data from the same sensor unit that is in the TRIAXYS™.

The systems being delivered to the Port of Melbourne Corporation will be fitted with radio and cellular telemetry systems as well as ISatPro for WatchCircle monitoring and terrestrial telemetry if required.

For more information, visit www.metoceanservices.com.

**Kongsberg Maritime acquires SMSC**

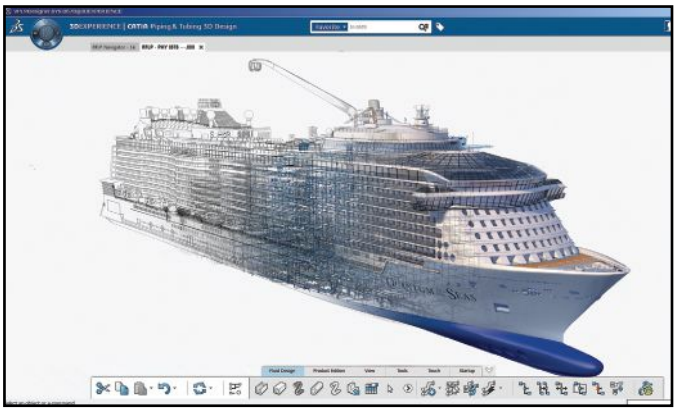
Kongsberg Maritime has signed a contract to buy the Trondheim-based ship simulation and consultancy company, Ship Modelling & Simulation Centre AS (SMSC). The acquisition, which is expected to be completed January 2016, will contribute to strengthening Kongsberg Maritime's position as a world leader in maritime simulation.

"More sophisticated vessel operations have contributed to an increasing focus on training to enhance safety and efficiency," says CEO of Kongsberg Maritime, Geir Håøy. "SMSC fits perfectly into our business and will complement our existing product and service portfolio well. In addition to supplying simulators, training and certification, the competence of SMSC also supports us to offer our shipyard and offshore customers new and innovative simulation services, ranging from ship modeling and engineering projects to pre-simulation and operational consulting."

For Kongsberg Maritime's existing simulator customers, the acquisition of SMSC will contribute to increasing capacity, for instance for the development of new and accurate models to use in simulation exercises.

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

# Meyer Werft deploys Dassault Systèmes' 3DEXPERIENCE Platform



Dassault Systèmes the 3DEXPERIENCE Company, world leader in 3D design software, 3D Digital Mock Up and Product Lifecycle Management (PLM) solutions, and Meyer Werft, one of the world's leading cruise ship builders, announced that Meyer Werft is deploying Dassault Systèmes' "On Time to Sea" and "Designed for Sea" industry solution experiences to more efficiently design and build its ocean-going cruise ships, enhance its innovation skills and expand its market leadership.

This deployment reinforces the long-standing cooperation between the two companies. Specifically, it supports Meyer Werft's new technology and development center in Papenburg, announced in November 2015, which will pool most of the design and development work from its 500 designers and engineers who are shaping the new features and developments of its future cruise ships. It will also support additional teams in Papenburg and at sites in Rostock, Germany and in Finland that are involved in building ocean-going cruise ships, river cruise ships, ferries and other vessels.

Building cruise ships is a particularly complex task compared to other industries. One cruise ship is made of more than 10 million individual parts and assemblies, compared to about one million parts for today's largest passenger airplanes and about 10,000 parts for a car. The complexity, diversity and large volume of data involved require efficient solutions to design and build ships that stand out from those of competitors.

With "On Time to Sea" and "Designed for Sea," based on the 3DEXPERIENCE platform, Meyer Werft's design and development teams can now rely on a unified digital environment to monitor the entire lifecycle of a ship, from its construction and operation to its decommissioning decades later. Virtual design, engineering and project management applications help seamlessly address complex needs in product development and process requirements.

For more information, visit www.3ds.com.

**Sonar demonstrations show the way ahead for vessel navigation**

Maritime security technology company, Sonardyne International Ltd, has successfully demonstrated the capabilities of its Navigation and Obstacle Avoidance Sonar, NOAS, during 3 days of water-borne demonstrations in Plymouth, southwest England.

Above the water, innovations such as ECDIS (Electronic

Chart Display and Information System) which integrates GPS, AIS and radar, have delivered valuable improvements in situational awareness for captains and their crews. However, when navigating poorly charted or unfamiliar areas, commercial ships, expedition cruise ships and naval vessels remain vulnerable to groundings and collisions with submerged objects. In their quest for privacy, large private yachts are particularly at risk as owners seek to explore remote locations, often close to shore. This is where underwater forward-looking sonar technology provides a solution.

NOAS works by scanning a wide area in front of a vessel with multiple sonar 'pings' to create a highly detailed, 3D model of the sea floor and water column along a vessel's course. The intuitive display informs the crew of water depth, underwater features and potential hazards to a range of up to 600 m over a 90° field of view. NOAS also has a sonar mode for navigation and underwater intruder detection capability out to a range of 1,500 m over a 180° field of view.

For more information, visit www.sonardyne.com.

## Wärtsilä develops inert gas solution for 17 new LNG carriers

Daewoo Shipbuilding and Marine Engineering (DSME) in South Korea has contracted Wärtsilä to supply combined inert gas generators and gas combustion units for 17 new LNG carrier vessels under construction at the company's yards. The vessels are being built for leading operators in Singapore, Greece, South Korea, Cyprus and Canada. These significant contracts with Wärtsilä were signed in June and September.

These will be the first units delivered by Wärtsilä that combine inert gas generators (IGG) and gas combustion units (GCU) with high capacity. The systems have a maximum volume of up to 3,800 kg/h, which is sufficient for the industry's largest LNG carriers. The concept of combining the two systems was developed by Wärtsilä in close cooperation with DSME. The system uses an existing Wärtsilä Moss inert gas generator to burn the boil-off gas, thereby eliminating the need for a conventional gas combustion unit. This results in considerable capital expenditure savings. At the same time, by using the boil-off gas as fuel for creating inert gas, the combined system also provides notable operating cost savings.

The combined IGG-GCU system has a minimal environmental footprint. This is achieved through the replacement of a separate onboard system and by using the boil-off gas for inert gas generation, which together minimize the extra use of marine diesel oil (MDO) fuel.

"Wärtsilä has a vast depth of experience in supplying advanced gas solutions for marine and offshore applications. We appreciate the excellent cooperation with DSME in enabling the development of this combined IGG-GCU system," says Juha Kytölä, vice president, environmental solutions, Wärtsilä.

"We are pleased to be working on this project with Wärtsilä, a company that we know well and respect. We have every confidence in their ability to provide an efficient, reliable, and safe solution for these vessels," says NS Kim, junior director, DSME.

Wärtsilä has earlier supplied smaller versions of the combined IGG-GCU system since its introduction in 2013. These new Wärtsilä contracts are scheduled to be delivered to the yard commencing in the third quarter of 2016.

**Maximizing sea life's ability to reduce atmospheric carbon may help combat climate change**

New research on West Antarctic seabed life reveals that the remote region of the South Orkney Islands is a carbon sink hotspot. The findings suggest that this recently designated (and world's first) entirely high seas marine protected area may be a powerful natural ally in combating rising $CO_2$ as sea ice melts.

"There has been a cascade of rising atmospheric $CO_2$ driving warming, reducing sea ice, leading to longer micro-algal blooms—which means longer meal times for animals, which are growing more," said Dr. David Barnes, senior author of the Global Change Biology study. The recently discovered polar seabed carbon gains remove carbon from cycling and represent a key negative feedback working against climate change.

This new science, which was conducted with Darwin Initiative funding, suggests that researchers should investigate whether maximizing natural carbon capture by seabed life could help reduce global $CO_2$.

**Moonlight drives winter 'werewolves' to gather for Arctic Ocean odyssey**

Scientists studying the moon's effect on marine life during the constantly dark Arctic winter believe they have uncovered the "werewolves of the ocean," which regularly gather in their billions to undertake the largest migration on Earth.

The team from the Oban-based Scottish Association for Marine Science (SAMS) have published findings in the journal Current Biology that the actions of zooplankton (small marine animals) respond to the moon as the main light source during the polar night.

Using echo sounders fixed to the seabed and analyses more commonly associated with studying the human biological clock, the scientists observed zooplankton moving deeper into the darkness in response to the full moon. The team believes this migration is to hide from light-dependent visual hunters, such as the voracious centimetre-long crustacean *Themisto libellula*.

This response could be seen across the entire Arctic at all water depths, ice covered and ice free, from 70°N to 90°N.

Lead author on the Current Biology paper Dr. Kim Last, SAMS principal investigator in marine chronobiology, said: "It was previously presumed that there was little activity during the Arctic winter, as there is hardly any food and no light, but our recent work with partners from the University of Tromsø showed there is a surprisingly high level of activity."

"Now we know that when the moon rises, the zooplankton drop down in the water column to around 50 m in depth, presumably to hide from predators."

The mass migration has been detected by the team at the North Pole, in water 4,000 m deep and underneath thick ice. The research suggests that reducing sea-ice cover, resulting from climate change, may cause further changes in these migrations as more light penetrates the sea.

This newly discovered response to moonlight during the Arctic winter has been described by the researchers as lunar vertical migration (LVM) and only occurs for a few days each month as the full moon rises above the horizon.

The team also discovered that zooplankton follow the rising and setting of the moon. This phenomenon results in a new kind of daily lunar migration, the cycle of which is longer (every 24.8 hours) than the standard day/night solar light response in the sunlit waters of the rest of the world.

Dr. Last added, "Diel vertical migration (DVM) of zooplankton is one of the biggest daily migrations on the planet, a process driven by sunlight. It's therefore a complete surprise to us to find that wherever we look across the Arctic during the winter, we witness a migration driven by moonlight."

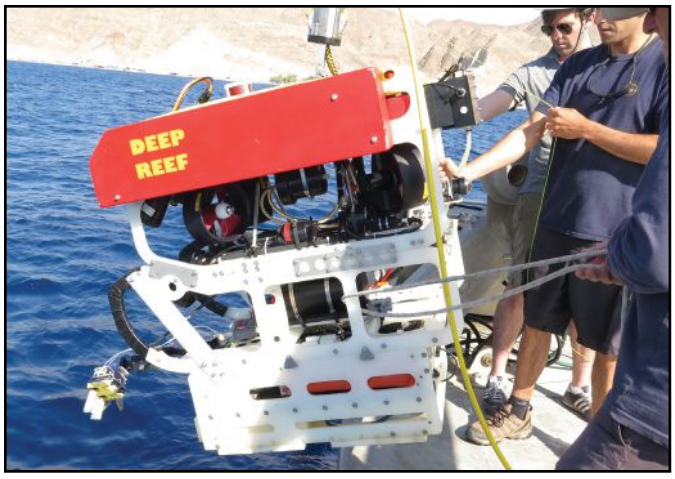
"Perhaps the 'werewolf' isn't a myth after all?"

Laura Hobbs, a Ph.D. student at SAMS and co-author on the paper, said: "The moon must have a dramatic effect on these creatures if they are undertaking such huge migrations."

"The next step is to find out moreabout the response, how it varies across the region and how the behaviors might change as Arctic sea ice cover reduces."

The work was funded by UK's Natural Environmental Research Council and the the Research Council of Norway under projects Panarchive and Circa, respectively.

# "Squishy" robot fingers aid deep sea exploration




***Soft robotic gripper is attached (lower left) to the ROV as it is lowered into the Red Sea for a test dive. (Photo courtesy of Kevin Galloway, Wyss Institute at Harvard University.)***

During a 2014 talk on his exploration of deep-sea coral reefs, Baruch College marine biologist David Gruber showed a video of clunky robotic hands collecting fragile specimens of coral and sponges from the ocean floor. Harvard engineer and roboticist Robert J. Wood was in the audience–the two scientists were being recognized as Emerging Explorers by the National Geographic Society–and a lightbulb went off.

"They were using rigid jaws of life-type grippers designed for the oil and gas industry that were totally overpowered and were destroying things," Wood recalls. "It immediately clicked that there was a soft robotics solution that may be viable."

In the months that followed, the pair collaborated to design, fabricate, and test soft robotic grippers for deep-sea collection of fragile biological specimens. Their recent expedition to the Gulf of Eilat in the northern Red Sea, a unique marine ecosystem that houses one of the world's largest and most diverse coral reefs, marked the first use of soft robotics for the non-destructive sampling of fauna from the ocean floor.

The new technology could enhance researchers' ability to collect samples from largely unexplored habitats thousands of feet beneath the ocean surface, areas that scientists believe are biodiversity hotspots teeming with unknown life. The soft grippers also could be useful in underwater archaeology.

As described in a paper published in the journal Soft Robotics, the team successfully developed two types of grippers, and in the process demonstrated a new fabrication technique that allows for the rapid creation of soft actuators.

Manipulating and grasping fragile organisms from the seafloor requires something that can mimic the dexterity and soft touch of a human diver's hand. Wood, Charles River Professor of Engineering and Applied Sciences at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) and founding core faculty member of the Wyss Institute for Biologically Inspired Engineering at Harvard University, recognized that soft robotics is tailor-made for the task.

Wood and Wyss Institute mechanical engineer Kevin Galloway set about designing two types of hands to replace the ROV's factory-furnished metal gripper, each capable of gently recovering objects of different sizes and shapes. One, inspired by the coiling action of a boa constrictor, can access tight spaces and clutch small and irregular shaped objects. The other, a bellows-style model, features opposing pairs of bending actuators.

For more information, visit www.seas.harvard.edu.

### Robot subs inform protection of English deep-sea corals

A fleet of robotic submarines, based at the National Oceanography Centre (NOC), headquartered in Southampton, have been used to map vulnerable cold-water coral reefs in the deep ocean off southwest England. This data set is being used to inform the management of a new Marine Conservation Zone (MCZ) that protects the only area of deep-sea coral habitat in English waters. This MCZ forms part of a national network that is being expanded this week as a second round of designated sites are announced by Defra.

Scientists at the NOC worked in partnership with the Defra network to collect data from The Canyons MCZ, which is over 300 km southwest of Cornwall, using an unprecedented variety of marine robotic vehicles deployed from the research ship, RRS James Cook. Collected data include 3D maps of the seafloor and high-quality video and photos and show the location and extent of the corals. This data set is providing Defra with robust evidence that will guide decisions about how to implement management measures at the site.

The Canyons MCZ is particularly challenging to survey as much of the site occurs within a deep-sea canyon over a mile deep. By using the research ship and robotic vehicles together, the NOC team was able to create a series of detailed maps of the site at different scales from tens of kilometres down to a few millimetres. Ship-based seafloor mapping provided information on the overall shape of the canyon, and the Autosub6000 AUV was then "flown" within the canyon to make more detailed maps of coral habitats. While Autosub6000 was undertaking its missions, the NOC's Remotely Operated Vehicle, Isis, was deployed to map steep canyon walls and collect images and samples that confirmed coral presence and species.

By using these robotic vehicles in combination, the team were able to collect a vast array of high-quality data in just 3 days, demonstrating how robotic vehicles can augment relatively expensive ship operations. In addition, by directly deploying the vehicles into the depths of the canyon, the team was able to map and image steep and overhanging rock walls that hosted extensive coral communities; these habitats were previously overlooked using conventional (downward-looking) ship-based instruments.

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

### WOC and Maersk Line partner with the University of Hawai'i to advance tsunami detection

Maersk Line vessels operating across the North Pacific are hosting instruments that create a network of low-cost tsunami sensors to augment existing detection systems. Maersk's involvement in the project was organized by the World Ocean Council (WOC) "Smart Ocean-Smart Industries" Program, which works as a broker between the science community and the ocean business community in order to advance the use of ocean industry vessels and platforms for data collection.

Accurate and rapid detection and assessment of tsunamis in the open ocean is critical for predicting how they will impact distant coastlines, enabling appropriate mitigation efforts. Scientists from the University of Hawai'i – Mānoa (UHM) School of Ocean and Earth Science and Technology (SOEST), with funding from NOAA, are partnering with Maersk Line and Matson Navigation to equip 10 ships with real-time geodetic GPS systems and satellite communications. The pilot network of GPS-equipped ships enables each vessel to act as an open-ocean tide gauge. Data from these new tsunami sensors are streamed, via satellite, to a land-based data center where they are processed and analyzed for tsunami signals.

"The 2011 Japan earthquake highlighted weaknesses in our understanding of earthquake and tsunami hazards and emphasized the need for more densely-spaced observing capabilities," said James Foster, SOEST associate researcher and lead investigator for the project. "Commercial vessels are the only realistic option for providing observation platforms at the scale necessary. The WOC Smart Ocean-Smart Industries program was exactly the mechanism we needed to identify and engage a shipping company that might respond to our needs for instrument hosting and ocean data collection," he added.

During the Illapel tsunami in 2015, several of the pilot project ships were in the open ocean, enabling actual testing of the sensors. First results were positive, confirming predicted performance of the sensors. With the network installed, the scientists are at the beginning of further testing of system performance and refining methods for filtering the time series to improve the resolution of tsunami events.

For more information, visit www.oceancouncil.org.

**Minesto enters technology partnership with Schottel Hydro**

Minesto has entered into a technology partnership with German tidal turbine manufacturer Schottel Hydro. The objective is to supply Minesto with hydrokinetic turbine components in 2016 and 2017.

"This is a strategic technology partnership with one of the world leaders in underwater technology, ensuring the quality and performance of our marine power plant, Deep Green," said Minesto's CEO, Anders Jansson.

According to the newly signed agreement. Schottel Hydro will deliver a customized turbine solution that will optimally fit the requirements of Deep Green, Minesto's underwater kite construction that is expected to be deployed in 2017 at the Holyhead Deep site off the coast of Anglesey, Wales. The lightweight nacelle power-take-off system includes a turbine, drive train, power electrics and auxiliary devices. All components will be tailor-made to fit the system of the "underwater kite" perfectly.

"We are very pleased to announce this strategic partnership with one of the world leaders in underwater technology," said Anders Jansson, CEO at Minesto. "This will not only ensure the overall quality of Deep Green, delivering a one-stop shop turbine solution which can be perfectly integrated in our system, but also optimize product development by supplying expertise to Minesto."

The drive train concept is based upon the proven concept of the Schottel Instream Turbine (SIT). It consists of an inline arrangement of open rotor, a rotor shaft including sealing and bearing, planetary gearbox and generator. In contrast to this readily available device with rotor diameters between 3 and 5 m, the Deep Green turbine will be significantly smaller and able to operate at higher rpms. Schottel Hydro will also carry out a full-load test series on a specially built test stand prior to installing the turbine in 2017.

During the coming 3 years, 19 more Deep Green-devices will follow and eventually form an array with an overall capacity of 10 MW, supplying electricity to the equivalent of 8,000 households and create local jobs in both construction and operational phases.

For more information, visit www.minesto.com.

**MHI Vestas Offshore Wind receives 330 MW order from DONG Energy**

DONG Energy and MHI Vestas Offshore Wind have again partnered for the supply of V164-8.0 MW turbines, this time for the Walney Extension West project in the UK. The project will be the second order for the V164-8.0 MW and with 40 turbines it will be the largest 8-MW project to-date. The turbines will utilize a power mode to increase performance.

MHI Vestas Offshore Wind has received a 330-MW order from DONG Energy for 40 V164-8.0 MW wind turbines for the Walney Extension West project in the UK. The order includes a 5-year full-scope service contract with an availability guarantee, ensuring optimized performance of the wind power plant with maximum power output.

The V164-8.0 MW turbines–rated with a capacity of 8 MW–have been optimized for the Walney Extension West project, utilizing a power mode to be able to deliver a maximum output of 8.25 MW, further increasing the value for the customer.

"We're proud that once again DONG Energy has chosen to partner with MHI Vestas for the supply of V164-8.0 MW turbines for the Walney Extension West project," said CEO Jens Tommerup. "This will be the second project to use the V164-8.0 MW and our order backlog together with DONG Energy now stands at 588 MW, which demonstrates the confidence the customer has in our technology and our company."

Blades for the project will be produced at the MHI Vestas factory on the Isle of Wight, where over 200 employees commenced serial production of 80-m blades for the Burbo Bank Extension project in May 2015.

The Walney Extension project is located in the Irish Sea, approximately 35 km northwest of the Fleetwood and Blackpool coast. This will be the first phase of the 660-MW Walney Extension offshore wind farm project that on completion will be capable of supplying over 460,000 homes with clean energy.

For more information, visit www.mhivestasoffshore.com.

# Innovative wave energy device lands in Australia


BioPower Systems (BPS) completed the deployment of its 250-kW bioWAVE pilot demonstration unit off the coast near Port Fairy, Victoria. The $21 million project has been in development by BPS for 3 years, with $11 million funding from the Australian Renewable Energy Agency (ARENA) and $5 million funding from the Victorian Government.

BPS CEO Dr. Timothy Finnigan said the usually powerful swell at this site abated enough for the installation to be completed smoothly and successfully.

"Installation of the bioWAVE in the Southern Ocean marks the culmination of an intensive development phase and the beginning of a testing and demonstration phase for bioWAVE. We will now turn our attention to commissioning the plant for operation, and we aim to be delivering electricity into the grid very soon," Dr. Finnigan said.

The bioWAVE was deployed by a crane-equipped ship, which transported the device to the site and lowered it into the water. The structure was angled slightly, piercing the surface like a diver to avoid any impacts from the waves, before being levelled out and landed on the seabed. Divers monitored the process from below to ensure accurate placement.

"This is a major achievement for Australia's emerging wave power industry and represents another ARENA-supported breakthrough in renewable energy innovation," said acting ARENA CEO Kay said. "BPS has overcome a range of logistical and technical challenges over the better part of a decade, taking BioWAVE through extensive research, design and testing phases. Developing new technologies takes considerable time and resources and government support is crucial for enabling this process. The device will be tested and monitored throughout its operation to produce an independent performance assessment that will be shared with the energy industry in line with ARENA's knowledge sharing agenda."

The unique bioWAVE device is a 26-m tall oscillating structure designed to sway back-and-forth beneath the ocean swell, capturing energy from the waves and converting it into electricity that is fed into the grid via an undersea cable. The design was inspired by undersea plants and the entire device can lie flat on the seabed out of harm's way during bad weather.

For more information, visit www.biopowersystems.com.

### Block Island Wind Farm caps off successful first offshore construction season

The first offshore construction season is now complete for America's first offshore wind farm, with all five steel jacket foundations fully installed at the Block Island Wind Farm site.

Construction crews installed the last deck platform on 21 November 2015. All of the construction and crew vessels associated with the operation have now demobilized from the site.

"From the first 'steel in the water' in July to the last deck lift in November, we've completed a season of firsts–not only for the Block Island Wind Farm but also for the launch of a new American offshore wind industry," said Deepwater Wind CEO Jeffrey Grybowski. "We are proud of the work we've accomplished so far, but we've only just begun–and 2016 will be a year to remember."

Over the course of the busy 18-week construction period, approximately 200 workers (100 of them local) and a dozen construction and transport barges, tugboats, crew ships and monitoring vessels were active at the project's port facilities and the wind farm site roughly 3 mi off the coast of Block Island.

The focus this winter and spring now turns to turbine assembly and submarine cable installation work.

Deepwater Wind and General Electric are establishing a new temporary manufacturing facility at the Port of Providence for the assembly of turbine components. GE–which recently completed its acquisition of Alstom's offshore wind unit–is supplying the 6-MW Haliade 150 offshore wind turbines for the Block Island Wind Farm. Approximately 60 local workers will be involved in this aspect of the project.

Over the next 6 months, GE will install the critical electrical, mechanical, and safety equipment within the bottom tower sections now at ProvPort, with the remaining tower sections arriving in Rhode Island next year. Each turbine tower consists of three sections, with a total height of approximately 270 ft, and a total weight of approximately 440 tons, once assembled.

For more information, visit www.dwwind.com.

### Balfour Beatty to build onshore substation for Hornsea

Balfour Beatty has been awarded a £25 million project by DONG Energy to construct a new high voltage onshore substation as part of the new Hornsea Project One offshore wind farm.

Work to construct the new onshore substation is planned to start in January 2016, with Balfour Beatty responsible for the build at North Killingholme, North Lincolnshire. The facility will enable the transfer of electricity from the Hornsea offshore wind farm to the adjacent, existing National Grid substation.

The project includes the construction of core buildings and compounds, the installation of low-voltage electricity equipment, low-voltage cables, and communication cables as well as roads, paths, drainage and landscaping. Balfour Beatty will be the principal contractor during the 2.5 year contract, which also includes the installation of high-voltage electrical equipment by third parties.

The wind farm itself, built by DONG Energy, will provide enough electricity to power well over 800,000 homes in the UK and is the third onshore substation in the UK from DONG Energy that has been awarded to Balfour Beatty.

For more information, visit www.balfourbeatty.com.

### Beothuk announces offshore wind project offshore Nova Scotia

Beothuk Energy Inc. has announced its plans for a major offshore wind farm off the coast of Nova Scotia. The project is estimated to cost CAD 4 billion.

Beothuk is proposing to manufacture and install a 1,000-MW wind farm in shallow waters off the southwest coast. Power will be exported to New England via a proposed 200-nmi subsea cable, the Can-Am Link. This link will ensure traceability of the clean, green wind energy to the New England market. To develop this Nova Scotia - New England export project, Beothuk has partnered or has formed working relationships with leaders in finance, construction and the offshore wind industry which include Jacob Capital Management, Siemens Offshore Wind, Talon Energy and Maderra Engineering.

Beothuk will coordinate technology, economics, and environmental disciplines that will help contribute to a healthier green environment, while maximizing benefits for Nova Scotia and Atlantic Canada generally. The proposed site has world-class wind resources and will be located about 20 km from shore in shallow waters of 30 m or less. It will be outside of major shipping lanes and commercial fishing grounds. The Can-Am Link will make landfall close to existing transmission facilities near Boston, giving access to the New England transmission corridors. This offshore wind power will contribute to the region's security of supply and benefit both the American and Canadian governments' climate

change strategies. Benefits to Nova Scotia include the manufacturing of various components for the offshore wind farm that consist of gravity-based structure construction and establishment of a service/supply port.

Beothuk is in discussions with various Canadian and American utilities and independent power producers regarding power purchase agreements and partnerships for this project. Early in 2016, Beothuk plans to hold consultations with Nova Scotia stakeholders, including First Nations and environmental groups, and municipalities in proximity to the project.

For more information, visit www.beothukenergy.com.

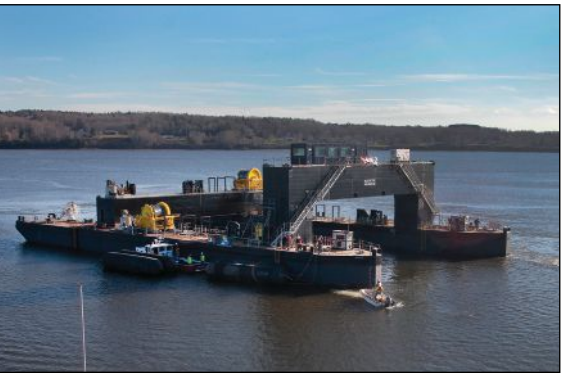
### Scotia Tide barge launch

The Scotia Tide barge, designed by OpenHydro, a DCNS Company, and built by Aecon Group in Pictou, Canada, took its maiden test voyage around Pictou Harbour in December. The unique, catamaran-style vessel is the largest heavy lift capacity barge in Atlantic Canada.

The 64-m long, 37-m wide, 650-ton barge has a 1,150-ton carrying capacity. Purpose-built for deployment and recovery operations for wave and tidal power installations, the Scotia Tide is equipped with three heavy-lift winches that give it a unique capacity to lower and raise turbines from the seafloor. Cape Sharp Tidal's 1,000-ton turbines will be towed from Pictou Harbour to the FORCE test site in Parrsboro in the spring.

Cape Sharp Tidal plans to install two 2-MW in-stream tidal turbines in 2016, North America's first commercial scale grid-connected tidal array. It will be the first developer to demonstrate its technology at the FORCE test site. The project is the first step toward demonstrating that in-stream tidal energy development is an opportunity for Nova Scotia and Canada to establish a thriving tidal industry and be a global leader in an emerging market.

For more information, visit www.capesharptidal.com.



### Full-scale tidal demonstrator installed in Wales

A Welsh tidal stream technology company has installed the country's first tidal energy generator in Ramsey Sound, Pembrokeshire. Developed by Cardiff-based Tidal Energy Ltd, the DeltaStream device will become one of the first grid-connected demonstration devices worldwide to generate green, sustainable and predictable tidal power. The patented DeltaStream device was loaded off the quayside in Pembroke Port by the offshore construction vessel Siem Daya 1 before making the short passage to Ramsey Sound for installation during a suitable tidal window.

Weighing 200 tons, with a frame 16 m long and height of 18 m, the DeltaStream 400-kW demonstration device has a gravity-based foundation that sits on the seabed under its own weight, without the need to drill or pile the structure into the seabed.

The company says that Ramsey Sound was chosen as the test-site for the device because it is sheltered from prevailing wind and wave conditions, but has a good tidal climate with tidal streams reaching up to 3 m/s on spring tides. There is a good grid connection feeding electricity to St. Davids city and excellent port facilities and marine engineering capabilities nearby in Pembroke Port.

A total of around £15 million has been invested in the project, which has been provided by the company's majority shareholder, Welsh renewable energy company Eco2 Ltd, along with EU funds worth £8M delivered through the Welsh Government.

Chief Executive of Eco2 Ltd, David Williams, said, "As a broad-based renewables company we have been long-time backers of the tidal energy industry and are delighted to have supported Tidal Energy Ltd in reaching this significant milestone."

"The DeltaStream device literally takes renewable power generation out of sight, minimizing environmental impact whilst harnessing the largely untapped energy resources of the oceans. There is great potential here and we look forward to demonstrating the viability of our technology and developing our commercial scale demonstration project at St. Davids Head."

This site at St. Davids Head in Pembrokeshire is 2 mi north of Ramsey Sound and is being developed by Eco2 in partnership with Tidal Energy Ltd. This will involve up to nine DeltaStream devices being deployed, generating enough power for approximately 10,000 homes.

For more information, visit www.tidalenergyltd.com.

### SPR, Atlantis to establish the largest tidal stream portfolio in the UK

Atlantis Resources and ScottishPower Renewables (UK) Limited (SPR) are teaming up to develop a joint portfolio of projects for the fast growing tidal sector. Atlantis's Scottish project development vehicle, Tidal Power Scotland Limited (TPSL), will acquire SPR's portfolio of tidal projects in exchange for a 6% shareholding in TPSL for SPR. As a shareholder, SPR will have a representative on the TPSL board, ensuring that the enlarged portfolio can benefit from its experience in renewable energy development and operations and demonstrating commitment to the future of tidal power in the UK.

The SPR tidal power portfolio consists of two sites, a 10-MW project at the Sound of Islay in western Scotland and a 100-MW development at the Ness of Duncansby at Scotland's northeastern tip. The projects will sit alongside the flagship 398-MW MeyGen project, which is 85% owned by TPSL.

The project assets include agreements for lease with The Crown Estate for both sites, and the Sound of Islay site also has a grid connection offer and construction consents from the Scottish Ministers. The Sound of Islay project has been awarded €20.7 million of grant funding from the European Commission's NER300 fund by way of capital and revenue support. With consents, grid connection and grants secured, this project is the most advanced commercial-scale project in the UK after MeyGen and is expected to achieve financial close in 2016.

Following completion of the acquisition of Marine Current Turbines Limited from Siemens AG in an all share deal earlier this year, the Atlantis group has agreements for lease for two further Scottish tidal sites, at the Mull of Galloway in southwest Scotland and Brough Ness to the north of the MeyGen and Ness of Duncansby sites in the Pentland Firth. Atlantis is in the process of adding these two projects, with a combined capacity of 130 MW, to the TPSL portfolio.

Atlantis, through TPSL, is the driving force behind the growing tidal sector in the UK. TPSL has the largest tidal stream portfolio in the UK, which is at the forefront of this burgeoning industry. The benefits of the increased scale of development in the expanded portfolio are expected to extend to a stronger supply chain in Scotland and the UK as a whole, attracting inward investment and diversifying exposure to the traditional offshore sector.

For more information, visit www.atlantisresourcesltd.com.

# Balmoral Offshore Engineering
## www.balmoraloffshore.com

Balmoral Offshore Engineering is dedicated to technologically driven composite and polymer solutions for today's demanding oceanographic, seismic and deepwater oil and gas sectors.

Operating to depths of 10,000msw, Balmoral products include ROV/AUV and surface/subsurface buoyancy, elastomer cable protection, bend restrictors, stiffeners, clamps, riser buoyancy and thermal insulation and are used in the most hostile waters of the world.

Proprietary laboratory, hyperbaric and mechanical testing facilities enable Balmoral to research, identify and develop cost-effective materials across a spectrum of applications. The company has invested heavily in the most comprehensive suite of syntactic, composite and polymer processing facilities the sector has ever seen and is currently building the world's largest hyperbaric test center at its Aberdeen HQ.

Since establishment in 1980 Balmoral's reputation has been built on innovation. Attention to detail, customer communication, supply chain control and on-time delivery of the highest quality products at the best possible price are the company's utmost priorities.

A firm believer in promoting excellence at all levels, Balmoral subsea, umbilical, riser and flowline (SURF)-related products are accredited by Bureau Veritas in line with the American Petroleum Institute's demanding API 17L standards.

A multi-award winning company, Balmoral recently celebrated its third UK Queen's Award for Enterprise for International Trade. Previous Queen's Award wins were achieved in 2010 and 2012. Export sales now account for over 80% of sales—more than double the UK industry average.

### End-to-end ROV buoyancy specialists

With advances in deepwater technology the need for remote intervention has seen major increases in the number of remotely operated and autonomous underwater vehicles. As the complexity of these vehicles evolves the demand for lower density, high performance buoyancy systems has increased. This is an area where Balmoral has made significant technological advances.

The use of conventional cast composite buoyancy packs still offers commercial benefits for large vehicles used in trenching of pipelines or submarine cables. However, for deepwater work-class ROVs the performance benefits of Balmoral's low density foam (LDF) series become significant.

This pure foam composite system provides the opportunity to increase ROV uplift, resulting in increased payload while reducing the overall weight and dimensions of the vehicle. Intricate buoyancy profiles, with virtually no size limitation, are created using Balmoral's unique in-house 5-axis CAD/CAM milling facility.

This series of LDF buoyancy is generally available from stock and is complemented by ROV support equipment including floats and FlexLink™, a buoyant umbilical bend control system.


***Balmoral buoyancy system on Fugro FCV 3000 work-class vehicle. Image courtesy of Fugro.***

### Market conditions demand focus

Jim Milne, MD, founder and chairman of the company, said: "I believe Balmoral has a name for consistently delivering and being very customer friendly: we work hard and are good at what we do. However, we are certainly not complacent and remain focused on improvements across the board."

"You have to know your customers and make sure they know you. This is particularly pertinent under current market conditions. There is continuous pressure to do better, and we seek to fulfil.

"We have an outstanding engineering team that is always working on something new and this is fundamental to our business. It is important to realise that we are a private company and do not require shareholder approval for major R&D projects.

"We make huge investments in R&D and ensuring there is something behind the brand. Many people say we have a fantastic brand but that has been earned over many years of consistent high level performance.

"The differentiators between us and our competitors are innovation, technical expertise and manufacturing efficiency as well as offering a comprehensive product portfolio. We listen very carefully to our customers and maintain open communication channels at all times."

**Austal awarded LCS support contract**

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

"This contract directly reflects our customer's confidence in Austal's ability to build and support highly advanced ships and to meet today's changing requirements," said Austal chief executive officer Andrew Bellamy.

Work will be performed at Austal's state-of-the-art ship manufacturing facility in Mobile, Alabama, USA. Work will begin immediately based on the US$51,684,797 funding with an additional US$14 million funding expected in March 2016 with the remaining funding expected in two yearly increments 12 months after the initial awards.

"This agreement is a key indicator of our maturing support business in the U.S.," said Bellamy.

Austal's LCS and Frigate design services consist of special studies supporting engineering design and trade-offs, core class studies that support program management efforts including configuration control and maintenance of the class design for ships under construction, and class services including ongoing technical support for design modifications and maintenance of the LCS configuration and baseline design for delivered ships as well as future flight upgrades. These upgrades include preliminary design efforts for the LCS transition to the frigate.

For more information, visit www.austal.com.

**Final section of Prince of Wales arrives in Rosyth**

The aft island, the final section of Royal Navy's newest aircraft carrier, has been delivered after an epic journey around the British Isles.

The 750-ton structure–home to Flying Control (Flyco), which directs air operations on the vast deck below–was built just three dozen miles from the carrier's assembly site.

The only way to move the island from BAE's Govan yard on the Clyde to central Scotland's other great river was by sea–and given the weather at this time of year, the barge carrying it went through the Irish Sea, up the Channel, past Dover and along the east coast rather than risk the Pentland Firth… a journey of 1,335 miles.

Now the aft island is in Rosyth–10 weeks ahead of schedule. It will be moved off the barge using an enormous remote-control low-loader (144 wheels, 16 axles) before being raised into its final location on the flight deck by the Goliath crane that dominates the northern shore of the Forth.

It took nearly 2 years to complete the aft island which, aside from Flyco, contains more than 100 compartments, over 27 mi of cable, 1,000 pipes and stands more than seven double-decker buses tall. It can double up as a secondary bridge should the forward island ever be knocked out in battle, while the bridge section could, in an emergency, act as a makeshift Flyco.

"This is the final piece in the jigsaw for HMS Prince of Wales and the culmination of a lot of hard work on the Clyde," said Rear Admiral Henry Parker, in charge of ship acquisition for the MOD's Defence Equipment and Support arm. "We are delighted to have all of the blocks finally in Rosyth and are looking forward to the aft island being lowered onto the flight deck forming the iconic shape of the ship."

There is still well over a year's construction and integration work ahead for the hundreds of Aircraft Carrier Alliance workers at Rosyth before Prince of Wales is ready to join her sister HMS Queen Elizabeth in the water.

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

# Future USS Omaha christened

Austal announced that Littoral Combat Ship (LCS) 12 was christened at Austal USA's Mobile, Alabama shipyard on 19 December 2015. Austal USA officials joined Secretary of the Navy Ray Mabus and the ship sponsor of the future USS Omaha, Susan Buffett, in celebrating the christening of the nation's 12th littoral combat ship (LCS).

The Omaha is the fourth LCS in Austal's 10-ship, US$3.5 billion block-buy contract. With its shallow draft of 4.5 m, the Austal designed and built Independence-variant LCS is an advanced high-speed and agile 127-m combat ship designed to operate in near-shore environments, yet capable of open-ocean operation.

The future USS Omaha (LCS 12), launched in November and scheduled for delivery in 2016, has a maximum speed of more than 40 knots. The Independence-variant combines superior seakeeping, endurance, and speed with the volume and payload capacity needed to support emerging missions–today and in the future.

Austal's LCS program is in full swing with three ships delivered and six ships under construction at this time. Jackson (LCS 6) was delivered this past summer and was recently commissioned in Gulfport, Mississippi. Montgomery (LCS 8) and Gabrielle Giffords (LCS 10) are preparing for trials and delivery in 2016. Final assembly is well underway on Manchester (LCS 14) and recently began on Tulsa (LCS 16). Modules for Charleston (LCS 18) are under construction in Austal's Module Manufacturing Facility.

The company has also been contracted by the U.S. Navy to build 10 Expeditionary Fast Transports (EPF), formerly known as the Joint High Speed Vessel. Of the 10 ships included in the $1.6 billion block-buy contract, 5 have been delivered.

For more information, visit www.austal.com.

**Tern moves closer to full-scale demonstration**

DARPA has awarded Phase 3 of Tern to a team led by the Northrop Grumman Corporation. DARPA plans to build a full-scale demonstrator system of a medium-altitude, long-endurance unmanned air system (UAS) designed to use forward-deployed small ships as mobile launch and recovery sites.

Small-deck ships such as destroyers and frigates could greatly increase their effectiveness if they had their own unmanned air systems (UASs) to provide intelligence, surveillance and reconnaissance (ISR) and other capabilities at long range around the clock. Current state-of-the-art UASs,

however, lack the ability to take off and land from confined spaces in rough seas and achieve efficient long-duration flight. Tern, a joint program between DARPA and the U.S. Navy's Office of Naval Research (ONR), seeks to provide these and other previously unattainable capabilities. As part of Tern's ongoing progress toward that goal, DARPA has awarded Phase 3 of Tern to a team led by the Northrop Grumman Corporation.

The first two phases of Tern successfully focused on preliminary design and risk reduction. In Phase 3, DARPA plans to build a full-scale demonstrator system of a medium-altitude, long-endurance UAS designed to use forward-deployed small ships as mobile launch and recovery sites. Initial ground-based testing, if successful, would lead to an at-sea demonstration of takeoff, transition to and from horizontal flight, and landing—all from a test platform with a deck size similar to that of a destroyer or other small surface-combat vessel.

The Tern Phase 3 design envisions a tailsitting, flying-wing aircraft with twin counter-rotating, nose-mounted propellers. The propellers would lift the aircraft from a ship deck, orient it for horizontal flight and provide propulsion to complete a mission. They would then reorient the craft upon its return and lower it to the ship deck. The system would fit securely inside the ship when not in use.

Tern's potentially groundbreaking capabilities have been on the Navy's wish list in one form or another since World War II. The production of the first practical helicopters in 1942 helped the U.S. military realize the potential value of embedded vertical takeoff and landing (VTOL) aircraft to protect fleets and reduce the reliance on aircraft carriers and land bases.

For more information, visit www.darpa.mil.

## Canadian ships return from outstanding deployment

Her Majesty's Canadian (HMC) ships Brandon and Whitehorse arrived home to HMC Dockyard in Esquimalt, B.C. concluding their unprecedented success on Operation CARIBBE 2015.

HMC ships Brandon and Whitehorse seized and disrupted more narcotics during a 44-day deployment this fall than any other duo of maritime coastal defense vessels during the operation's history, with a combined total of approximately 9,800 kg. The previous record of 5,934 kg was held by HMC ships Whitehorse and Nanaimo, obtained earlier this year while deployed in the Eastern Pacific.

Royal Canadian Navy ships deployed a total of 10 times (HMC Ships Whitehorse and Winnipeg deployed twice each) and sailed for a total of 344 days.

Operation CARIBBE is one of the many activities undertaken by the Government of Canada and the Department of National Defence/CAF as part of Canada's broader commitment to engagement in the Americas. This annual campaign against illicit trafficking directly supports the CAF's mission to defend against threats and security challenges to Canada, North America, and Canada's defense and security partners.

The Canadian Armed Forces have conducted Operation CARIBBE since November 2006 and remain committed to working with Western Hemisphere and European partners to address security challenges in the region and successfully disrupt illicit trafficking operations.

For more information, visit www.navy-marine.forces.gc.ca.

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# OFFSHORE INDUSTRY

## in this section



### Kongsberg signs contract with Wintershall

Kongsberg Oil & Gas Technologies AS (KONGSBERG) has been awarded a 3-year contract by Wintershall Holding GmbH for provision of its hosted SiteCom® real-time data aggregation and visualization solution for well construction.

All real-time, planned and historical data from all of Wintershall's drilling activity worldwide will reside in a central SiteCom repository facilitating monitoring, distribution, visualization, analysis and interaction, as well as exchange with Wintershall's existing portfolio of third-party D&C applications. This will give Wintershall's global team of engineers and geologists the ability to collaborate seamlessly whether they are located at the rigsite, a local office or in Wintershall's main support hubs in Kassel, Germany, Rijswijk, Netherlands, or Stavanger, Norway.

With a constant focus on safe and efficient operations, Wintershall expects that embedded use of KONGSBERG's SiteCom platform will allow their support team to further mitigate operational and financial risk, and drive continuous improvement in well construction and delivery in these challenging times for the industry.

Atle Høgberg, vice president, drilling & wells, Kongsberg Oil & Gas, comments: "We are extremely pleased to be able to now count Wintershall as a global license holder with us. Wintershall is a highly respected international operator actively drilling in areas that present a range of differing operational and logistical challenges, supported by core teams of experienced domain experts. With SiteCom we are confident that Wintershall will be able to extract maximum value, and hence efficiencies, from the data their global wells are generating. We very much look forward to working with Wintershall from the North Sea, across Europe, in the Middle Eastern desert, to the South American grasslands!"

### Bibby Offshore secures multimillion pound subsea project with BP

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

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


The Bibby Offshore ELXP contract involves installing new subsea control system infrastructure to safeguard power and communication links to ETAP's Machar, Madoes and Mirren fields, some 150 miles East of Aberdeen.

From April 2016, Bibby Offshore will provide dive support and construction support vessels from its international fleet to deliver services, including umbilical installation, trenching, structure installation and commissioning through to final survey of the completed workscopes.

Howard Woodcook, chief executive Bibby Offshore said: "This is a significant contract win for Bibby Offshore, and we are delighted to be working with BP again, having previously undertaken subsea intervention work for BP in 2014."

"The contract award as part of this high-profile life extension project highlights our wide range of subsea services and affirms our capability to consistently and successfully deliver complex and challenging projects for our clients."

### Woodside energy takes MetraWeather marine weather guidance for offshore Myanmar

Specialist offshore marine weather company, MetraWeather with science partner MetOcean Solution is supporting Woodside Energy in Myanmar with tropical cyclone, tropical squall and maritime forecasts; tow and route forecasts; and tsunami monitoring.

In early-January 2016 Woodside announced that its joint venture well with Total E&P and local energy firm MPRL. E&P had intersected a gross gas column of approximately 129 m, with approximately 15 m of so-called net gas pay interpreted within the primary target at the Shwe Yee Htun-1 exploration well in Block A-6 in Myanmar's Rakhine Basin.

Across South East Asia and Australia, typhoons (tropical cyclones) and tropical squalls rank among the greater threats to offshore safety.

Marine weather guidance and metocean studies are crucial to offshore exploration and production. The safety of crew, both on the sea and in the air; the mitigation of weather impacts on infrastructure assets; and logistics planning are top-of-mind considerations for offshore operations.

MetraWeather and MetOcean will be exhibiting their offshore marine weather solutions on Stand 07 at the 6th Myanmar Oil & Gas Exhibition. OGEX is the largest and longest established oil and gas exhibition in Myanmar and is being held in the Sedona Hotel, Yangon, Myanmar from 28-29 January 2016.

#### About MetraWeather

Every day across South East Asia and Australasia, offshore oil and gas companies make operational decisions based on specialist marine weather guidance from MetraWeather.

MetraWeather forecasts and historical metocean datasets provide guidance for safe offshore operations. Metocean engineering experience includes heavy lifts and construction, jack-up and semi-sub rig moves, metocean design criteria for pipelines, platforms and floating structures, and daily weather guidance for offshore operations.

# Innovation paving the way for marine industry

**By Tim Schweikert, President & CEO of GE Marine**

From the price of oil to environmental regulation, 2015 was a year of turmoil and uncertainty for the marine sector. Despite this, there were some common global trends that will define 2016.

**The environment**

In December 2015, world leaders met at the COP21 conference to discuss climate change. The event's outcome marks a decisive move towards a low-carbon future focused on achieving the agreed-upon world target of 1.5 degree climate change ceiling. Indeed, despite being the most carbon-efficient form of commercial transport[1], the scale of global shipping means it emits around 1,000 million tons of $CO_2$ annually and is responsible for 2.2% of global greenhouse gas emissions. Therefore the industry has a strong role to play in meeting this target.

While no targets were specifically mentioned for the shipping industry during the COP21, the UN's IMO[2] regulations have already established and imposed challenging regulation around emissions and fuel efficiency. Additionally, the EU introduced the MRV[3] framework in April 2015, which will require large vessels calling at EU ports to collect and publish annual data on $CO_2$ emissions, starting from January 2018. With more scrutiny to come, the maritime industry will need to implement solutions that will help limit their emissions' impact on the environment.

**Fluctuating economic conditions**

The overall decline in global shipping, timed with an increase in megaship deliveries, results in industry overcapacity. Consequently, ratings agency Fitch has revised its outlook for global shipping to negative for 2016 from stable in 2014, although long-term seaborne trade and fleet are both forecast to grow between 3% and 3.5% on average per annum to 2025[4].

The offshore industry remains particularly vulnerable. Rising costs, program delays, a large backlog ($390 billion) leading to oversupply, volatile oil prices and corruption scandals in the oil & gas industry in Brazil have created the perfect storm. Capital for building new offshore vessels is estimated to be $15 billion in 2015, down 75% from $68 billion in 2013[5]. We have seen exploration and extraction activities slow down and offshore owners and operators are under great pressure to meet cost challenges.

The volatile state of the industry and stricter environment regulations mean we need to change the way we operate.

Companies must rely on innovation using new technologies to increase productivity and meet the new environmental regulations on existing vessels as well as taking a fresh look at new possibilities to cost effectively produce new vessels.

**Innovations driving cleaner marine environment**

To meet the new demand driven by strict environmental regulations, GE Marine offers its Combined Gas turbine Electric and Steam (COGES) system for various commercial marine applications, including LNG carriers, cruise ships and container ships. The COGES system enhances conversion of energy available in the fuel to produce electricity and power for all ship needs, including propulsion. GE's marine gas turbines can operate on various fuels, including LNG boil-off gas or marine gas oil (MGO). No additional emissions reduction equipment is required to meet IMO Tier III or US EPA Tier 4 requirements.

Restrictions became even more stringent as of 1 January 2016 for diesel engines around the world. The United States Environmental Protection Agency's (EPA) Clean Air Act began enforcing "Tier 4", for diesel engines built after 1 January. For vessels governed by IMO's MARPOL Annex VI, more stringent nitrogen oxide (NOx) emissions requirements, known as IMO III, come into effect for vessels built after 1 January 2016 and operating in the designated environmental control areas (ECAs).

These regulations will impact both the environment as well as the engine manufacturers. Advanced engine technology is needed to make sure new ship engines meet the stricter emissions requirements, and cause as little impact to the vessel design and operations as possible.

GE Marine's latest Tier 4 Engine meets the new EPA Tier 4 and IMO III emissions standards, reducing nitrogen oxide by more than 70% compared to EPA Tier 2 and IMO II emissions standards, while still maintaining world-class fuel efficiency and service intervals. Its in-engine solution is based on exhaust gas recirculation technology, reducing the formation of NOx at combustion, thus eliminating the need for a urea-based after-treatment system.

Because the engine does not need a urea-based selective Catalytic Reduction (SCR) after-treatment system, it requires only about 25% of the engine room space versus other market solutions, reducing the need to make significant design changes on the vessel. This technology also eliminates the incremental operating expenses for urea use, catalyst replacements and maintenance on an SCR after treatment system.

**Moving to a digital marine mind-set**

With all eyes on operational expenditures in an uncertain market, technology will play a vital role in making marine operations as efficient and cost effective as possible.

To meet this demand, more shipbuilders will build vessels with technology at the forefront of the design process, using advanced modeling software that analyses a vessel's anticipated operational profile and optimizes the design from the offset.

Using digital tools, vessels will also become greener, more efficient, and increasingly productive. GE's SeaStream* Insight, for example, provides operators with a holistic view of their ships, allowing them to spot anomalies and other data that lead to better operational decision making and therefore fuel efficiency.

With Predix* at its core, SeaStream* Insight allows preventative maintenance to be carried out before a failure occurs, thanks to early warning signs made visible through data-driven analytics. This level of visibility allows operators to switch from a scheduled maintenance model to a condition-based one, reducing downtime and offering significant cost savings.

SeaStream* Insight also particularly benefits the offshore industry, where vessels are operating in remote locations, as its remote monitoring capability allows engineers to assess issues from anywhere in the world, reducing third-party cost, and help solve problems faster.

With belts being tightened across the industry, the cost savings that digital technology can deliver can't be ignored.

**2016–A year of opportunity**

The year ahead presents an opportunity–increased environmental regulation paves the way for wider use of hybrid energy solutions, which are not only cleaner, but also offer significant leaps forward in efficiency. This is good news for operators across the marine industry, who will be looking to work as cost effectively as possible in 2016. Operating in a leaner, greener manner is the future of the marine industry, and 2016 will be a defining year.

* Indicates a trademark of the General Electric Company and/or its subsidiaries.

***Tim Schweikert** has been appointed as the President & CEO of GE Marine since January of 2015. First joining GE in 1984 on the Manufacturing Development Program, Tim progressed through various roles and was made General Manager, Global Locomotive Operations for GE Transportation in December 2003, overseeing the launch of the Evolution Series locomotive and the acceleration of GE's global locomotive business. In February of 2006, he was appointed President, GE China Transportation, leading one of GE's fastest growing businesses in China and in November of 2007 Tim became President & CEO China Region GE Technology Infrastructure.*

**References**

[1] International Chamber of Shipping.

[2] United Nations International Maritime Organisation.

[3] Monitoring, Reporting and Verification.

[4] Clarkson.

[5] Clarkson Apr'15 offshore seminar (multi-source consensus), GE O&G leading indicators Aug'15 (Barclays, TR consensus), Evercore ISI's 2015 Mid-Year Global E&P Spending Outlook (20%), FT 18/05/15 (25%)), IHS Industry Resets July '15, top 18 exploration companies.

**Pole Star awarded USCG LRIT ASP contract**

Pole Star Space Applications announces that it has been awarded a prestigious contract by the U.S. Coast Guard for the provision of LRIT ASP services.

"We are very honored to have been awarded this contract from the U.S. Coast Guard to provide LRIT ASP services in support of the United States' National Maritime Domain Awareness Plan and wider National Strategy for Maritime Security program," said Julian Longson, managing director at Pole Star.

Pole Star currently provides LRIT services to 47 maritime administrations, including 4 of the 5 largest fleets in the International Maritime Organization's LRIT network–those of Panama, Singapore, Liberia, and the Marshall Islands. In securing this contract, Pole Star has added the U.S. Coast Guard to those of Australia, Canada and others that form the backbone of international LRIT data users network.

"It is an honor to be working with the U.S. Coast Guard today and into the future. Our technical teams are working very well together. We look forward to supporting the US Coast Guard's needs by providing them with robust maritime domain awareness services in today's challenging maritime environment," said Nick Salvi, head of government sales - North America.

**Under Pressure**

During a recent event hosted in London by the Society of Underwater Technology. Douglas-Westwood (DW) presented its outlook for the offshore energy sector, including outputs from soon to be published studies, in the context of a highly-turbulent start to the year that saw oil prices on the day of $27/bbl.

Research Director Steve Robertson opened the event with an introduction that examined the current outlook for offshore expenditure in comparison to that of a year ago, highlighting the movement in overall number of projects expected and subsequent expenditure (look out for more on this in the coming weeks…).

Economist Matt Adams followed with a review of the macro-economic factors impacting the sector presently, examining key drivers for energy supply and demand and highlighting recent DW analysis concerning supply additions vs the demand outlook for 2016. Matt explained that whilst there were limited positive drivers for oil price in the near term (other than unpredictable geopolitical events), towards the end of the year we should see excess supply eroded by some 1 million bpd. Matt also highlighted the relative stock performance between firms in different sectors of the oil industry (land drilling, offshore drilling, subsea equipment, oilfield services, etc.) with subsea hardware providers faring the best (down 15%) and offshore drillers the worse (-64%).

Steve followed with a run-through of DW's latest market forecasts in a number of key sectors including offshore drilling, oilfield services (OFS), oilfield equipment, floating production and offshore wind. He highlighted the underlying reason for the poor performance of offshore drillers is excess supply, with low levels of utilisation for the fleet and dayrates for high-spec rigs falling from over $600,000/d at peak to less than $250,000/d for new fixtures in the last six months. The fragility of the subsea equipment providers was also highlighted, with most original equipment manufacturers (OEMs) having been somewhat insulated during 2015 as a function of high backlogs which are now rapidly declining. Order levels in the last 12 months have been very low and DW anticipates that the sector will see heightened competitive intensity and firms will need to position themselves accordingly for lower levels of activity in the coming years. The FLNG and Offshore Wind markets were presented as a positive growth story and a highlight amongst the more negative outlook in other sectors.

Geologist Matt Cook presented some highlights from his recent work with DW's Drilling and Production offering, including in-depth country analysis for Egypt, Mozambique, Angola, and the USA, followed by analysis of anticipated subsea activity by operator type. ENI was highlighted as a company that stands out in terms of the volume of subsea development activity compared to previous years, with Matt highlighting projects such as Zohr, Coral, Mamba and Sankofa.

The session was wrapped-up with a summary proposing that 2016 would likely be a very difficult year for the offshore sector – for many firms the focus would be survival. However, for those in position to invest, it was suggested that this was an opportune moment to secure equipment, services and skilled labour at historically low prices and historically short lead times.

*- Steve Robertson, Douglas-Westwood London.*

**Subsea Expo program is revealed**

Subsea UK urges the industry to turn talk into action now to safeguard the future of the UK's £9billion subsea sector.

The call was issued as Subsea UK announced the final speaker line-up and program for its eleventh annual conference and exhibition, Subsea Expo. Europe's largest annual subsea event takes place at the Aberdeen Exhibition and Conference Centre from 3-5 February 2016.

This year's theme "Time for Transformation" will look at the fundamental changes the industry must make to deliver the cost savings and efficiencies needed to sustain the sector in a lower, for longer oil price environment.

More than 6,000 people from the subsea supply chain are expected to attend the event, including dignitaries and senior industry figures from Africa, Brazil, Japan, Mexico, Nigeria and the U.S.

With over 200 exhibitors, Subsea Expo is an opportunity for those in the industry to showcase new technology and services. The 2016 program is packed with high profile industry speakers from a number of companies including Subsea 7, Proserv, GE Oil and Gas and One Subsea. Their presentations will cover global opportunities, key projects around the world, standardization & optimization, integrity management with a focus on pipelines, ROV inspection and technology R&D.

The event's plenary session, chaired by Neil Gordon, chief executive of Subsea UK, will provide an overview of the industry and stimulate debate with presentations from Matt Corbin of Aker Solutions on collaboration, integration and standardization –a sustainable future for the Subsea sector, Gunther Newcombe of the Oil and Gas Authority will look at maximizing UKCS performance and Matt Nicol of Centrica will lead a discussion on small pools. The session will also hear from Howard Woodcock of Bibby Offshore on leading safety in the new era through workforce engagement and Chris Bird of MOL Energy will look at transformational behavior changes.

Neil Gordon, chief executive of Subsea UK, said: "If we don't make changes now, if the oil price falls further, for longer, the subsea landscape will look very different in a year from now. We have an opportunity to define our future by truly embedding the behavioral change that will sustain our industry in the long-term and achieve the goals of Maximizing Economic Recovery in the North Sea."

"Subsea Expo represents the ideal platform to bring together leading industry figures to discuss how we can deliver the fundamental changes to bring about the necessary transformation. With the UK subsea sector's pioneering attitude and ingenuity, for which we are renowned for around the world, I am confident that we can transform and lay solid foundations for a brighter future."

Gordon Drummond, project director of NSRI will lead the Spotlight on Technology session, which will look at the near to market technologies that will help maximize economic recovery of hydrocarbons and play a part in the exploitation of stranded small pools in the UK Continental Shelf.

Subsea Expo's gala dinner and awards ceremony, on the evening of the opening day, will see a selection of the country's most innovative, dynamic and successful subsea businesses recognized for their success over the past 12 months. Award-winning writer and broadcaster John Sergeant will be the guest speaker at the awards dinner.

Entrance to the exhibition and conference is free of charge; pre-registration is recommended via the website. Delegates can register for the conference on line at www.subseaexpo.com.

# Nexans awards contract to iSURVEY

iSURVEY AS, Norway, has been awarded a multi-year frame agreement with Nexans Norway AS to provide navigation, positioning and survey support for its cable lay operations on board the C/S Nexans Skagerrak.

iSURVEY will provide services including positioning and monitoring during cable lay and trenching operations, together with as-trenched and as-laid reporting and charting. Subsea positioning is to be provided to integrate IKM Subsea's Merlin work-class ROV into installation operations

iSURVEY's commercial director, Anja Bergstrøm Karthum, said: "Securing this contract with Nexans is of strategic importance to iSURVEY and enables us to further develop our capabilities within the subsea power cable lay market. We have been supporting Nexans' operations on board C/S Nexans Skagerrak since 2007 and are pleased to have been selected to continue this cooperation in the coming years."

iSURVEY Group is a leading provider of survey and positioning services to the global oil and gas, telecommunications and offshore renewable energy sectors. The Group is headquartered in Norway with bases in Singapore and Aberdeen.

For more information, visit www.isurvey-group.com.

**VIKING leads offshore evacuation to greater heights**

Leading maritime safety equipment and servicing manufacturer VIKING Life-Saving Equipment A/S has received type approval from Lloyd's Register for its new offshore evacuation chute system, certified to operate at an unprecedented evacuation height of 81 m to sea level.

"The system's certified evacuation capacity is 146 people in just 10 minutes, comfortably beating the threshold required by maritime authorities, even from such an extreme height," says Kristian Ellertsen, Norway-based offshore technical manager for the company.

**Higher demands**

With rig sizes increasing and evacuation heights exceeding what is possible with enclosed davits and lifeboats, chute-based evacuation solutions have become increasingly important. Designing and building them, however, demands significant know-how and experience.


In 2013, Noble Corporation plc, one of the world's the largest offshore drilling contractors, was in the early planning stage of its CJ70 jack-up rig for delivery in 2016. The company required an evacuation system that could cope with the rig's unprecedented height, but the previous record for such a system, held by VIKING, was only 64 m.

**Tall order**

"Developing something of this height was not easy," says Kristian Ellertsen. "In fact, just finding an offshore structure of the right height for testing was difficult. But VIKING has more than 35 years of experience with mass evacuation systems, so even though we were facing a demanding schedule, developing, testing and manufacturing a never-before-seen system in record time, we were confident the effort would succeed. And, in any case, we always enjoy a challenge."

**Leading the field**

The new 81-m system reasserts VIKING's lead in the field of evacuation systems. Already, two systems have been installed on the Noble Lloyd Noble jack-up rig due to be completed during 2016 at the Jurong shipyard in Singapore and destined to operate in the Norwegian sector of the North Sea.

For more information, visit www.viking-life.com.

***With recent type approval of an 81-m high evacuation system, VIKING has answered the needs of offshore fixed and jack-up rigs to handle extreme heights.***

### Harding keeps up the pace offshore with Heerema Sleipnir

Harding has been awarded contracts for nine FF1200 freefall lifeboat systems complete with davits on Heerema Offshore Services BV's semi submersible crane vessel Sleipnir. The vessel will be built by Sembcorp Marine at its flagship Tuas Boulevard Yard in Singapore.

Heerema's Sleipnir is one of just a handful of large offshore projects currently running, along with the Johan Sverdrup Field Centre in Norway, where Harding is also a supplier. "Everyone is talking about Sverdrup, but this project is every bit as big, with just as many systems," says Harding's regional sales manager Oddgeir Mælen.

And while deliveries are essentially based on offshore technology, the Heerema contracts pose a special kind of challenge. "The new crane vessel will serve world wide, so a number of relevant international standards had to be considered when selecting life saving equipment," Mælen relates.

The FF1200 is a 70-person freefall lifeboat designed to DNV OS E-406 standards, the most stringent in the industry, far exceeding SOLAS rules for freefall lifeboats. The boats will be perfectly matched with their LA1200H and LA1200HO skid launch davits, specially designed for the FF1200.

The Sleipnir contract will push Harding just over the 100 mark on delivered FF1200 lifeboats, securing its place as an industry favorite. Oddgeir Mælen believes it is no coincidence that Harding was selected to supply this latest Heerema project. "Harding lifeboats are the industry leaders, the boats chosen for the most demanding projects and benchmark vessels," he points out.


For example, Harding supplied lifeboats to all the ships nominated for major Nordic shipping magazine Skipsrevyen's "Ship of the Year" award for 2015, including the winner, the Skandi Africa. "Delivering to Heerema's NSCV is yet another confirmation of the quality of our products and service," Mælen states.

### Coming out on top

Winning contracts in today's trying times requires more than just good fortune, and Harding finds itself sitting on some of the biggest. What's the secret?

"Superior systems are the key to winning contracts, and we believe Harding quality is at the base of this success. But we also

put in a lot of hours with both the yard and the owner right from the start on the Heerema project," Mælen tells. "We listened to their concerns and came back with the best answers," he explains, adding that Harding's ability to draw on good local contacts, a strong global network and technical prowess was a determining factor.

"Harding has truly used its global outreach on this project. In order to put together the best possible bid, we enlisted a high degree of participation from our offices in the Netherlands, in Singapore and in Norway," says Mælen. "Access to this overall expertise allowed us to provide the most value for the money. I believe it speaks of our ability to deliver quality at competitive prices."

Harding CEO Styrk Bekkenes agrees: "We are extremely proud of winning such a competitive contract in today's tight market. Harding has been through a major transition to reach our current level of capability, and in this bid we could really see the benefits. Our people pulled together and stepped up to a new level."

With the Sleipnir contract, Harding has proven that it is not just a player, but a stayer in offshore, matching Heerema's own forward-leaning stance. By pressing ahead with the Sleipnir project despite the low price of oil, Heerema has proven its commitment to serving the industry, and Harding stands equally as firm: "We are not in and out," Bekkenes emphasizes. "Harding is in to stay."

### Mariner project re-phasing agreed

Prosafe and Statoil (U.K.) Ltd (Statoil) have agreed to re-phase the Mariner Project in the UK Continental Shelf of the North Sea from 2016 into 2017, and extend the firm hire duration from 8 months to 13 months.

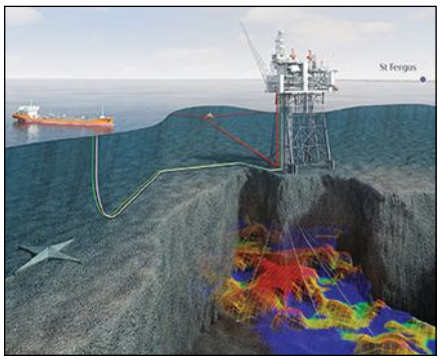
Operations at the Statoil Mariner platform will commence within Q3 2017 and will be performed by either the Safe Zephyrus or Safe Boreas accommodation support vessel. In addition to the revised extended firm hire duration, Prosafe has granted Statoil six additional 1-month options linked to the Mariner project.

The Mariner Field is located on the East Shetland Platform of the UK North Sea approximately 150 km east of the Shetland Isles.

Total value of the re-phased and extended firm hire duration for the Mariner Project has increased from USD 76.3 million to approximately USD 131.8 million, including a re-phasing charge payable in 2016.

Prosafe is the world's leading owner and operator of semi-submersible accommodation vessels. Operating profit reached USD 248.3 million in 2014 and net profit was USD 178.8 million. The company operates globally, employs 800 people and is headquartered in Larnaca, Cyprus. Prosafe is listed on the Oslo Stock Exchange with ticker code PRS.

For more information, please refer to www.prosafe.com.



### Tidewater Subsea charters the M/V Brandon Bordelon

Tidewater Subsea charters the Jones Act compliant MV Brandon Bordelon for (60 days plus options. Tidewater Subsea is mobilizing two FMC Technologies Schilling HP 150 ROVs to the vessel. The Brandon is now fully capable to perform a variety of operations, including IMR (inspection, maintenance and repair), light construction, survey and inspection work.

The Brandon is a highly specialized 260-ft (80-m) DP2 vessel featuring a helideck, a 60-ton AHC crane with 3,000 m of wire, POB (60), a mezzanine deck supporting the two FMC Technologies Schilling HP 150 ROVs. The vessel also offers 6,200 sq. ft (576 sq. m) of clear useable deck space. The Brandon also features two fully-integrated Ranger2 Pro thru-hull full USBL systems. The vessel delivers a fully integrated ROV control room, ROV support offices, below deck work and storage spaces, extensive communications and ROV data network, plug and play, with patch panel racks installed. All systems are fully interfaced with the vessel systems, bridge, office, and accommodation spaces. The vessel is designed with removable bulwarks around the entire aft of vessel along with power, water, air, and hydraulic oil connections on the deck. The vessel is also equipped with four additional below deck Tier 3 generators, providing fully redundant power to the crane and ROV systems.

Wes Bordelon, President/CEO commented, "We are very excited to work with Tidewater Subsea. Being a vessel operator, we speak the same language on day one. But Jason and his team also bring a wealth of ROV and subsea experience to the game. And when partnered with our new Stingray ULIV design, I think we will be very successful in the light IMR and Intervention space. The vessel and ROV systems are new and state of the art. This vessel is truly a high spec, fit for purpose, Jones Act-compliant solution that gives the client an affordable option to the larger MPSVs."

### Statoil awarded highest number of licenses since 2005

In the Awards in Predefined Areas (APA) round 2015, Statoil has been awarded interest in 24 licenses on the Norwegian continental shelf (NCS), 13 of those as operator and 11 as partner.

"The NCS is the core of Statoil's business and we are pleased with the awards in the APA 2015 round, which will allow us and the industry to further explore for value. This award is an important contribution to replenishing our exploration portfolio and in the work to maintain the production on the NCS until 2030 and beyond," says Jez Averty, senior vice president for NCS exploration in Statoil.

Two commitment wells are included in the work program in areas important to Statoil. Both prospects are potential tie-back opportunities to existing infrastructure – Blåmann to Goliat and Cape Vulture to Norne.

For more information, visit www.statoil.com.

### Business leaders demand end to drilling off Atlantic, Arctic coasts

A week after President Obama said in his State of the Union address that the U.S. must accelerate the transition away from dirty energy, more than 200 business leaders from 19 states sent a letter to Congress urging the federal government to protect the Atlantic and Arctic coasts from the threat offshore oil drilling poses to our economy.

The letter, organized by the national, nonpartisan business group Environmental Entrepreneurs (E2), comes as the Bureau of Ocean Energy Management develops its 5-year offshore drilling plan and as the U.S. Senate considers adding pro-drilling amendments to major energy legislation.

"As President Obama said in his State of the Union address, we must accelerate the transition away from dirty energy," said E2 executive director Bob Keefe. "Well, expanding offshore drilling does the exact opposite–at great harm to our economy and our environment."

The business leaders' opposition arrives amid a growing chorus of strong local opposition to offshore drilling from coastal communities throughout the southeast. Much of this grassroots opposition is based on economic concerns, and the letter highlights the risks that oil spills pose to local businesses and industries.

Specifically, the letter notes that in 2010 the BP Deepwater Horizon spill cost the Gulf Coast tourism industry nearly $23 billion in lost revenue.

If Atlantic offshore drilling is allowed, the $40 billion generated annually from tourism, recreation and fishing along the South and Mid-Atlantic coasts would be similarly threatened. Instead, the E2 letter notes we can protect our fragile coastline and still get plenty of home-grown energy–clean, renewable energy from offshore windfarms.

"Business leaders know we shouldn't destroy the economic benefits that come with a beautiful coastline and bountiful tourism industry with the economic calamities that can come with offshore drilling," Keefe said. "Hopefully, Congress and the Bureau of Ocean Energy Management will listen and permanently protect our Arctic and Atlantic coasts."

For more information, visit www.e2.org.

**Hydroid introduces new capability for lightweight AUVs**

Hydroid, Inc., a subsidiary of Kongsberg Maritime and the leading manufacturer of marine robotic systems, announced the release of Line Capture Line Recovery (LCLR), a self-contained module that is initially offered on Hydroid's REMUS 600 autonomous underwater vehicle for the purpose of autonomous launch and recovery.

"We designed the LCLR to be a first-of-its-kind system that will make the launch and recovery process completely autonomous," said Duane Fotheringham, president of Hydroid. "This will enable easier vehicle recovery and increase operational flexibility. As industry leaders, it is our goal to continue to progress autonomous technologies, which is illustrated with the development of this innovative product."

A vertical line is deployed in the water with a transponder attached to the end of the line. When the vehicle is commanded to dock, the LCLR software autonomously homes the vehicle to approach the transponder. The vehicle navigates autonomously toward the transponder and attaches itself to the line above the transponder. The line and the attached vehicle are then recovered on a vessel such as an Unmanned Surface Vehicle (USV) or any other platform. The vessel may be stationary or moving during the capture process.

The LCLR module uses a linear Digital Ultra Short Base Line (DUSBL) Acoustic Array for homing the vehicle to the transponder. The final capture is assisted by articulated arms for capturing the line after the vehicle reaches it. Upon capture, a latch mechanism attaches the vehicle to the line. An optical sensor is used to confirm the completion of the vehicle's capture and initiate its recovery.

During the approach of the vehicle to the transponder, the system Graphical User Interface (GUI) can send updates on the transponder position via acoustic messages to the vehicle. The GUI may be configured to transmit the position update to the vehicle automatically or manually by the operator. The LCLR system also works for moving captures, using GPS to determine the vessel's position.

Hydroid's LCLR is now available and has already made initial deliveries of the LCLR module to multiple customer vehicles.

For more information, visit www.hydroid.com.

**RTsys COMET AUV unveiled**

RTsys specialist in underwater acoustics is proud to reveal the results of a 4 year development combining acoustics and underwater robotics. We developed a next generation of AUV at the cutting edge of technology meeting the needs of current demand in offshore companies such as weight and size, working capabilities (speed and autonomy), positioning and recovery and re-deployment.

The first achievement is to offer a compact system with high speed and autonomy that is quickly reconfigurable and deployable. COMET AUV weighs less than 35 kg and can speed up to 15 knots. It is able to cover a 200 km distance at 3 knots on a single deployment thanks to its rechargeable batteries.

Moreover COMET AUV is used as collaborative underwater drones or operate in "swarm" mode.

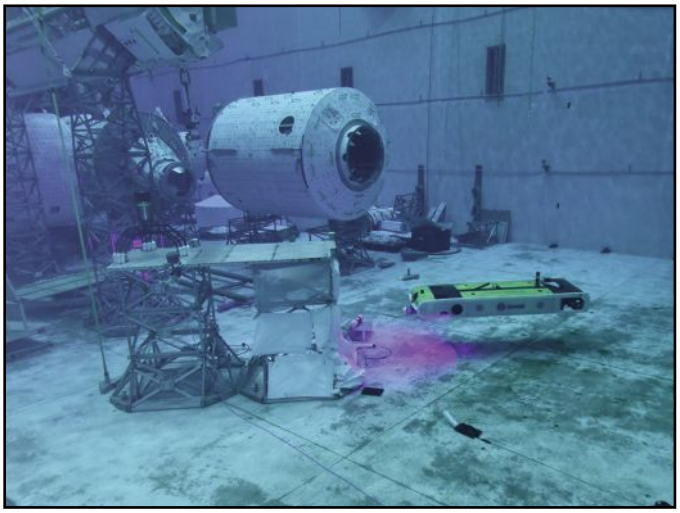
In July 2015 COMET AUVs first demonstated operating in swarm mode by scouting in front of a vessel. COMET AUVs are able through swarm mode and using its underwater acoustic capabilities to collaborate on various 3D geometries that will improve their positioning accuracy. These AUVs can operate from several meters to 250 m from each other and are able to accomplish a various type of missions and communicate in broadband.

A wide range of sensor loads can be embedded on COMET AUVs which are now ready to provide their cutting edge capabilities to many applications.

RTsys is pleased to announce that COMET AUV will be displayed for the very first time at Oceanology International 2016.

For more information, visit www.rtsys.eu.


# SAAB demos AUV/ROV hybrid Seaeye Sabertooth at NASA laboratory



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

The Seaeye Sabertooth is a hybrid of an AUV and an ROV; it merges Saab's Double Eagle SAROV (Saab Autonomous Remotely Operated Vehicle) with Saab Seaeye technologies. The vehicle, available in a single- and double-hull version, features long-excursion range, a six-degrees-of-freedom control system, and an operational depth of 1,200 msw (3,000 msw). It is a powerful, but lightweight and maneuverable platform, ideal for accessing complex structures and carrying out light inspection, maintenance and repair (IRM) tasks.

The demos at NBL displayed how the Seaeye Sabertooth can remotely execute subsea intervention tasks, such as closing a subsea valve. To make performing these duties possible, the Seaeye Sabertooth was fitted with an electric torque tool from Seanic Ocean Systems. This allowed the Seaeye Sabertooth to be operated via a free space optics (FSO) link. The link was connected to the subsea valve, where the torque tool was engaged with the torque bucket.

These demos marked several milestones for Saab's Seaeye Sabertooth demonstrations in North America: they were the first time an operational double-hull Seaeye Sabertooth had been demonstrated in the region, the first time it had been operated using FSO in front of a North American audience, and the first time it had been fitted with an electric torque tool.

For more information, visit www.seaeye.com.

**Sonardyne goes from deep sea to deep space during NASA demonstrations**

Subsea engineering company, Sonardyne International Ltd., UK, has successfully demonstrated its wireless integrity monitoring technologies during a series of in-water demonstrations held at NASA's Neutral Buoyancy Lab (NBL) in Houston, Texas.

Hosted by OneSubsea, a Cameron and Schlumberger Company, senior oil company executives, chief engineers,

equipment specifiers and offshore operators attended the 2-day technical symposium in November to witness firsthand the capabilities of Sonardyne's and other vendors' subsea innovations. The event was followed by a further 2 days of demonstrations organized by underwater vehicle manufacturer, Saab Seaeye, with Sonardyne as its primary technology partner.

Around the pool, Sonardyne deployed acoustic data telemetry, sonar imaging and optical communications technologies to simulate some of the typical remote inspection and intervention scenarios its low-risk technology can be utilized for. 6G sensor nodes suspended mid-water were used to show how critical data from remote assets such as satellite wells can be recovered using robust, long range acoustic communications. On the pool floor was Sentry IMS, a wide area sonar that automatically warns operators of integrity breaches around subsea oil and gas assets. Positioning moving targets in the water was Ranger 2, a high accuracy system for tracking and commanding ROVs and AUVs as they carry out their work.

Creating significant discussion amongst attendees was Sonardyne's high speed optical data modem, BlueComm. Installed on Saab Seaeye's Sabertooth hybrid ROV/AUV, a link was established to a matching BlueComm unit on an apparatus designed to replicate a subsea manifold. This enabled through-water wireless control of the vehicle including commanding the actuation of a standard Class 4 subsea valve. A simultaneous video feed provided by BlueComm from the Sabertooth to poolside allowed the vehicle's pilot and the gathered audience to monitor the valve operation.

After docking in a separate, optically enabled subsea docking station, BlueComm was also used to harvest mission data at very high data rates and to provide the vehicle with details of its next mission. With the exception of an acoustic emergency stop using Sonardyne's WSM6+ mini-beacon, BlueComm was the only means of communication between the Sabertooth ROV/AUV and shore during the entire 30-minute demonstration run.

For more information, visit www.sonardyne.com.

### Lockheed Martin selects SeaRobotics Corporation as the OEM for its Marlin® Mk3 AUV

Designed for deepwater applications such as pipeline inspection, deepwater survey, and life of field support services for oil and gas, the Marlin® Mk3's modular, plug and play mission package architecture and dual AUV/ROV propulsion modes is a revolution in AUV technology that can perform a wide range of deepwater geophysical survey and structural integrity management inspection operations. The Marlin® can be outfitted with sophisticated sensor packages including multi-beam, side-scan, 3D, sub-bottom profiler, and synthetic aperture sonars, as well as high resolution video, still photo, and laser profilers, enabling advanced autonomous data acquisition, processing, analysis and response.

"Lockheed Martin's extensive AUV development expertise, coupled with SeaRobotics' comprehensive commercial design, manufacturing, and offshore support capabilities, forms a team that is fully capable of delivering Marlin's game-changing technology to commercial markets," said Don Darling, president of SeaRobotics.

Leveraging advanced autonomy technologies developed for Lockheed Martin's undersea defense portfolio, the Marlin Mk3 offers powerful new autonomous inspection capabilities that significantly reduce operator workload and fatigue. High resolution, 3D models of subsea structures in real time, and prior survey result detections enhance Marlin's capabilities. The Marlin Mk3's 44 kWh battery capacity provides mission endurance up to 24 hours and an operational range greater than 100 km before recharging is required.

For more information, visit www.lockheedmartin.com.

### Deep Ocean Engineering introduces the Phantom™ T5 ROV

Deep Ocean Engineering, Inc. has revealed its newest addition to its family of underwater drones, the Phantom™ T5 ROV, a powerful, rugged, reliable, portable and easily expandable system.

The applications for use of the Phantom T5 span a broad spectrum of industries, including:

- Homeland security – defense, military, customs, police;
- Hydroelectric system monitoring – power plants, reservoirs;
- Infrastructure inspections – bridges, tunnels, pipelines, ships;
- Scientific research – geology, biology, archaeology;
- Exploration – oil and gas, salvage, search and recovery; and
- Cinematography – videos, photos, film.

"The Phantom T5 open-frame architecture makes mechanical integrations a breeze, while the dedicated expansion bulkhead connectors, used for both power and telemetry, are provided as standard. In addition, an optional tool skid allows the customer to "bolt on" their sensors or tools by plugging into the expansion bulkhead connectors for nearly limitless, task-specific, expansion possibilities," said John Bergman, Deep Ocean Engineering, vice president of engineering.

Standard Phantom T5 features include:


- Full HD video (1080i & 0.35 lux) with 20X optical zoom, on-screen videographic overlay mounted on a tilt platform with angle feedback;
- 300 m depth rating (500 m optional), LED Lights, and two person portability (39 kg / 86 lbs dry weight);
- User accessible power/telemetry bulkheads and open frame architecture for facilitated expansion;
- Minimal topside footprint for rapid deployment;
- High performance, magnetically coupled thrusters (highest thrust to weight ratio and reliability of any ROV in its class);
- Resilient, non-corroding polypropylene chassis; and
- Maintenance-free auto-functions available (including auto-heading, auto-depth, auto-stabilize, and auto-altitude).

For more information, visit www.deepocean.com.

### C-Innovation chooses Kongsberg AUV systems

C-Innovation (C-I), an integrated marine services company specializing in advanced subsea solutions and a member of the Edison Chouest Offshore (ECO) family of companies, has ordered four AUVs from Kongsberg Maritime. The order adds AUV capabilities to C-I's industry-leading ROV fleet, integrated with ECO's worldwide vessel fleet for a full-spectrum IMR solution for clients.

The two HUGIN AUVs under order are depth rated to 4,500 m, while the two MUNIN AUVs are rated to 1,500 m. All are equipped with the latest generation sonar, echo sounders, cameras and profilers. All four are specially designed for subsea inspection, mapping and pipeline surveys.

They feature the most advanced autonomous pipeline tracking software, enabling the AUV to track a pipe using SAS or sidescan, as well as flying overhead collecting bathymetry, photos and laser profiles.

The HUGIN includes swappable batteries and removable data storage, while the MUNINs have a fast charge system and data download facility designed to maximize productivity and minimize downtime between dives. The HUGINs are equipped with the latest generation of HISAS 1032 Synthetic Aperture Sonar (SAS).

For more information, visit www.c-innovation.com.

### Fugro to conduct airborne LiDAR bathymetry surveys in Canada

Fugro has been awarded new task orders by the Canadian Hydrographic Service (CHS) to conduct airborne LiDAR bathymetry (ALB) surveys in eastern and central Canada. The task orders, which have been issued under a supply arrangement Fugro holds with the CHS, are in support of their nautical charting programs and involve the survey of multiple sites along the coasts of Quebec, Newfoundland and Labrador, Prince Edward Island, Nova Scotia and central Canada.

Fugro's ALB systems will be used to acquire hydrographic survey data and seabed imagery in shallow coastal waters where the acquisition of similar information by traditional vessel-based acoustic methods is inefficient, expensive and unsafe. The data will fill gaps in shallow water and junction with existing deeper water data that have been acquired previously by CHS vessels. All data will be acquired to International Hydrographic Organization (IHO) Order 1B, an international standard for conducting hydrographic surveys, and will ultimately be used to update CHS' nautical charts.

Fugro provides ALB products and services worldwide to public and private sector clients as a rapid and cost-effective solution to nearshore hydrographic survey needs where scale of the project, time constraints and user safety are of primary concern.

For more information, visit www.fugro.com.

### SeaTrepid orders six HUGIN AUV systems

Kongsberg Maritime AS has announced the sale of 6 HUGIN AUV Systems. The vehicles will be operated by SeaTrepid International LLC. of Louisiana, USA and supported by Deep Ocean Search Limited.

The AUVs are rated to 6,000 m. They have a comprehensive sensor suite including triple frequency sidescan sonar, KONGSBERG's de facto industry standard EM2040 multibeam echo sounder, sub-bottom profiler and a color camera. The vehicles are also equipped with a magnetometer mounted inside the AUV body.

All six SeaTrepid HUGIN AUVs are fitted with swappable Lithium polymer batteries and can achieve mission durations of more than 60 hours with payload sensors operating. They will be supplied with a comprehensive topside spread including launch and recovery containers, operations room containers

oceanology international 2016 Stand H100

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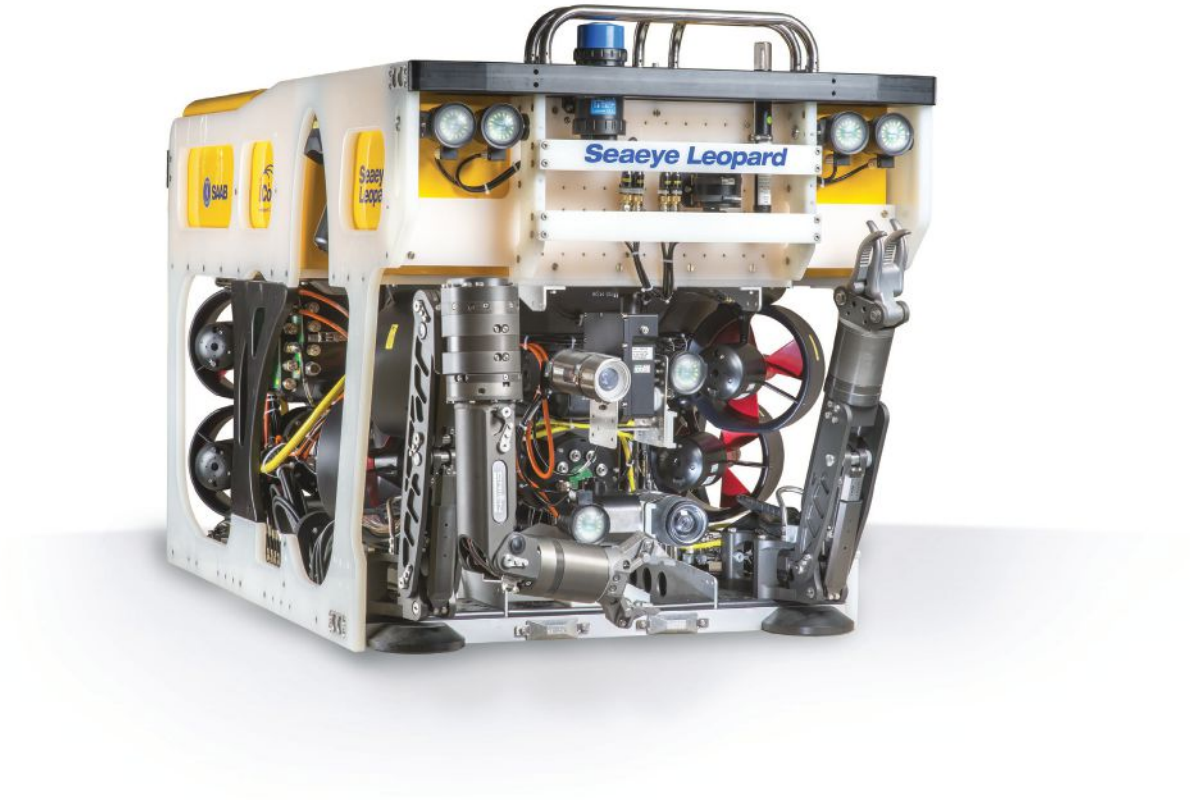
# Leap into the future

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and KONGSBERG HiPAP USBL systems for supervised operations.

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

### New Kongsberg acoustic positioning operator station for surveyors installed on Bibby offshore vessel

Kongsberg Maritime Ltd, the UK division of Kongsberg Maritime has completed the first ever APOS Survey installation on Bibby Offshore's long term charter vessel, the Olympic Bibby. Launched this December, the new APOS Survey operator station enables surveyors to leverage the power of Kongsberg Maritime's de facto industry standard HiPAP High Precision Acoustic Positioning system to deliver accurate survey results simultaneously, while the HIPAP is still utilized as a DP position reference.

With state-of-the-art new generation of positioning software for flexible, cost effective subsea survey and construction operations, APOS Survey station offers full LBL and SSBL, quicker mobilization times and is designed for both permanent and temporary installation on vessels, negating the mobilization cost and time associated with over the side portable transducers.

APOS Survey communicates directly with the HiPAP transceiver, which enables the surveyor to operate independently of the bridge. Acoustic interrogations are interleaved or run simultaneously with the DP system updates without making changes to the vessel's APOS software or installation parameters. With APOS Survey, the surveyor can interface local survey grade sensors, IMU, gyro and GNSS, set up lever arms and load sound velocity profiles independent of the vessel, thus unlocking the full potential of HiPAP for survey operations.

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

### Award-winning Centre to deliver new ROV training course

The award-winning subsea training and testing facility, The Underwater Centre, has added the FMC Schilling TITAN 4 syllabus to its current ROV training suite.

The course familiarizes candidates with all major components of the TITAN T4 manipulator and provides system operation and routine maintenance procedures.

The Centre has adapted the course to offer extensive operational practice through specific activities designed to give candidates familiarity with the manipulator in use.

There will be multiple deliveries of the course throughout the year and it is included in the Centre's 7-week Premium ROV Course. The 2-day course will be integrated into the ROV Tooling module and offered as a standalone option as well.

The FMC Schilling Manipulator was donated to the Centre by Fugro and upgraded by FMC Schilling Robotics from a TITAN 3 to a TITAN 4. The TITAN 4 represents the industry standard for position-controlled manipulator operations used in work class ROV applications.

The development of this manipulator has featured extensively in the advancement in remote technology applications, in the harshest of marine environments, and deserves its reputation as the proven system of choice for all major ROV operators and their clients alike. This training provides a vital addition to the skill-set of any ROV pilot technician.

With accommodation and additional classrooms based at the landward end of the pier, The Underwater Centre is set up to provide its students with the skills and experience to succeed in their new careers and continue providing the subsea industry with the workforce that it needs.

For more information, visit www.theunderwatercentre.com.

### 3D at Depth completes over 100 subsea metrologies

3D at Depth, a global provider of advanced subsea LiDAR systems and solutions, announced the company's LiDAR technology has completed over 107 subsea spool metrologies worldwide.

The metrologies were conducted in collaboration with top tier service providers with survey operations in the North Sea, Angola, Africa, Asia Pacific and the Gulf of Mexico.

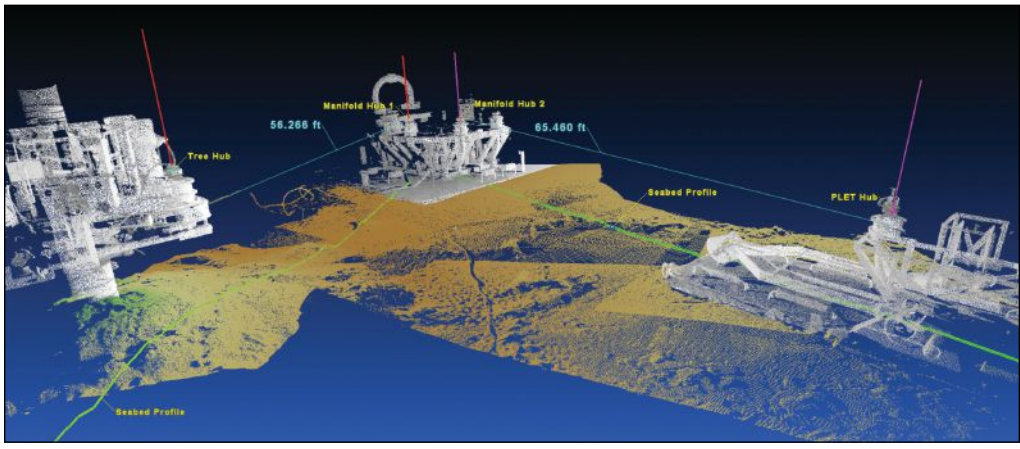
3D at Depth's LiDAR platform was orginally designed to greatly reduce the overall cost of survey operations while delivering robust data sets that can be validated and comply with the IMCA recommendations for accuracy–or higher. Using 3D's SL1 and SL2 LiDAR sensor hardware combined with back-end software, survey engineers were able to deploy on ROVs, AUVs or as a standalone solution, depending on the specific requirements.

The average 3D at Depth subsea laser metrology took 2.5 hours to complete in water depths from 50 to 2,900 m with metrology lengths varying from 20 to 89 m. Survey results included full 3D visualization of the location with seabed digital terrain models (DTMs), which provide a base line for structure placement and sediment stabilization. In addition, there were significant improvement in terms of speed, repeatability and resolutions, with a great reduction requirement in project planning and execution.

"We hope to continue to build the case for LiDAR technology use in offshore survey operations," stated Carl Embry, co-founder of 3D at Depth. "We have worked closely with our partners to deliver a solution that can seamlessly integrate into offshore survey and contractor programs with workflows that are repeatable and leverage industry-leading point cloud processing tools."

As LiDAR scanning technology continues to secure acceptance and build momentum in various subsea applications, 3D at Depth will continue to work closely to advance the industry through innovative solutions that address data collection, mapping and visualization challenges, and demonstrate performance.

For more information, visit www.3datdepth.com.



### New features for JW Fishers search systems

JW Fishers Mfg., a company specializing in the design and manufacture of underwater search equipment for almost 50 years, is introducing new features for some of their key products.

Fishers popular SeaOtter-2 and SeaLion-2 ROVs will now come standard with LED lights on the front and rear of the underwater vehicle. The two front lights have been upgraded from 100-W quartz halogen bulbs to high intensity LEDs, each producing 2,200 lumens, significantly more illumination than the old style bulbs.

The intensity of the LED lights can be increased or decreased with the push of a button on the surface controller. The new lighting system employs a single-source COB (chip on board) LED that emits light from a single plane eliminating problems previously experienced with the multi-LED type light source. The color temperature of the new lights is 5,000°K, very close to the 5,500°K of natural daylight and within the recommended range for shooting underwater video. Colors are illuminated more accurately with the LEDs than with the warm 3,500°K temperature of quartz halogen lights. The new lighting enhances picture quality and maintains a constant color temperature throughout the entire range of illumination intensity, something not possible with the halogen lights.

Another key advantage of the LED lights is their lifespan. Quartz halogen lights require regular replacement and can be damaged if the ROV is dropped or takes a hard shock. The LED lights last virtually as long as the ROV, rarely if ever needing replacement.

Fishers is also offering an upgrade to new lighting for all existing SeaOtter-2 and SeaLion-2 ROVs for the low price of $995. Not only will the LEDs be included on new ROVs, these lights will be a standard feature on the company's other underwater video systems including the DV-1 drop video, TOV-1 towed video and DHC-1 diver-held video system.

The other new addition to JW Fishers line is an optional tablet computer for use with their sonar systems and boat-towed detectors. The Microsoft Surface 3 tablet is mounted in the lid of the equipment's control console, eliminating the need for a separate laptop computer to run the system software. Elimating the external laptop and its connecting cables is a key advantage, another is the tablet's high resolution and ultrabright display, which


makes it much easier to see even on sunny days. Having the tablet mounted in the console's lid provides protection from the elements and makes for a cleaner, sleaker equipment package.

The tablet is available with Fishers Proton 4 magnetometer, Pulse 12 and Pulse 10 boat-towed metal detectors and will run the company's Tracker software, which displays the detector's readout, GPS position coordinates, and the track of the boat as it moves over the search area. The tablet can also be used with Fishers side-scan sonars and SCAN-650 scanning sonar. When used with the side-scan, the tablet runs Fishers Sonar View software, which displays a sonar image of the bottom on each side of the boat as well as the track of the boat as it moves over the search area and the size of the area being scanned. Recorded sonar files can be overlaid onto Google maps and some other mapping programs. The cost to upgrade from the standard laptop to the tablet is only an additional $295.

### Innovative remote piloting and automated control technology

In October 2015, Oceaneering demonstrated two new technologies in the Gulf of Mexico that will greatly increase ROV operational efficiency and reduce costs for its customers.

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

With remote piloting, an infield high bandwidth wireless or satellite link is used so that an ROV can be piloted on an offshore vessel from another remote location. Subject matter experts or other pilots can be linked-in in the event of highly complex processes or technical procedures that require special knowledge. Remote connection technology allows the use of multiple virtual connection technologies and potentially creates cost savings opportunities such as reduction and/or elimination of second shift crewing for low intensity operations.

The demonstration also included an essentially hands-free operation method of piloting, whereby the pilot was able

to "fly" the ROV with a command-based system involving automated steps instead of using the traditional joystick. Using video machine vision technology, the video processing software analyzes video and sends the ROV control system positioning data from the video to control the thrusters and move the ROV.

For more information, visit www.oceaneering.com.

### Geo Oceans provides ROV support for subsea pipeline construction in South Pacific

Geo Oceans has recently demobilized ROV teams and equipment after successfully providing 2 months of continuous ROV support for a large subsea pipeline construction and maintenance project in the South Pacific. Geo Oceans worked closely with several subsea and marine construction companies to deliver a complex scope in a safe and efficient manner.

Having our ROV team on hand during the project provided both the proponent and construction contractors with a valuable subsea data collection tool at all times. Rapid turnaround of inspection and monitoring data during pigging operations allowed for timely review of results and decision making by the proponent.

For more information, visit www.geooceans.com.

### FlatFish: Investing in the next generation of underwater vehicles

Vehicles that make detailed inspections of subsea pipelines, facilities and structures are the focus of an R&D project–codenamed FlatFish–being undertaken by BG Brasil and the Brazilian Institute of Robotics (BIR).

FlatFish will be a lightweight, low-cost vehicle able to carry out subsea inspections completely autonomously. It will reside subsea and be capable of undocking from a submerged docking station, carrying out an inspection mission and returning to base, all without human intervention. As a result, in addition to obtaining traditional 2D video footage, we will be able to build 3D state-of-the-art visual reconstructions of equipment and structures, which will help us identify any collision or impact damage, the presence and nature of defects, and make an assessment of the overall structural integrity.

The Flatfish project aims to reduce operating costs and mitigate production losses and the risks of major accidents through increased inspection frequencies and higher-quality inspection results.

The first phase of the project has developed, tested and trialed two prototype vehicles: one has been built and tested in Germany and the second in Brazil. A second phase will be launched in early 2016, leading to the construction of a production vehicle, which will be field-trialed in a BG Group asset. Future developments will include the addition of manipulation and intervention capabilities to the vehicle.

For more information, visit www.bg-group.com.

**Airbus Group to sell commercial satellite communication business**

Airbus Group SE has signed with French private equity firm, Apax Partners, a share purchase agreement (SPA) for the sale of 100% of the share capital of the legal entities comprising the commercial satellite communication business. The final closing of the transaction–subject to regulatory approvals – is expected to take place in the next months.

Airbus Defence and Space announced in September of 2014 that a detailed and comprehensive portfolio assessment had defined Military Aircraft, Space, Missiles and related Systems and Services as its future core businesses. As the Commercial Satcom business did not fit those strategic goals, the decision was taken to transfer the activities to a new owner who could provide better focus and drive additional growth.

The maritime and land commercial satcom business is present in 14 countries across Europe, Asia, Middle East and Americas and has a distribution network of approximately 400 re-sellers worldwide. It serves all maritime sectors in the world and thousands of users operating in challenging environments in the mining, energy and humanitarian sectors that needs highly reliable satcom mobile and fixed connectivity services.

The government satcom business is not part of this transaction and remains part of Airbus Defence and Space's core activities. After more than 10 years, the company has built a leading position in the government market with a large portfolio of communication solutions and services based on both military and commercial satellites.

For more information, visit www.airbusgroup.com.

**Ashtead secures deal with nCentric**

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, increase communication and 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 DeepWater 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 center as well as between one another and create a reliable communication link.

Headquartered in Belgium, nCentric is a fast-growing provider of offshore network solutions to support offshore communication.

Through the delivery of enhanced technical support services, the increased capabilities of its teams across the business and the addition of the latest technology, Ashtead Technology delivers a range of value-added services that include the supply of offshore personnel, equipment sales, complete asset management, calibration, repair and maintenance, custom engineering, cable moulding and training.

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

# World's largest cargo ships using high-speed VSAT


With MSC (Mediterranean Shipping Company) Zoe's inaugural voyage completed this summer, the largest containership ever built is now operating with high-speed Marlink Maritime VSAT (Very Small Aperture Terminal) on board. Marlink VSAT services provide reliable connectivity for operational and crew communications on MSC Zoe and 130 other MSC ships. MSC, the second largest container company in the world, is also saving time and money with a suite of integrated IT solutions designed to reduce network administration on board and provide easy access to communication services for crew, all enabled by the XChange communications management platform from Marlink.

Recently added to MSC Zoe's communications solutions and being rolled-out across the MSC fleet is XChange Universal Remote Access (URA), a unique system that provides secure remote access to computers on board from the shore office. MSC is already experiencing higher uptime for IT systems across the fleet due to the improved remote maintenance and troubleshooting capabilities provided by URA. The system differs from standard remote access solutions, which are designed for specific terminals or protocols and require their own IP address. Since it is a universal access solution, MSC can use the same tool to access IT systems on MSC Zoe, its largest ship, as on any other ship regardless of age or type across its entire fleet.

XChange as standard also provides communication lines for MSC crews to easily stay in contact with their families and friends via email, Internet and social media, while giving full control of access and costs to administrators on shore. For MSC, this functionality has been extended by XChange BYOD (Bring Your Own Device), a ready-to-use Wi-Fi solution and accompanying apps that provide voice and data access for crew using their own smartphones, tablets or laptops. By ensuring straightforward account administration and streamlining payment using pre-paid cards, XChange BYOD helps MSC to meet the requirement of its maritime professionals to access the Internet via Wi-Fi using their own devices.

For more information, visit www.marlink.com.

**NCL cruise ship breaks social media record**

Norwegian Escape, the newest and largest of Norwegian Cruise Line's 14-vessel fleet, experienced a record-breaking social media milestone during its inaugural celebrations from 22 October 22 - 11 November 2015. Cruisers logged 576,896 Facebook posts, 14,150 tweets and 11,367 Instagram posts for a total of 159 million impressions, surpassing the cruise line's "social media usage at sea" record set during the 2013 inaugural events for Norwegian Breakaway, exceeded in 2014 with the Norwegian Getaway.

### Novel tsunami detection network uses navigation systems on commercial ships

UH Mānoa researchers have equipped 10 Matson and Maersk Line ships with real-time geodetic GPS systems and satellite communications to create a network of low-cost tsunami sensors.

Accurate and rapid detection and assessment of tsunamis in the open ocean is critical for predicting how they will impact distant coastlines, enabling appropriate mitigation efforts. Scientists from the University of Hawai'i at Mānoa School of Ocean and Earth Science and Technology (SOEST) are using commercial ships operating in the North Pacific to construct a network of low-cost tsunami sensors to augment existing detection systems.

The researchers, funded by NOAA, are partnering with Matson, Maersk Line and the World Ocean Council to equip 10 ships with real-time geodetic GPS systems and satellite communications. The newly built pilot network of GPS-equipped ships enables each vessel to act as an open-ocean tide gauge. Data from these new tsunami sensors are streamed, via satellite, to a land-based data center where they are processed and analyzed for tsunami signals.

"Matson was an obvious partner for this project due to their long history in Hawai'i and shared interest in community safety and coastal hazards," said James Foster, SOEST associate researcher and lead investigator for the project. "The World Ocean Council's unique connection within the industry allowed us to bring Maersk Line into the collaboration."

"The unexpectedly huge 2011 Tohoku, Japan earthquake and the unanticipated type of fault slip which caused the 2012 event at Queen Charlotte Islands, Canada highlighted weaknesses in our understanding of earthquake and tsunami hazards and emphasized the need for more densely-spaced observing capabilities," said Foster.

Despite the advances in tsunami monitoring and modeling technology over the last decade, there are too few observations of tsunamis to provide sufficiently accurate predictions required for hazard response agencies to be able to make the best possible response to tsunami events. In particular, there are very few sensors in the deep ocean between the tsunami source and the distant coastlines that might be threatened. The sensors that do exist are expensive to build and maintain, so only a limited number are deployed. Gaps in the coverage of the network, as well as routine outages of instruments, limit the ability of the current detection system to accurately assess the hazard posed by each event.

"Our approach offers a new, cost-effective way of acquiring many more observations to augment the current detection networks," said co-investigator Todd Ericksen, SOEST assistant specialist.

By chance, in 2010, UH Mānoa researchers discovered that the ship-based global navigation satellite systems aboard the UH research vessel Kilo Moana were able to detect and measure the properties of tsunamis in the open ocean, thus paving the way for the current project. Foster and colleagues were running an experiment using geodetic GPS on the R/V Kilo Moana when the

tsunami generated by the magnitude 8.8 earthquake in Maule, Chile (27 February 2010) passed the ship. Analysis of the data proved that the system accurately recorded the tsunami signal.

The researchers are working with the NOAA Tsunami Warning Centers to ensure that the network provides the most useful data products to help them with their predictions. They will be working with their industry collaborators to develop a new version of the shipboard package that can be deployed on a much greater number of ships.

For more information, visit www.hawaii.edu.

### Panasonic, Kymeta bring revolutionary antenna to maritime market

Panasonic Avionics Corporation and Kymeta Corporation have announced a landmark agreement that brings innovative, high-performance antenna technology to several unique maritime markets. Under terms of the agreement, Panasonic will order a significant volume of Kymeta's flat panel antennas and

use Kymeta mTenna technology to manufacture and distribute maritime terminals for vessels around the world. The antennas are expected to go through prototype testing this year and be commercially available in 2017.

Unlike traditional maritime antennas, which weigh several hundred kilograms, require weeks of vessel downtime to install, and use mechanical components that can easily break and are difficult to maintain, Kymeta's technology enables electronically steered, lightweight, flat panel antennas that can acquire and track any satellite from any moving platform, anywhere in the world.

By combining Panasonic's high-throughput satellite network with Kymeta's lightweight antenna design that can be carried on-board by hand to be easily installed, the companies are giving maritime vessels anywhere in the world the ability to provide cost-effective, high-speed connectivity to passengers and crew alike.

Panasonic also will purchase and distribute a new technology from Kymeta that enables the combining of multiple apertures into one antenna. This combining technology will give customers a more powerful antenna that ultimately will provide faster and more efficient connectivity.

"This agreement is a perfect example of our commitment to bring broadband communications to a wide range of mobility markets," said Paul Margis, president and chief executive officer of Panasonic Avionics. "We believe this exciting breakthrough technology will enable rapid growth in many market segments, and we look forward to working with Kymeta to set a new standard in connectivity for merchant vessels, yachts, river cruises and other vessels."

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"Kymeta's goal is to use our mTenna technology to help realize the power of a truly connected future for any platform that moves around the world, and this agreement is another major milestone towards that goal," said Dr. Nathan Kundtz, Chief Executive Officer of Kymeta. "We are excited to partner with Panasonic and help their maritime customers with higher speed internet connections for vessels anywhere in the world."

For more information, visit www.panasonic.aero.

### ITC Global awarded contracts in Western Africa

ITC Global has been awarded two multi-million dollar contracts, each spanning 3 years, to provide remote offshore communications to five floating production storage and offloading (FPSO) vessels based in Western Africa. Service is being delivered to several major European-based oil and gas companies including Saipem and Eni S.p.A.

The FPSOs, operating in the Congo, Angola, and Equatorial Guinea, are each outfitted with two C-band stabilized antennas, delivering between 4 and 10 Mbps high data rate service to the vessels. The custom-engineered solution was designed to enable increased automation at the remote site, reducing the number of remote workers required on each FPSO at one time.

"As the industry continues to experience unpredictability, ITC Global has seen tremendous opportunity to improve operational processes and systems and drive efficiencies for customers," said Joe Spytek, chief executive officer, ITC Global. "While some oil and gas service providers have responded to recent market dynamics through consolidations and cost cuts, ITC Global is focused on putting customers in the best position to weather industry headwinds and be prepared for growth."

With certified field technicians based in strategic locations throughout Western Africa, ITC Global utilized its local presence to ensure fast installation and commissioning of each FPSO for the customer's African operations.

"Being able to respond quickly to local customer requirements in key oil and gas regions around the world is the cornerstone of ITC Global's business," said Spytek. "As an International organization, we've built a service culture that understands the meaning of urgency and global responsiveness, and our local presence in strategic regions allows us to deliver added flexibility and effective service to our customers worldwide."

In August, ITC Global was acquired by Panasonic Corporation of North America and now operates as an independent unit of Panasonic Avionics Corporation. Panasonic Avionics is a leading provider of inflight communications and entertainment systems to the aviation market. Collectively, ITC Global and Panasonic Avionics are one of the world's largest buyers of commercial satellite capacity. Joining Panasonic further enables ITC Global to help customers meet demands for increased bandwidth, better performance, and overall lower costs for satcom systems, networks, and equipment.

For more information, visit www.itc-global.com.

### One Horizon Group signs contract with Globecomm

One Horizon Group, Inc. has signed an agreement to deliver its revolutionary mobile VoIP service to Globecomm Asia Pte. Ltd.

One Horizon is expanding its licensee base through the delivery of a new Globecomm branded crew-calling VoIP app. Globecomm will purchase pre-paid calling cards from One Horizon and resell to ship crews through its network of maritime distribution channels. Globecomm has a global operation covering thousands of vessels. The revenue possibilities of One Horizon for this service are significant with our observed monthly revenue per vessel of $150. Phone calls to friends and family will be carried through the One Horizon Public Switched Telephone Network (PSTN) in Asia, Europe and North America and billed to the crew on a pay-as-you-go basis at competitive rates.

One Horizon's optimized technology was successfully trialed by Globecomm and is an ideal solution for smaller capacity Internet connections like satellite Internet because of its low bandwidth usage and high voice quality. The company's track record of successful maritime deployments with Singapore Telecommunications (Singtel) and Smart Communications in the Philippines were key reference deployments over satellite that Globecomm considered as part of

their selection process.

One Horizon Group CEO, Brian Collins, noted, "We were delighted to be able to expand our VoIP as a Service platform to even more high quality maritime operators like Globecomm. Our track record of success in low bandwidth conditions like those at sea or at remote mining sites is a key driver for these new revenue streams in our business. Both teams worked tirelessly to deliver a truly high quality and affordable calling solution for the crews aboard the Globecomm fleets."

For more information, visit www.onehorizongroup.com.

### Marlink upgrades Maridive Group offshore support vessels to VSAT broadband

Maridive Group has chosen to migrate 24 of its modern offshore support vessels to Marlink's VSAT (Very Small Aperture Terminal) WaveCall Plus services in addition to one new build vessel. By choosing the latest generation VSAT services from Marlink, Maridive plans to significantly improve its operational, client and crew communication facilities.

As one of the largest marine and oil service companies in the world, Maridive Group has a globally distributed fleet with an operational footprint covering North and West Africa, the Mediterranean, the Caspian Sea and Latin American countries. Reflecting Maridive's established position as a technology focused operator, the company selected Marlink to upgrade its vessels to VSAT in 2012. This latest contract adds a further five vessels operating in Venezuela and Brazil, while enhancing Maridive's communication capabilities for business, crew and safety by upgrading to WaveCall Plus.

"With so much new technology available to support our maritime and business operations, our strategy is to ensure reliable broadband connectivity on board. The higher bandwidth and reliability of Marlink's VSAT service will enable smarter operations through the use of IP-based technical applications, ERP, surveillance cameras and equipment monitoring in addition to faster, multi-user internet access and navigation software and chart updates," said Capt. Mohamed Yakout, marine sector general manager, Maridive Group.

All 24 contracted Maridive offshore support vessels will benefit from even higher bandwidth while using WaveCall Plus, an all-inclusive package combining high-speed Ku-band connectivity including increased Maximum Information Rate (MIR) and Committed Information Rate (CIR) with unlimited L-band back-up and XChange. XChange, Marlink's innovative service delivery platform, will allow Maridive to manage and control its communications network aboard as well as from shore. XChange will support Maridive's IT support team to significantly reduce the time needed for network administration, such as when adding new users or groups or managing access to data and voice services on board.

Furthermore, Maridive is committed to enhance its communication services for on-board clients and crew members. Hence, crew and clients can reliably use Bring Your Own Device, a ready-to-use WiFi solution to improve voice and data access using personal devices, such as smartphones and laptops, while Maridive keeps full control over the IP pipe and related cost.

In order to ensure higher availability of connectivity globally and in all conditions, the connectivity solution includes L-band back-up for business critical communication as standard.

For more information, visit www.marlink.com.

**ABB debuts innovative power restoration technology**

ABB has handed over the new high-voltage direct current (HVDC) power link between the Åland islands in the Baltic Sea and mainland Finland to Kraftnät Åland, the transmission grid operator. Prior to handover ABB successfully simulated the "black-start" outage restoration functionality, a key feature of ABB's HVDC solution. The real-time simulation was carried out in the early hours of the morning, with the power supply to intentionally cut off, and then restored with an automatic start-up sequence.

The Åland link transmits electricity between mainland Finland and the archipelago, which lies between the Finnish west coast and Swedish east coast. The link will allow integration of renewable energy sources, delivering clean power to 28,000 inhabitants.

With the Black-Start feature, restoration time can be reduced to fractions of a second under operational conditions. This functionality, when incorporated with ABB's HVDC Light® technology, performs an intelligent and controlled injection of electricity into the grid to quickly re-energize the system. As demonstrated in the Åland simulation, even when the link is not in active operation, the black-start system can restore power in under five minute–many times faster than in the absence of this innovative feature. It also replaces local auxiliary power supply needs like diesel generators, and eliminates the use of costly and carbon dioxide emitting fossil fuels.

The simulation was performed to demonstrate how ABB technology could restore electricity after a complete power outage, a worst-case scenario for the isolated islands, which would require a lengthy and challenging process to restore power with traditional technology.

Black-start is one of the many innovative features provided by ABB's HVDC Light solution that is being increasingly deployed across applications like cross-border interconnections, integration of renewables, city in-feeds and to reinforce existing AC grids.

**NEC, TM land SEA-ME-WE 5 in Malaysia**

NEC Corporation announced that Telekom Malaysia Berhad (TM) and NEC successfully completed the landing of the South East Asia-Middle East-Western Europe 5 (SEA-ME-WE 5) submarine cable system at Melaka, Malaysia.

Upon completion in 2016, the 20,000 km cable system will provide 24 Terabits per second (Tbit/s) of capacity utilizing the latest 100Gbit/s coherent transmission technology via a fiber optic path between South East Asia, the Middle East and Europe, with connections to Malaysia, Singapore, Indonesia, Myanmar, Bangladesh, Sri Lanka, Pakistan, Oman, the United Arab Emirates, Djibouti, the Kingdom of Saudi Arabia, Egypt, the Republic of Turkey, Italy and France.

NEC is in charge of deploying the segment spanning from Singapore to Sri Lanka, including the Malaysia branch, where the shore end cable successfully landed in Melaka on 30 October 2015.

"The telecommunications landscape and needs in Malaysia are fast evolving and we are delighted to be able to support this development together with SEA-ME-WE 5 consortium members," said Rozaimy Rahman, executive vice president, global & wholesale, TM. "The installation of this new cable system presents greater opportunities to empower the Malaysian people through an enhanced connectivity with South East Asia, the Middle East and Europe."

"We are pleased with the successful landing of the SEA-ME-WE 5 Cable System at Melaka, achieving yet another important milestone towards completing the construction of this significant project," said Mr. Katsuji Yamaguchi, SEA-ME-WE 5 project manager at NEC Corporation. "I truly believe this new cable will make valuable contributions to Malaysia and the surrounding economies."

For more information, visit www.nec.com.

# Canadian tidal project installs interconnector cable

Cape Sharp Tidal, a joint venture between Emera and OpenHydro, has completed a significant milestone in preparation for the next phase of the tidal energy demonstration project – the installation of its subsea power cable.

The operation to lay the Cape Sharp Tidal interconnection cable is the first project component to be deployed and the only system of its kind in the world. The operation was completed during a single tidal cycle, while holding position over Cape Sharp Tidal's berth site at the Fundy Ocean Research Centre for Energy (FORCE) near Parrsboro, Nova Scotia.

With support from its marine operations partner, Atlantic Towing Ltd., Cape Sharp Tidal deployed 300 m of power and fiber-optic data cable from a specially outfitted barge. Teams also recovered and lifted the existing 16-MW subsea export cable installed by FORCE, and using an on-deck mating table linked it to the Cape Sharp's interconnection hub. The whole system was placed back on the seafloor, where the cables will remain until spring 2016, when the turbines are scheduled for deployment.

For more information, visit www.capesharptidal.com.

**Alcatel-Lucent, Bluesky Pacific Group launch new Pacific system**

Alcatel-Lucent Submarine Networks has signed a turnkey contract with Amper, SA subsidiary Bluesky Pacific Group to roll out a new submarine cable system spanning more than 9,700 km across the Pacific.

Named Moana Cable, the system will link New Zealand and Hawaii using the latest submarine cable technology, providing much-needed capacity and redundancy in the region to address increased traffic requirements as mobile broadband and the provision of fiber access to homes and businesses take center stage in the region.

With completion scheduled in 2018, the Moana Cable system will have two main segments: the first segment, based on two fiber pairs, will connect New Zealand to Hawaii over 8,000 km, serving Samoa and American Samoa and significantly enhancing route diversity for New Zealand; the second segment, based on one fiber pair, will link the Cook Islands to the Samoa hub over 1,700 km.

The Moana Cable is also designed to accommodate the connection of additional Pacific island nations such as Niue, Tokelau and Tonga, which lie in close proximity to the New

Zealand-to-Hawaii trunk as well as French Polynesia.

The Moana Cable will be the first long-haul submarine cable in the Pacific islands region relying on the latest innovative 200 Gbit/s transmission technology, with ultimate capacity between Hawaii and New Zealand of 20 Tb/s.

Bluesky Pacific Group has a strong track record as a submarine cable owner and operator with its ASH Cable connecting American Samoa to Hawaii and SAS Cable connecting Samoa to American Samoa. Anchor customers of the Moana Cable include Bluesky Pacific Group companies and existing ASH Cable customers. Bluesky has also signed a memorandum of understanding with RAM Telecom International, Inc., for collaboration and interconnection with its SEA-US submarine cable linking Asia to Hawaii and the West Coast of the United States. This technology partnership will enable the Moana Cable to provide unrivalled connectivity from New Zealand and the Pacific to the U.S. and Asia.

Under the terms of the contract, ASN will deploy its advanced submarine optical technology based on the innovative 1620 SOFTNODE and OADM branching units to maximize capacity and network flexibility. ASN will be responsible for the project on a turnkey basis, from system design to installation and commissioning as well as marine operations (cable laying and maintenance).

For more information, visit www.alcatel-lucent.com.

### Seaborn Networks completes total funding of Seabras-1

Seaborn Networks announced the completion of its US$500 million project funding for Seabras-1, a new transoceanic subsea fiber optic cable system directly connecting points of presence (POPs) in New York City (U.S.) and São Paulo (Brazil). All conditions to this project financing have been fully satisfied; debt and equity funds have been drawn.

Seabras-1, owned jointly by Seaborn and global private markets investment manager Partners Group, uses next-generation coherent technology to deliver high-capacity and low latency telecommunications for one of the fastest-growing transoceanic routes in the world. This six-fiber pair system with initial maximum design capacity of 72 Tbps is the first system to provide a direct point-to-point route between the commercial and financial centers of the United States and Brazil. Seabras-1 also includes branching units installed on certain of its fiber pairs that point towards Halifax (Canada), Ashburn (U.S.), Miami (U.S.), St. Croix (US), Fortaleza (Brazil), Rio de Janeiro (Brazil), and Las Toninas (Argentina).

Seaborn-managed Seabras-1 offers a wide range of capacity options (including lit, spectrum, and portions of fiber pairs) for POP-to-POP service on the New York to São Paulo route.

Full project equity capital was provided by Partners Group and development capital was provided by Seaborn. The project funding also includes total project debt of up to US$267 million provided by Natixis, Banco Santander, Commerzbank and Intesa Sanpaolo, which debt is backed by COFACE, the French Export Credit Agency.

Alcatel-Lucent Submarine Networks, now part of Nokia, is currently constructing Seabras-1 for Seaborn under a contract in force. Diverse, dark fiber backhaul and metro routes at each end of the system have been fully secured. Manufacturing of the Seabras-1 system is in progress, and the committed ready-for-service date is in the second quarter of 2017.

In the 165-year history of the subsea communications cable industry, Seabras-1 represents the first export credit agency-backed project financing of a subsea cable system.

For more information, visit www.seabornnetworks.com.

### WACS goes live following 100G upgrade

Huawei Marine Networks Co. Ltd. announced that the recently completed 14,530-km system upgrade of the West African Cable System (WACS) has gone live after successfully completing a stringent customer certification and testing program.

WACS is owned and operated by a consortium of 18 international and regional carriers that when launched in 2012, was deployed with 10G technology, and an initial design capacity of 5.12 Tbps. The upgrade to 100G uses Huawei's innovative 3rd generation Soft Decision-Forward Error Correction (SD-FEC) and bit interleaved technologies that guarantees the compatibility of 100 Gbps channels with 10 Gbit/s channels originally deployed. Today, the design capacity has increased to 14.5 Tbps, delivering significantly improved performance and reliability while maximizing the customers return on investment.

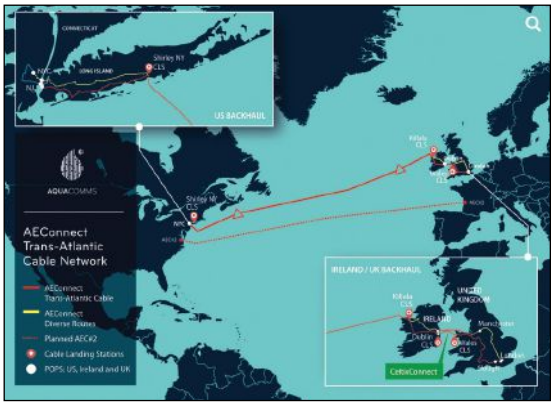
"Thanks to the efficiency and expertise of Huawei Marine's delivery team, coupled with their leading-edge transmission technology, the WACS upgrade was completed smoothly and on time, fulfilling our on-going commitment to our customers," said Vishen Maharaj, Chairperson of the WACS Consortium's Management Committee.

"The increasing reliance on Internet and mobile applications, high-definition video, and other data intensive applications such as cloud services are fundamental drivers underpinning the increasing demand for bandwidth," said Mike Constable, CEO of Huawei Marine. "The additional capacity now available on the WACS submarine cable will greatly enrich international communications, in turn further stimulating economic development in the West Africa region and the communities it serves," Constable noted.

For more information, visit www.huaweimarine.com.

### Aqua Comms' AEConnect goes live

Aqua Comms Limited announced that its America Europe Connect subsea fiber optic cable system is now live and handed over for commercial service to its first customer. AEConnect features the latest technology of 130 x 100 Gbps per fiber pair and is designed to meet the exponential surge in bandwidth demand from carriers, global data centers, financial services companies, and cloud and content providers, including Web-scale providers and Over-the-Top (OTT) companies that require exceptional reliability and performance. One of the first subsea cables constructed between New York City and London in nearly 12 years, the 100G compliant,




coherent optimized system is a major advance upon cable systems built at the turn of the 21st century and will benefit the most from the improvements that coherent technology offers, today and into the future.

"Envisioned to revolutionize connectivity between North America and Europe, AEConnect, now live, is the most secure transatlantic cable system in existence, providing scalable, low latency and unprecedented, high capacity connectivity across the Atlantic," stated Greg Varisco, chief operations officer, Aqua Comms. "This next-generation transatlantic cable system, which is future-proofed against increased capacity requirements, will lower network costs and enable higher, more consistent network performance for end-users. As AEConnect opens for service and hands off to its first client, Aqua Comms would like to thank our partners and anchor customers for their considerable support and confidence, which helped inspire and realize this prodigious accomplishment."

Highly secure, AEConnect transverses the minimum length of shallow water along the continental shelf on both sides of the Atlantic and avoids major fishing grounds and shipping anchorage areas that are known to expose subsea cables to damage. Additional armoring and deeper burial were also obtained to further mitigate potential vulnerability. In addition to its highly secure routing, AEConnect delivers one of the lowest latency crossings of the Atlantic, projected at a speed of 53.9 milliseconds.

Spanning more than 5,522 km across the Atlantic, with stubbed branching units for future expansion, AEConnect is a major paradigm shift from legacy systems that were designed for 10G, and in some cases, 2.5G services. As the Submarine Line Terminating Equipment (SLTE) market evolved to coherent technology, AEConnect was designed as a coherent optimized system and will therefore benefit the most from advanced modulation schemes. AEConnect will initially support 13 Tbps (130 x 100 Gbps) per fiber pair, however, with the introduction of more advanced modulations, including 8QAM, this will continue to increase. This ensures that global organizations can take advantage of resilient and secure connectivity at predictable costs to leverage economic opportunities across the Atlantic.

For more information, visit www.aquacomms.com.

## Ooredoo to build cable network in the Maldives

Ooredoo Maldives has partnered with Huawei Marine for a $25-million project to deploy a nationwide fiber optic submarine cable system, which will greatly support the country's broadband policy of making Maldives the most advanced country in ICT across the SAARC region.

The nationwide submarine cable utilizes Huawei Marine's 100G technology and stretches across 1,200 km, and will bring about key enhancements to the quality of Internet connectivity that can be provided across the country. Combined with an escalated network capacity for the delivery of high bandwidth services, this will provide Ooredoo with an enhanced resilient network that can fully address the country's increasing communication needs across developing islands and new resort locations.

The National Submarine Cable Project will further strengthen the role that Ooredoo is playing in developing the telecommunication infrastructure of the Maldives and connecting the nation to a digital future. Ooredoo has continued to be at forefront of introducing the latest technologies from the global telecommunication market to the people of Maldives, taking the lead in introducing 2G EDGE, 3G & 4G LTE network to the Maldives. As Ooredoo ventures into new areas, such as fixed line Internet and mobile money, the submarine cable will allow the company to address rising traffic needs arising from the surge in usage of mobile broadband and fiber access to home and businesses.

Ooredoo's Nationwide Submarine Cable is expected to complete by the end of 2016.

For more information, visit www.ooredoo.com.

### Global Marine to install Indonesian cable

Global Marine Systems Limited announced that it has secured a sub-contract to install approximately 48 km of optic cable between the Indonesian islands of Bali and Lombok. The main contract of this project was signed to the turnkey solution provider Huawei Marine.

The main lay of the project will see cable surface laid between shore ends at Seraya on Bali and Senggigi on Lombok. Cable burial will take place at the Lombok end where the beach comprises volcanic sand. However, the Bali end presents more of a challenge in that a thin "veneer" of sand covers rock. Thus, in order to ensure the cable is suitably protected, additional cable protection measures will be utilized.

Global Marine has begun the marine installation and is working with a local contractor on beach operations. Here, a jet sled will be deployed to conduct burial in water up to 10 m in depth on the Lombok side. The jet sled, which can bury cable in mud, sand and clay, will ensure the cable is submerged up to 3 m beneath the surface of the seabed.

The project is an example of the strong collaborative working and co-operation between the joint venture partners and is being served by the well proven DPS-2 Class cable lay and multi-purpose offshore support vessel Cable Innovator. At 145-m long, Cable Innovator has been designed and constructed to a very high standard and has the ability to perform a variety of complex subsea operations.

For more information, visit www.globalmarinesystems.com.

### Cable ship Isaac Newton delivered

A delivery ceremony for the Isaac Newton, a sophisticated multipurpose vessel for a range of specific marine tasks and built by Uljanik Brodogradiliste shipyard for the Luxembourg company Sofidra S.A., was held in Uljanik, Croatia, on 27 November 2015.

Isaac Newton has a length of 138 m and width of 32 m, with a deadweight of 13,436 tons. In cable-installation mode the vessel will be capable of transporting and laying cable in a single length with a total weight of approximately 10,500 tons.

In addition to the laying and burying of cables on the seafloor, the ship may also be used for the transport of cargo on the open deck or as a working platform for underwater construction tasks, and for this purpose the ship is equipped with two deck cranes.

Isaac Newton will be operated by the Jan De Nul Group, one of the leading companies in the area of dredging and complex marine, undersea and offshore works. Over the past 7 years, Jan De Nul Group has considerably expanded its fleet and as a result now owns the most state-of-the-art dredging fleet in the world. The company noted earlier this year that it is adjusting its investment strategy and is now more than ever focusing on niche markets. Multipurpose vessels such as the Isaac Newton allow Jan De Nul to better meet the clients' requests to have a project executed by one contractor or one vessel and to reduce the mobilization costs for its clients.

For more information, visit www.uljanik.hr.

PRODUCT
# SPOTLIGHT

## JouBeh Technologies
www.joubeh.com

As a prominent Iridium® Satellite Value-Added Reseller (VAR) focused on data services since 2006, JouBeh is a leader in the satellite communications industry. Although we have a particularly strong presence in the Ocean Technology market, our business ranges across many different industry sectors, with our partners spanning the globe as experts in these fields.

We are proud to offer a wide range of products and services:

- Iridium Satellite Airtime Services and Hardware
- Original Equipment Manufacturers (OEM) Terminal Hardware
- Vessel Monitoring System (VMS)
- Data Processing, Analysis, Provisioning and Re-billing Software Services
- Iridium Modem Solutions

**What Makes Us Different**

Our team of knowledgeable sales and customer support staff offer unmatched service for your telemetry applications. We take extra measures to ensure the quality and security of our services such as airtime management and data processing tools. We also maintain an R&D lab for evaluating hardware solutions. Our customers demand comprehensive and experienced support for their telemetry applications—JouBeh always delivers this service.

**Iridium Pilot (product spotlight)**

Iridium Pilot is more reliable than ever, delivering exceptional performance, durability and value for broadband connectivity at sea, everywhere on the planet. Without the burden of long-term commitments, you can satisfy all your voice and data communications needs at prices that fit your budget. As the best Iridium cost-per-byte option, Pilot can easily be integrated into your existing data acquisition system.


**Unparalleled coverage and connectivity**

Iridium Pilot is built with the same reliable high-quality voice and data capability the world has come to trust from the only pole-to-pole satellite communications company. The unique cross-linked architecture of Iridium's global constellation of 66 Low Earth Orbiting (LEO) satellites gives Iridium Pilot inherent advantages in performance and dependability—making it an ideal platform for primary or back-up communications.

**Lightweight, durable and easy-to-install**

The lightweight, low-profile Iridium Pilot omnidirectional satellite antenna can be easily mounted at any convenient location and can withstand the effects of nearly any marine environment. Iridium Pilot also provides near real-time usage metrics to assist in troubleshooting.

**Key features and benefits**

- Pole-to-pole global coverage
- Reliable high-speed data (32 kbps, 64 kbps, 128 kbps)
- Three independent voice line capability
- Durable construction
- Performs in any conditions
- Easy to install
- Global service program
- 5-year limited warranty

**Specifications**

Outdoor Unit
- Height: 8.0 in (203 mm)
- Diameter: 22.44 in (570 mm)
- Weight: 27.5 lbs (12.5 kg)

Data
- Up to 128 kbps bidirectional with Iridium OpenPort broadband service

Phone
- Three independent lines for simultaneous use

Coverage
- Global, pole-to-pole

iridium® Everywhere

**Ready for Iridium NEXT**

With the first launch expected in 2016, Iridium NEXT is set to completely redefine the way people and organizations communicate everywhere. Iridium's next generation global satellite constellation will provide backward compatibility and ongoing support for Iridium Pilot and other Iridium solutions—ensuring longevity and security of users' purchase for decades to come.

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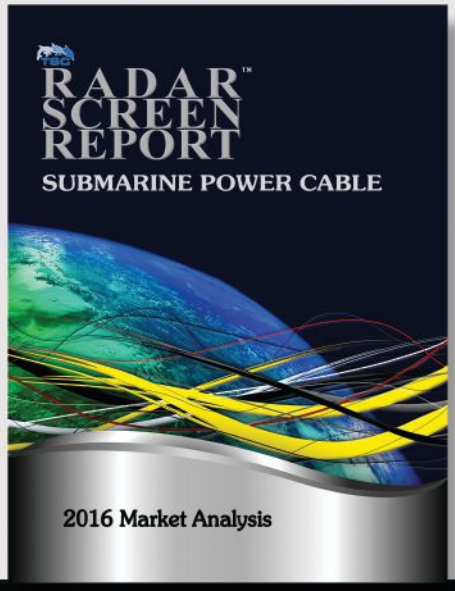
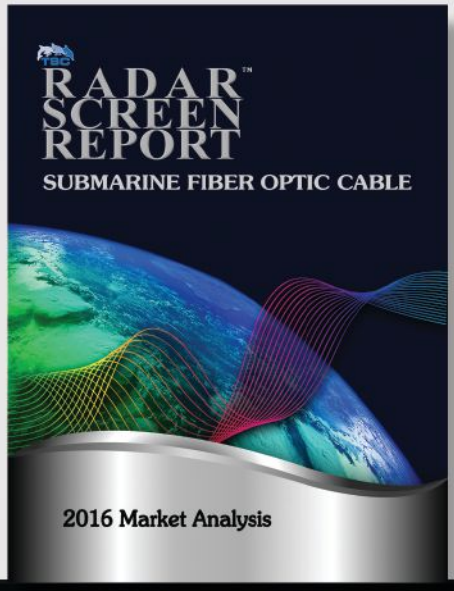
- Major Factors Impacting the Market
- List of 2015 Projects Under Contract
- List of Future Planned Projects

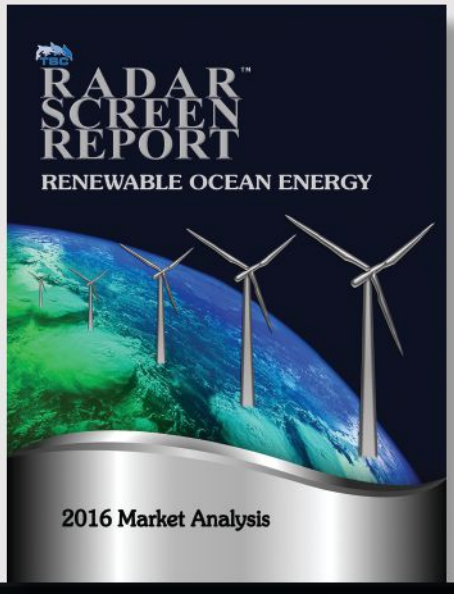
### SUBMARINE POWER CABLE




### SUBMARINE FIBER OPTIC CABLE




### RENEWABLE OCEAN ENERGY

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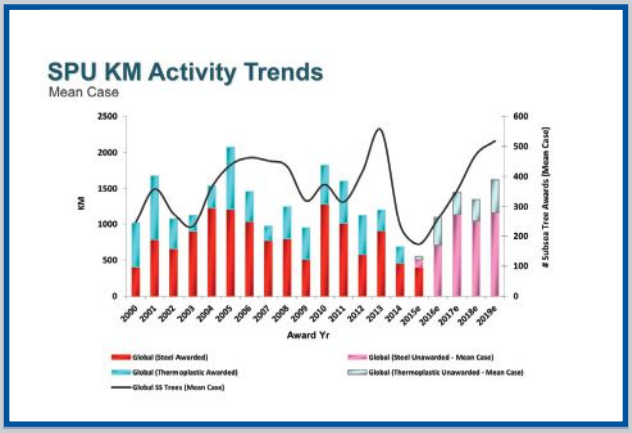
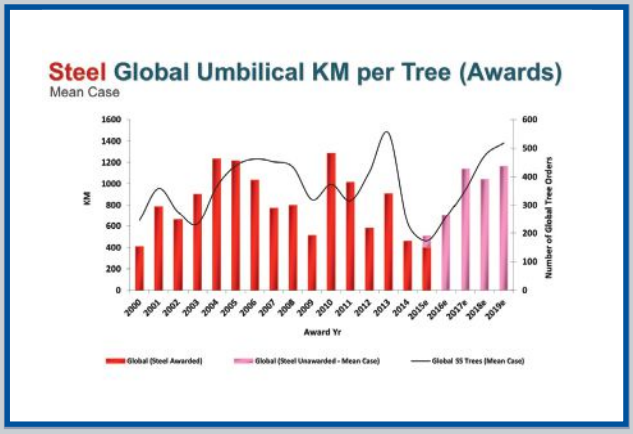
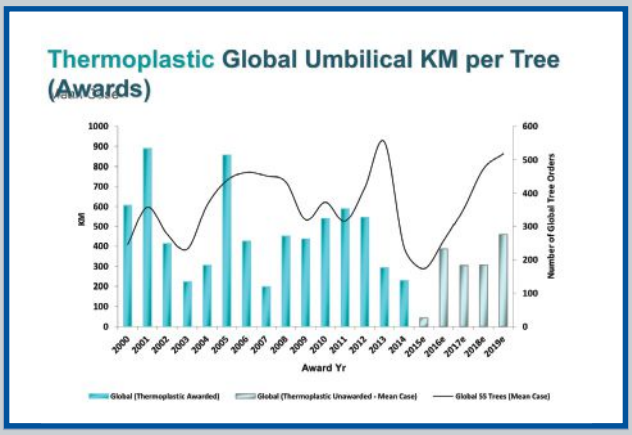
# OFFSHORE STATS & DATA

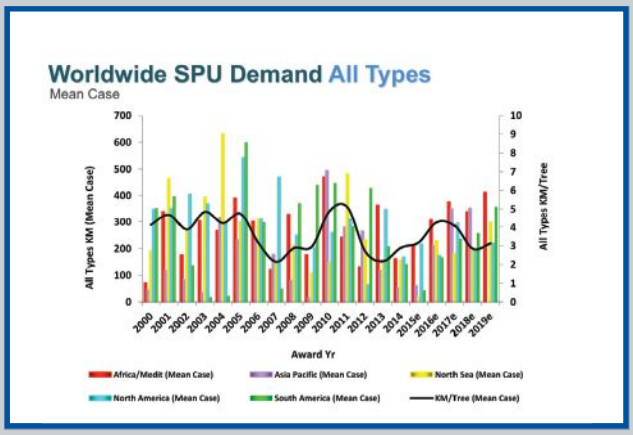


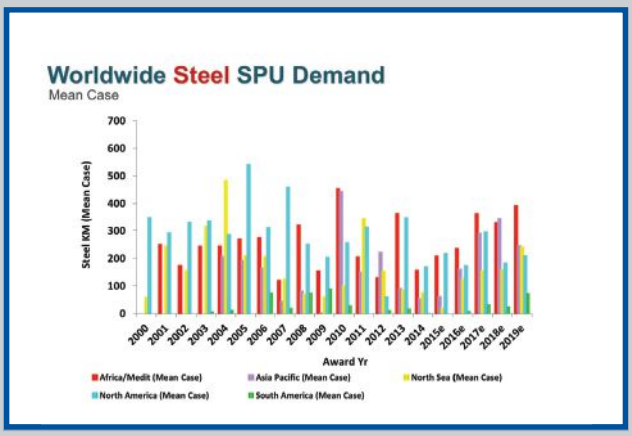
## Quest Offshore Activity Report

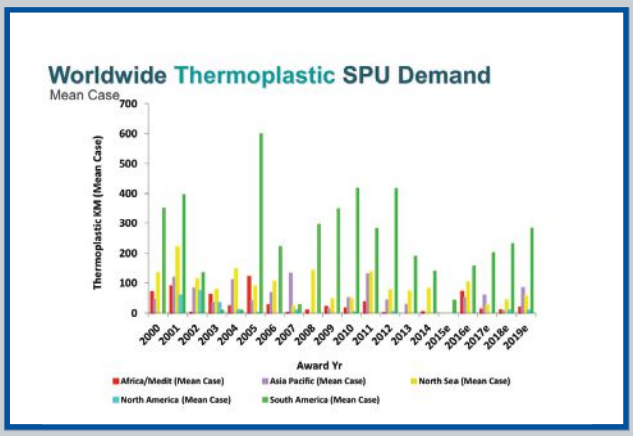


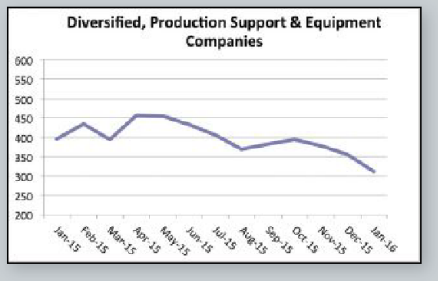



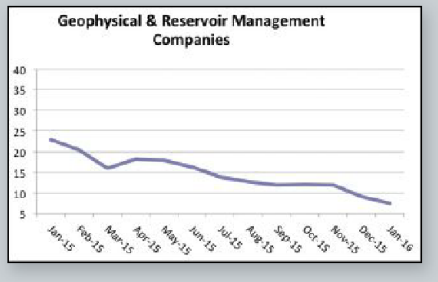
# Monthly Stock Figures & Composite Index

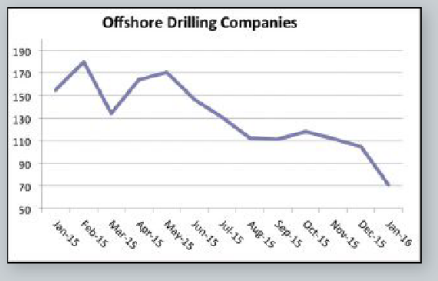
| Industry<br>Company Name | Symbol | Close(*Mid*)<br>*January* | Close(*Mid*)<br>*December* | Change | Change<br>% | High<br>52 week | Low<br>52 week |
|---|---|---|---|---|---|---|---|
| **Diversified, Production Support and Equipment Companies** | | | | | | | |
| Baker Hughes, Inc. | BHI | 39.62 | 45.05 | -5.43 | -12.1% | 70.45 | 38.62 |
| Cameron Intl. Corp. | CAM | 58.24 | 63.68 | -5.44 | -8.5% | 71.22 | 39.52 |
| Drill-Quip, Inc. | DRQ | 53.92 | 58.65 | -4.73 | -8.1% | 81.78 | 52.74 |
| Halliburton Company | HAL | 30.96 | 35.19 | -4.23 | -12.0% | 50.20 | 29.64 |
| Tenaris SA | TS | 19.95 | 23.42 | -3.47 | -14.8% | 32.77 | 19.76 |
| Newpark Resources, Inc. | NR | 4.32 | 5.42 | -1.10 | -20.3% | 10.85 | 4.20 |
| Schlumberger Ltd. | SLB | 62.61 | 70.57 | -7.96 | -11.3% | 95.13 | 61.75 |
| Superior Energy Services, Inc. | SPN | 9.60 | 13.60 | -4.00 | -29.4% | 26.95 | 9.43 |
| Weatherford International, Inc. | WFT | 6.02 | 9.05 | -3.03 | -33.5% | 14.91 | 5.98 |
| Deep Down, Inc. | DPDW | 0.60 | 0.42 | 0.18 | 42.9% | 0.89 | 0.37 |
| FMC Technologies | FTI | 24.40 | 29.84 | -5.44 | -18.2% | 44.43 | 24.21 |
| **Total Diversified, Production, Support and Equipment** | | **310.24** | **354.89** | **-44.65** | **-12.6%** | **499.58** | **286.22** |
| **Geophysical / Reservoir Management** | | | | | | | |
| Dawson Geophysical Company | DWSN | 3.26 | 3.33 | -0.07 | -2.1% | 7.31 | 2.93 |
| Mitcham Industries, Inc. | MIND | 2.89 | 3.00 | -0.11 | -3.7% | 7.92 | 2.74 |
| Compagnie Gnrale de Gophysique-Veritas | CGV | 1.30 | 2.78 | -1.48 | -53.2% | 7.98 | 1.26 |
| **Total Geophysical / Reservoir Management** | | **7.45** | **9.11** | **-1.66** | **-18.2%** | **23.21** | **6.93** |
| **Offshore Drilling Companies** | | | | | | | |
| Atwood Oceanics, Inc. | ATW | 6.14 | 12.38 | -6.24 | -50.4% | 35.66 | 6.07 |
| Diamond Offshore Drilling, Inc. | DO | 17.11 | 21.60 | -4.49 | -20.8% | 37.56 | 16.51 |
| ENSCO International, Inc. | ESV | 10.24 | 15.67 | -5.43 | -34.7% | 32.28 | 10.01 |
| Nabors Industries, Inc. | NBR | 6.28 | 8.84 | -2.56 | -29.0% | 16.99 | 6.13 |
| Noble Drilling Corp. | NE | 7.82 | 12.31 | -4.49 | -36.5% | 19.62 | 7.74 |
| Parker Drilling Company | PKD | 1.29 | 1.97 | -0.68 | -34.5% | 4.55 | 1.28 |
| Rowan Companies, Inc. | RDC | 12.52 | 18.74 | -6.22 | -33.2% | 25.13 | 12.28 |
| Transocean Offshore, Inc. | RIG | 9.63 | 13.05 | -3.42 | -26.2% | 21.90 | 9.51 |
| **Total Offshore Drilling** | | **71.03** | **104.56** | **-33.53** | **-32.1%** | **193.69** | **69.53** |
| **Offshore Contractors, Services, and Support Companies** | | | | | | | |
| Helix Energy Solutions Group, Inc. | HLX | 3.6 | 5.09 | -1.49 | -29.3% | 20.88 | 3.52 |
| Gulf Island Fabrication | GIFI | 8.22 | 9.34 | -1.12 | -12.0% | 18.03 | 8.22 |
| McDermott International, Inc. | MDR | 2.51 | 3.35 | -0.84 | -25.1% | 6.00 | 2.10 |
| Oceaneering International | OII | 31.89 | 37.8 | -5.91 | -15.6% | 59.65 | 30.72 |
| Subsea 7 SA | SUBCY.PK | 5.37 | 7.11 | -1.74 | -24.5% | 12.15 | 5.25 |
| Technip ADS | TKPPY.PK | 10.44 | 12.61 | -2.17 | -17.2% | 18.15 | 10.17 |
| Tetra Technologies, Inc. | TTI | 8.10 | 8.10 | 0.00 | 0.0% | 9.44 | 4.62 |
| **Total Offshore Contractors, Service, and Support** | | **70.13** | **83.40** | **-13.27** | **-15.9%** | **144.30** | **64.60** |
| **Offshore Transportation and Boat Companies** | | | | | | | |
| Seacor Holdings, Inc. | CKH | 43.73 | 53.08 | -9.35 | -17.6% | 78.95 | 43.34 |
| Gulfmark Offshore, Inc. | GLF | 2.64 | 5.08 | -2.44 | -48.0% | 22.39 | 2.50 |
| Bristow Group | BRS | 19.97 | 24.65 | -4.68 | -19.0% | 64.64 | 19.73 |
| PHI, Inc. | PHII | 17.14 | 18.66 | -1.52 | -8.1% | 36.95 | 15.58 |
| Tidewater, Inc. | TDW | 5.09 | 6.50 | -1.41 | -21.7% | 33.84 | 5.05 |
| Trico Marine Services, Inc. | TRMAQ.PK | 9.72 | 10.96 | -1.24 | -11.3% | 14.35 | 9.63 |
| Hornbeck Offshore | HOS | 7.10 | 9.03 | -1.93 | -21.4% | 25.22 | 7.00 |
| **Total Offshore Transportation and Boat** | | **105.39** | **127.96** | **-22.57** | **-17.6%** | **276.34** | **102.83** |

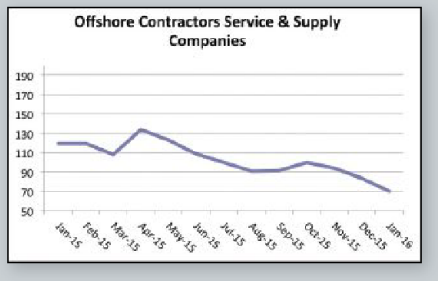
# Monthly Stock Figures & Composite Index

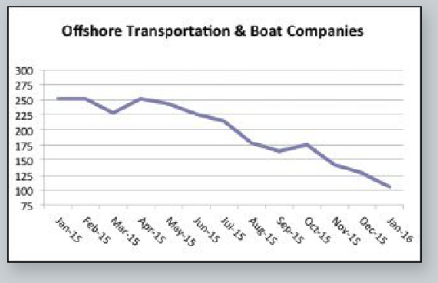
| Industry | Close(*Mid*) *January* | Close(*Mid*) *December* | Change | Change % | High 52 week | Low 52 week |
|---|---|---|---|---|---|---|
| Total Diversified, Production, Support and Equipment | 310.24 | 354.89 | -44.65 | -12.6% | 499.58 | 286.22 |
| Total Geophysical / Reservoir Management | 7.45 | 9.11 | -1.66 | -18.2% | 23.21 | 6.93 |
| Total Offshore Drilling | 71.03 | 104.56 | -33.53 | -32.1% | 193.69 | 69.53 |
| Total Offshore Contractors, Service and Support | 70.13 | 83.40 | -13.27 | -15.9% | 144.30 | 64.60 |
| Total Offshore Transportation and Boat | 105.39 | 127.96 | -22.57 | -17.6% | 276.34 | 102.83 |
| Total Offshore Source Index | 564.24 | 679.92 | -115.68 | -17.0% | 1,137.12 | 530.11 |

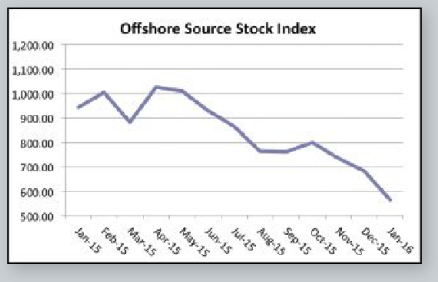


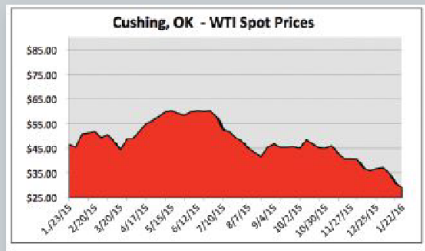




DISCLAIMER

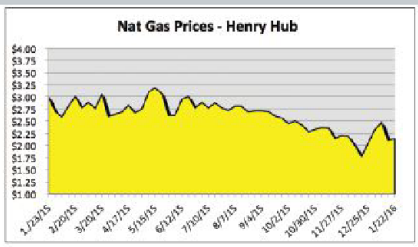
*The information on this page is provided for information and comparison purposes only and should not be used to make financial and business decisions and is accurate to the best of our knowledge for the period indicated.*

# Oil & Gas Industry Trends

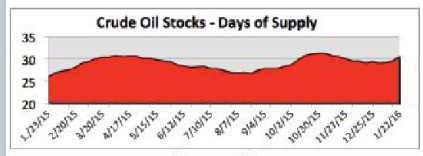
## *Monitoring the Pulse of the U.S. Offshore Oil & Gas Industry*



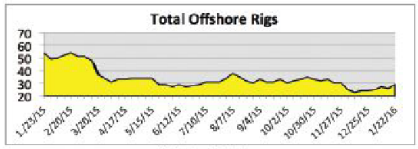

*Source - EIA



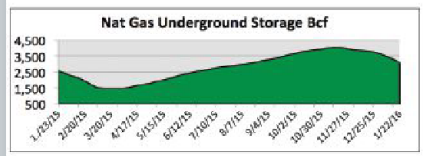

* NYMEX Close



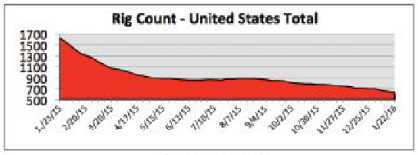

*Source - EIA




*Baker Hughes




*Source - EIA




*Baker Hughes

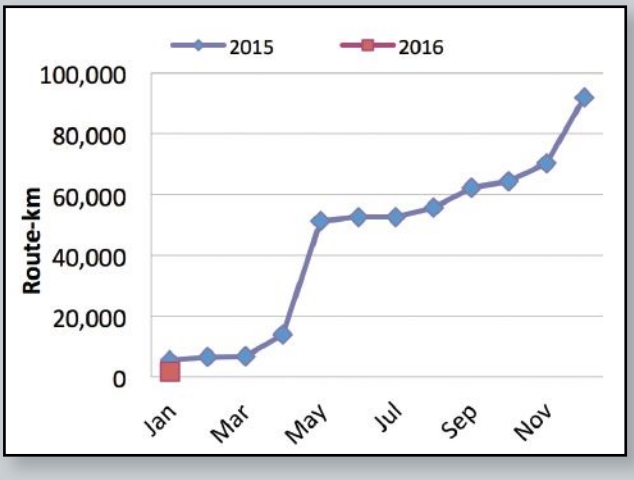
**Positive trend, at least 3 weeks**

**Changing trend, less than 3 weeks**

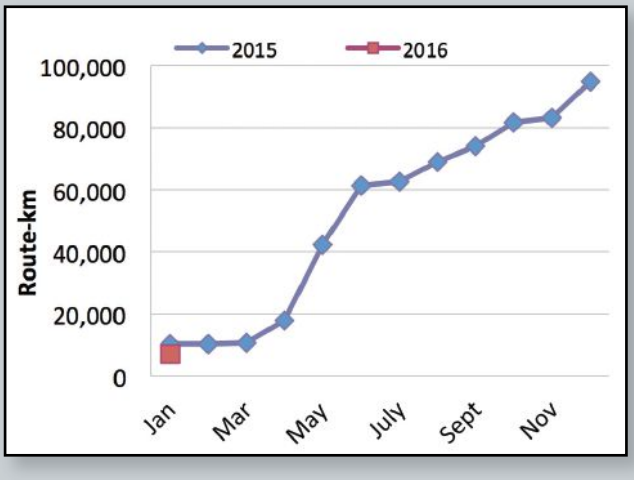
**Negative trend, at least 3 weeks**

# Subsea Telecom & Power Cable Data

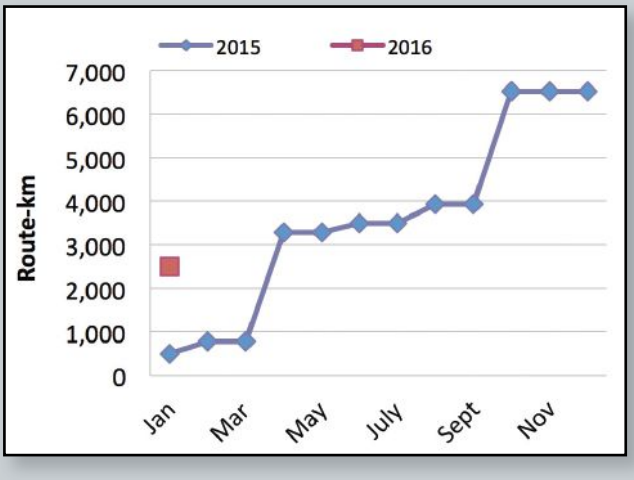
## FO Cable Awards by Month



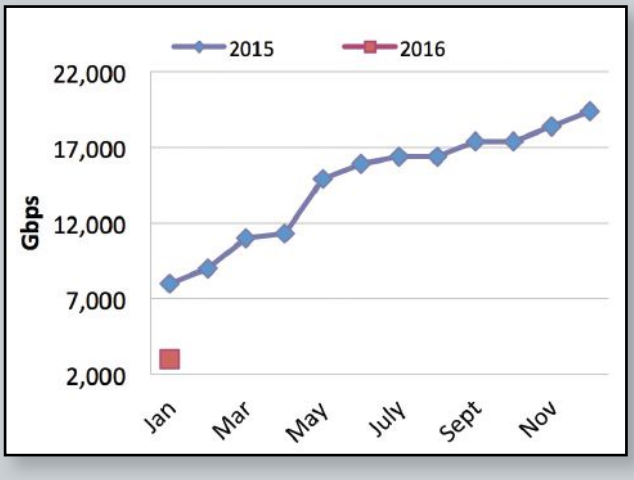

## FO Cable Announcements



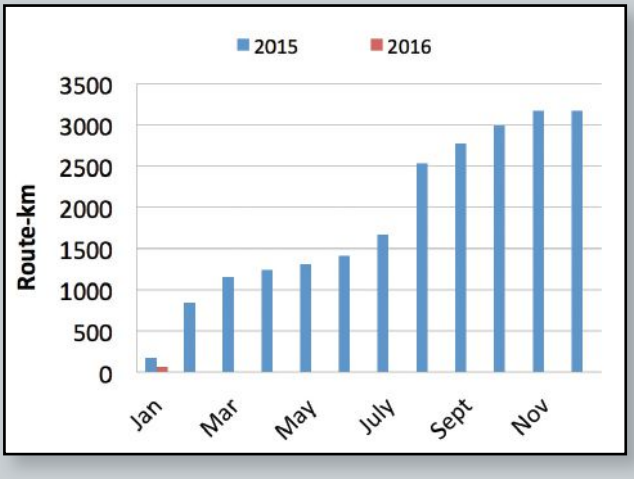

## Submarine FO Cables Entering Service in Route-km



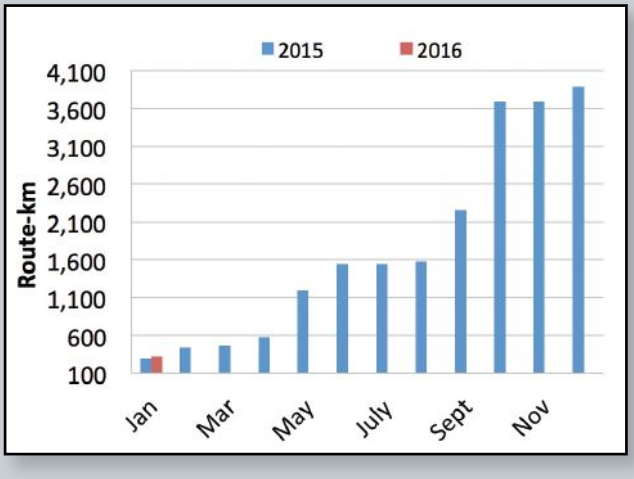

## Upgrades of Existing Cable Systems in Gbps




## Submarine Power Cable Awards in Route-km




## Submarine Power Cable Announcements in Route-km



# Gulf of Mexico Data
## Current Deepwater Activity

| Operator | Area | Block | OCS Lease | Rig Name | Prospect Name | Water Depth (ft) |
|---|---|---|---|---|---|---|
| SHELL OFFSHORE INC. | AC | 857 | G20870 | NOBLE DON TAYLOR | Great White | 8,037 |
| SHELL OFFSHORE INC. | AC | 857 | G17565 | H&P 205 | Great White | 7,817 |
| SHELL OFFSHORE INC. | MC | 657 | G08496 | T.O. DEEPWATER NAUTILUS | Coulomb | 7,570 |
| EXXON MOBIL CORPORATION | WR | 584 | G20351 | MAERSK VIKING | Julia | 7,138 |
| UNION OIL COMPANY OF CALIFORNIA | WR | 677 | G21245 | T.O. DISCOVERER CLEAR LEADER | Saint Malo | 7,038 |
| SHELL OFFSHORE INC. | MC | 566 | G08831 | NOBLE GLOBETROTTER | Fourier addition | 7,015 |
| MARUBENI OIL & GAS USA INC | MC | 305 | G19935 | ENSCO 8505 | Aconcagua | 6,997 |
| UNION OIL COMPANY OF CALIFORNIA | KC | 770 | G25804 | T.O. DISCOVERER INDIA | | 6,574 |
| BP EXPLORATION & PRODUCTION INC | MC | 562 | G19966 | T.O. DEVELOPMENT DRILLER III | Isabela | 6,535 |
| REPSOL E&P USA INC. | KC | 686 | G33341 | ROWAN RENAISSANCE | | 6,162 |
| LLOG EXPLORATION OFFSHORE LLC | MC | 427 | G31498 | SEADRILL SEVAN LOUISIANA | La Femme | 5,768 |
| BP EXPLORATION & PRODUCTION INC | MC | 777 | G09867 | SEADRILL WEST VELA | Thunder Horse South | 5,719 |
| ENI US OPERATING CO INC | MC | 772 | G16647 | ENSCO 8506 | Triton (mc) | 5,639 |
| CONOCOPHILLIPS COMPANY | AC | 475 | G35137 | MAERSK VALIANT | | 5,143 |
| BP EXPLORATION & PRODUCTION INC | GC | 825 | G28100 | ENSCO DS-3 | Mad Dog Phase 2 | 4,979 |
| COBALT INTERNATIONAL ENERGY LP | GB | 958 | G30876 | ROWAN RELIANCE | | 4,846 |
| CHEVRON USA INC | KC | 96 | G33531 | PACIFIC SANTA ANA | Ludlow | 4,838 |
| NOBLE ENERGY INC | MC | 338 | G32316 | ATWOOD ADVANTAGE | | 4,824 |
| ANADARKO PETROLEUM CORPORATION | GC | 726 | G24179 | ROWAN RESOLUTE | Tonga | 4,655 |
| EXXON MOBIL CORPORATION | EB | 946 | G08211 | * WIRELINE UNIT (L.J.#2) | Diana | 4,653 |
| EXXON MOBIL CORPORATION | EB | 945 | G08211 | T.O. DEEPWATER CHAMPION | Diana | 4,642 |
| EXXON MOBIL CORPORATION | EB | 945 | G08211 | * WIRELINE UNIT (L.J.DIST) | Diana | 4,642 |
| HESS CORPORATION | MC | 726 | G24101 | STENA FORTH | Tubular Bells | 4,610 |
| ANADARKO PETROLEUM CORPORATI | GC | 683 | G18421 | DIAMOND OCEAN BLACKHORNET | CAESAR-TONGA | 4,473 |
| BP EXPLORATION & PRODUCTION INC | GC | 782 | G15610 | MAD DOG SPAR RIG | Mad Dog Phase 2 | 4,428 |
| BP EXPLORATION & PRODUCTION INC | GC | 627 | G25174 | SEADRILL WEST CAPRICORN | | 4,305 |
| CHEVRON USA INC | KC | 102 | G25782 | T.O. DEEPWATER ASGARD | Tiber | 4,262 |
| ANADARKO PETROLEUM CORPORATI | EB | 690 | G22296 | NOBLE BOB DOUGLAS | Navajo | 4,202 |
| CHEVRON USA INC | GC | 596 | G16759 | T.O. DISCOVERER INSPIRATION | Tahiti north | 4,023 |
| FREEPORT MCMORAN OIL & GAS LLC | GC | 643 | G35001 | NOBLE SAM CROFT | Holstein Deep | 3,885 |
| LLOG EXPLORATION OFFSHORE LLC | MC | 895 | G33764 | SEADRILL WEST NEPTUNE | | 3,682 |
| HESS CORPORATION | GC | 512 | G26315 | DIAMOND OCEAN BLACKLION | Stampede | 3,577 |
| SHELL OFFSHORE INC. | GB | 559 | G11546 | NOBLE BULLY I | Oregano | 3,393 |
| SHELL OFFSHORE INC. | VK | 956 | G06893 | * COIL TUBING UNIT (N.O. #2) | Ram-powell | 3,214 |
| SHELL OFFSHORE INC. | MC | 807 | G07958 | OLYMPUS N88 | MARS | 3,037 |
| ATP OIL & GAS CORPORATION | MC | 711 | G14016 | DIAMOND OCEAN BLACKHAWK | Gomez | 3,030 |
| ANADARKO PETROLEUM CORPORATI | MC | 711 | G14017 | * COIL TUBING UNIT (N.O. DIST) | Gomez | 2,975 |
| ANADARKO PETROLEUM CORPORATI | MC | 711 | G14016 | CAL-DIVE Q-4000 | Gomez | 2,951 |
| SHELL OFFSHORE INC. | MC | 807 | G07963 | H&P 201 | MARS | 2,945 |
| SHELL OFFSHORE INC. | GB | 426 | G07493 | * COIL TUBING UNIT (LAF DIST) | Auger | 2,862 |
| SHELL OFFSHORE INC. | GB | 426 | G07493 | * WIRELINE UNIT (LAF DIST) | Auger | 2,862 |
| ENERGY RESOURCE TECHNOLOGY GO | GC | 281 | G35658 | NOBLE DANNY ADKINS | Boris(gc) | 2,735 |
| SHELL OFFSHORE INC. | GC | 116 | G05904 | ATWOOD CONDOR | Popeye | 2,046 |
| STONE ENERGY CORPORATION | MC | 29 | G13997 | ENSCO 8503 | CARDONA | 2,009 |
| CHEVRON USA INC | VK | 786 | G12119 | NABORS 87 | Petronius Compliant P | 1,754 |
| HESS CORPORATION | GB | 216 | G14224 | NOBLE PAUL ROMANO | Penn state | 1,481 |
| LLOG EXPLORATION OFFSHORE LLC | MC | 794 | G34909 | NOBLE AMOS RUNNER | | 1,462 |
| STONE ENERGY CORPORATION | VK | 989 | G09771 | H&P 100 | Pompano i | 1,290 |
| ENVEN ENERGY VENTURES LLC | MC | 194 | G02639 | NABORS S.D. XIV | Cognac | 1,025 |
| EXXON MOBIL CORPORATION | MC | 280 | G03605 | * WIRELINE UNIT (N.O. #3) | Lena | 1,001 |
| FIELDWOOD SD OFFSHORE LLC | EB | 160 | G02648 | * WIRELINE UNIT (L.J.DIST) | Cerveza | 940 |
| FIELDWOOD SD OFFSHORE LLC | EB | 159 | G02646 | * WIRELINE UNIT (L.J.DIST) | Ligera | 924 |
| FIELDWOOD SD OFFSHORE LLC | EB | 165 | G06280 | * WIRELINE UNIT (L.J.DIST) | East breaks 164 | 863 |
| EXXON MOBIL CORPORATION | SM | 6636 | P00188 | * WIRELINE (GENERIC) | | 842 |
| WHISTLER ENERGY II LLC | GC | 18 | G05809 | NABORS MODS 201 | Boxer | 760 |
| ANKOR ENERGY LLC | MC | 21 | G22850 | * WIRELINE (GENERIC) | | 668 |
| W & T OFFSHORE INC | EW | 910 | G13081 | H&P 203 | | 557 |

Deepwater prospects with drilling and workover activity: 57

Current Deepwater Activity as of Monday, January 25, 2016

### Activity by Water Depth

| Water Depth (m) | Active Leases | Approved Applications | Active |
|---|---|---|---|
| 0 to 200 | 1,242 | 36,288 | 2,235 |
| 201 to 400 | 84 | 1,127 | 21 |
| 401 to 800 | 185 | 901 | 10 |
| 801 to 1,000 | 262 | 578 | 9 |
| 1,000 & above | 2,662 | 2,114 | 29 |

### Rig Activity Report 1 January 2016

| Location | Week of 01/22 | +/- | Week Ago | +/- | Year Ago |
|---|---|---|---|---|---|
| Land | 607 | -16 | 623 | -961 | 1568 |
| Inland Waters | 1 | 0 | 1 | -10 | 11 |
| Offshore | 29 | 3 | 26 | -25 | 64 |
| U.S. Total | 637 | -13 | 650 | -996 | 1633 |
| Gulf of Mexico | 29 | 3 | 26 | -24 | 58 |
| Canada | 250 | 23 | 227 | -182 | 432 |
| N. America | 887 | 10 | 877 | -1178 | 2065 |

Activity by Water Depth Information current as of Monday, January 25, 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*

# Septentrio introduces next generation GNSS reference receiver PolaRx5

Septentrio, a leading provider of accurate and reliable GNSS receivers announces the launch of its next generation Global Navigation Satellite System (GNSS) receiver for precise scientific and geodetic applications–the PolaRx5. This new receiver in the PolaRx product line is developed specifically to support the most demanding applications for the Earth science community offering a select range of advanced features that enable maximum accuracy and functionality.

Powered by Septentrio's next generation multi-frequency engine, the PolaRx5 offers 544 hardware channels for robust and high-quality GNSS tracking. The receiver supports all major satellite signals including GPS, GLONASS, Galileo and BeiDou as well as regional satellite systems including QZSS and IRSS.

Septentrio's field-proven Advanced Interference Mitigation (AIM+) technology enables the PolaRx5 to filter out both intentional and unintentional sources of radio interference, from narrowband signals over high powered pulsed signals to chirp jammers and Irridium interferers. Furthermore, Septentrio's patented APME+ multipath mitigation technology–unique in eliminating short delay multipath without introduction of bias–guarantees superior measurement quality. If needed, the user has the ability to activate or deactivate APME+ to obtain completely unmodified measurements.

Various independent tests have shown PolaRx5 consistently ranks highest among GNSS receivers in many areas of measurement quality, including fewest number of cycle slips and lowest power consumption well below 2 W.

PolaRx5 also introduces a new standard in ease-of-use. Thanks to Septentrio's comprehensive web interface and the built-in Wi-Fi and Bluetooth interface, users have complete control and visibility of the receiver. The user's web browser provides secure access to all receiver settings and status, data storage and firmware upgrades as well as advanced monitoring such as a built-in spectrum analyser.

"With PolaRx5, Septentrio has developed an advanced GNSS Reference receiver to meet the advanced needs of our customers," stated Jan Leyssens, PolaRx5 product manager. "The selection of PolaRx by UNAVCO for their reference receiver needs, illustrates the strengths of Septentrio's robust technology and PolaRx's innovative features such as its interference robustness, spectrum analyser and web interface to make the PolaRx5 the leading GNSS reference receiver on the market today."

For more information, visit www.septentrio.com.


# Rowe Technologies, Inc. announces the next innovative product of Doppler Profilers – the SeaSEVEN

Developed by the engineers that designed the first Acoustic Doppler Current Profilers, RoweTech presents the next innovation in ADCPs, the SeaSEVEN, a Research Grade Doppler Profiler. This is the first coordinated seven-beam profiler on the market.

The SeaSEVEN is designed with maximum performance and flexibility for advanced research, featuring dual frequency, high ping rate, resolution, accuracy, and long-range performance with ultimate controllability. The SeaSEVEN is intended to fill a void in today's data-rich environment, with a high capacity data recorder, multi-mission capability, external sensor integration and ultra-fast Ethernet data download. With its low aperture splayed beam array and modern electronics, it provides measurements not available from any other Doppler profiler. It collects, stores and transmits the data to allow advanced ocean research never before seen in a Doppler profiler.


The SeaSEVEN is designed to solve difficult application requirements. Data can be used in turbulence, waves, sediment transport, renewable energy, Reynold's Stress and Bottom Boundary layer research. SeaSEVEN is not "just" a current profiler. With its 24-bit high-speed A-D convertor and its optional high-capacity 64-gigabyte recorder you no longer have to decide "what data not to record." Unique in its capability to collect multiple data types, it allows scientists to easily archive research data.

For more information, visit www.rowetechinc.com.

### C&C Technologies upgrade to Sonardyne Ranger 2 Pro

Sonardyne Inc., Houston, has received an order to supply five Ranger 2 Pro USBL tracking systems to survey and mapping specialists C&C Technologies, Inc.–a subsidiary of Oceaneering International, Inc. By upgrading to the latest standard of acoustic positioning technology, C&C Technologies will now benefit from Ranger 2 Pro's ability to track multiple subsea targets at greater speeds, over longer ranges, and with the highest level of positioning accuracy.

Ranger 2 Pro is designed for deep water tracking of underwater targets and position referencing for dynamically positioned (DP) vessels. It builds on the simplicity and performance of Sonardyne's original Ranger system by adding support for the latest 6G (Sixth Generation) acoustic instruments and Wideband 2 signal architecture, both proven to increase the efficiency of survey operations, with equipment that is quick to set up and easy to use.

Using the Ranger 2 Pro system, with its fast position update rates, C&C Technologies can now track multiple targets, including ROVs, towfish and AUVs, simultaneously at ranges beyond 6,000 m. And, thanks to the system also supporting Long and Ultra-Short BaseLine (LUSBL) positioning, it can carry out complex seafloor operations with the highest levels of precision.

For more information, visit www.sonardyne.com.

### AML's UV•Xchange biofouling control: 2 years and counting

At OI '14, AML Oceanographic launched UV•Xchange, a biofouling control product that uses UV light to prevent fouling on Xchange™ sensors. The longest running *in situ* deployment of AML CTDs with UV•Xchange to date began in October 2013 continues today. UV•Xchange has maintained sensor surfaces in a high fouling shallow water environment for over 2 years of continuous deployment, with no cleaning or other maintenance.


The unprecedented success of UV light as an antifoulant has changed the limits of long-term deployments: months have become years. The development of sister product Cabled UV has brought the solution to other subsea equipment and surfaces, such as third-party sensors, ADCPs, camera lenses, lights, hydrophones, sonar heads, and much more.

For more information, visit www.amloceanographic.com.

### Successful implementation of an underwater noise real-time remote buoy for offshore wind farm

Human-generated noise has been causing interferences in the marine environment for decades. One of the highest noises with potential disturbance for marine wildlife is due to pile driving during the installation of offshore wind farms.

In order to protect marine ecosystems, a standard was established in Germany. In Europe, the appropriate authorities (Marine Strategy Framework Directive or MSFD) require the monitoring of a set of indicators to assess underwater noise with different indicators such as the type of noise, its duration and its level.

The RB-SDA14 has been designed to cater these needs and help solve these matters. The buoy can record underwater noise and simultaneously send and display real-time noise information. The access to data is flexible and can be made through WiFi and VHF two-way communication. The results are calculated from inside the buoy and displayed on intuitive interface in real-time. Moreover it is possible to receive and display information from different computers as it is possible to monitor simultaneously multiple buoys from a single computing unit.

As a multipurpose system, the RB-SDA14 meets the needs of industries that accurately know the noise they are emitting underwater.

The RB-SDA14 has been deployed in German North Sea to be used for the Gode Wind farm project during pile driving construction. The RB-SDA14 has been successfully able to continuously provide and display real-time noise information, sound exposure levels, sound pressure levels and third-octave bands.

The RB-SDA14 proved both great efficiency and performance as the surveyors decided to keep the buoy until the end of the project. They see in the RB-SDA14 not only a level monitoring tool but also a solution that can help in operational decision making, such as adapting pile driving strategy, wining time and therefore saving substantial operational costs.

For more information, visit www.rtsys.eu.

### DeepWater Buoyancy produces new "square" marker float

DeepWater Buoyancy has recently completed the design, tooling and production of a new, stackable marker float. Marker floats are used in ROV and survey operations around the world. Due to their unique acoustic signature and high visibility coloration they are a popular choice for marking bottom location to facilitate ROV maneuvering.

The traditional marker float, which has been produced for over 30 years, is the shape of a U.S. football. The new design has a square cross section. The square shape provides an even stronger signature for location. It also allows stacking for more efficient storage and shipping. Like the traditional model, the "square" marker float is constructed with a durable, rotationally molded shell and is filled with solid DeepTec™ syntactic foam. It is molded from a bright yellow polyethylene for visibility.

Both models provide the same


amount of buoyancy and are the same price for a given depth rating. Standard models are available for 3,000, 4,000 and 6,000 m. Of course, like all other DeepWater Buoyancy products, special requirements for a different depth are happily accomodated.

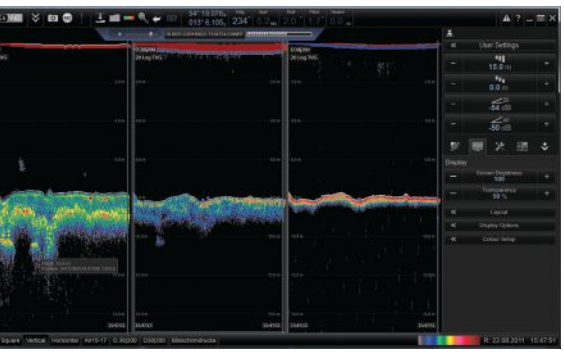
For more information, visit www.deepwaterbuoyancy.com.

### New Kongsberg EA 440 singlebeam echo sounder

Kongsberg Maritime has released its fifth generation of singlebeam echo sounder designed for shallow to medium depth waters and for hull-mounted side-scan systems. The new EA 440 supersedes the established EA 400 single beam platform with the addition of a new Wideband Transceiver (WBT), which provides for much more flexible installation and operation. All users of the EA 400 will be offered an upgrade path to this new enhanced version.

The new WBT unit in the EA 440 covers all frequencies and comes with a complete new topside software with a number of new and improved features. The system now uses FM Chirp as the transmit pulse, which offers longer range from less power, resulting in a much higher range resolution. Re-engineered very low noise electronics also support longer range capabilities.

The EA 440 hardware is designed for using up to four channels at the same time in a small and ruggedized transceiver unit, which makes for easier and more flexible installation. Taking flexibility even further, the WBT can be set up to use any frequency between 30 and 500 kHz, which essentially means it can be connected to any transducers on the market. A standard setup is offered for easy integration together with all standard hydrographic transducers from Kongsberg Maritime.



"The EA 440 comes as part of a new wave of recent technology launches including our new multibeam echo sounder and new cNODE transponders," said Helge Uhlen director of UMAP sales, Kongsberg Maritime. "We are pleased to bring these new products to market and are positive that the new technology will support our diverse user base, from subsea survey to underwater construction, to operate more efficiently and to get better results in a more flexible manner."

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

### WFS Technologies drives down the cost of subsea corrosion monitoring

WFS Technologies (WFS) announces the launch of Seatooth PipeLogger Corrosion Monitor. Designed to deliver a step reduction in the cost of long-term monitoring of subsea pipelines and jumpers, the Seatooth PipeLogger Corrosion Monitor is set to revolutionize subsea asset integrity monitoring.

The Seatooth PipeLogger Corrosion Monitor incorporates ultrasonic thickness (UT) sensors that monitor wall thickness to an accuracy of 0.1 mm through up to 6 mm of pipe insulation. Up to 8 UT sensors can be integrated with a single Seatooth PipeLogger to measure wall thickness at key points of interest. Wall thickness measurements are taken at user-defined intervals–typically daily or weekly–and stored in an on-board data logger. Data is harvested wirelessly by diver, ROV or AUV using Seatooth subsea radio or in real time through a Seatooth-enabled Subsea control module (SCM). The wireless communications range of standard Seatooth devices through seawater, the seabed, concrete blankets and the splash zone is 5 to 10 m.

The Seatooth PipeLogger Corrosion Monitor incorporates Seatooth Endure, innovative technology designed to extend the battery life of subsea wireless systems to up 15 years.

Systems are depth rated to 1,000 or 4,000 m, are compact, and weigh under 5 kg in seawater. They are suitable for deployment by mini-ROV operating off a rig or small vessel or by diver. Deployment and recovery is facilitated by use of magnetic clamps. An optional protection cover is available for systems


buried in the seabed, under concrete blankets or rubble.

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

### Global Marine releases a free augmented reality app

Global Marine Systems Limited, the UK headquartered world leader in subsea cable route design, installation and maintenance, showcased its capabilities in the power and offshore renewables markets at the EWEA Annual Exhibition in Paris. As part of the increased focus on this industry, Global Marine also released the GMSL App, which is available for free download from the App Store or Google play, by searching "GMSL".

The GMSL App brings Global Marine's images to 3D life. The technology shows digital information, in this case 3D models, overlaying static images in real-time via the camera view of either your smartphone or tablet. You can take a 3D tour of installation vessel C.S. Sovereign or the Q1000 ROV–key assets for Global Marine in the power market. Alternatively, switch to X-Ray View to read more information about each key feature of the two by pressing the hotspots shown in the 3D image.

The images are available from www.globalmarinesystems.com/gmsl-app.html where the page can be printed or the images can be viewed through the App on-screen direct from the webpage.


Sea what we have in store for 2016.
seacatalog.com

Bollinger Shipyards announces the promotion of **Brent Blackburn** to director of engineering. Blackburn has over 16 years of experience in the U.S. shipbuilding and maritime industry. He joined Bollinger in 2004 working in various key engineering, estimating, and proposal roles mainly focusing on the company's government programs. Blackburn's career began as a project engineer and rose steadily through the engineering and technical design departments. In 2014, he was promoted to Technical Manager, a position that solidified and proved his abilities, skills, and overall knowledge in managing projects and priorities.


Blackburn

HTL, part of the HTL Group are pleased to announce the appointment of **Ian Mander** as UK business manager. This appointment see's Ian progressing from his existing role within HTL as technical manager specialising in portable machines to taking responsibility for delivering HTL's extensive complete product and service portfolio to the UK Market. Ian is a qualified engineer with a breadth of expertise in both commercial and sales roles within Tier 1 engineering maintenance service contractors and portable machine OEM's.

Oceaneering International, Inc. announced the appointment, effective 1 January 2016, of **Martin J. McDonald** as senior vice president, remotely operated vehicles, with global responsibility for Oceaneering's ROV business. McDonald's career spans 26 years with Oceaneering. He most recently served as vice president and general manager of Oceaneering's ROV operations in the eastern hemisphere from 2006.

Hemisphere GNSS announced that **Randy Noland** has joined the company as vice president, global sales to further support the expanding portfolio of Hemisphere's national and international accounts. Randy brings a wealth of industry expertise and knowledge to Hemisphere. He has more than 30 years of proven experience in GNSS OEM, application software, and machine control markets, having spent the last 8 years with Carlson Software as the VP/director of machine control where he was instrumental in acquiring numerous large accounts. Noland's marketing experience is wide and varied with notable achievements as the co-founder and managing editor of Machine Control Magazine as well as his position as product marketing manager, machine control, with Topcon.

WFS Technology Ltd announces the appointment of **John Vicic** to the company's advisory board. John retired from ConocoPhilips in April 2015 were he was program manager for deepwater and arctic technology. He previosuly held positions at BP where he was director and program general manager of deepwater and arctic facilities technology in BP Upstream Technology and at Shell where he was technical advisor deepwater R&D. John has more than 35 years experience in the petroleum industry including deepwater development, offshore and subsea systems, deepwater drilling and completion systems, subsea boosting and processing, technology management, product design, reliablity, value engineering, strategic sourcing, supply chain and business management.

**BMT Group** (BMT) has announced an internal reorganisation which will see the existing BMT operating companies grouped into five market focused partnerships. These partnerships will be headed by new leaders. **Jan van Smirren**, who will lead the energy partnership, will join BMT in its Houston office, having

worked for the past 25 years for Fugro Inc. and Fugro GEOS. **Jeremy Berwick** will take the lead for the defence partnership and be based in BMT's Bath office. Previously a Consulting Partner and Sector Leader for Deloitte's UK aerospace and defence business, Jeremy's career spans 30 years working with the MoD, Home Office, Rolls Royce, Cobham, BAE Systems and QinetiQ. **Dr. Paul Wilkinson** has over 18 years' experience in water and environmental consultancy across Australia, Southeast Asia and the UK, having served in a range of leadership roles with Halcrow, URS and most recently, CH2M. He will take the lead for the environment partnership which will be based in Brisbane. **Denis Welch** has been chairman of One World Maritime for the past six years, providing consultancy and senior management support to companies looking to develop their business in the Asia Pacific region, Denis will take the lead for the ports, infrastructure & resources partnership based in Singapore. **David Bright**, currently BMT's sector director defence will lead the surveys, ship design & vessel performance partnership. David joined BMT in 2001 following a successful and varied career in the Royal Navy, including the lecturing of RN and USN officers in project management, engineering design and naval architecture.

**Lloyd's Register** and **Aker Solutions** will collaborate under a new global framework agreement to drive efficiency in engineering and subsea oil and gas developments. With this new global framework agreement in place, Norwegian oil services company Aker Solutions can further improve efficiency and uphold their position as forerunner in advanced technologies for the offshore oil and gas industry. The contract gives Aker Solutions access to all relevant services from the Lloyd's Register Group, including inspection, compliance, certification and advisory/consulting services in areas like risk management/HSEQ, engineering dynamics, asset integrity, drilling, wells and reservoirs.

**TE SubCom**, a TE Connectivity Ltd. company, announced that it has increased capacity throughput of cable manufacturing at its wet plant factory by 50% in an effort to continue meeting customer and market demand. In addition, the company has expanded its marine fleet capability to include a sixth 3-m plow, providing 3-m burial tools across the entire construction fleet.

**Teledyne BlueView** is pleased to announce the selection of **Measutronics Corporation** as their strategic marine partner for distribution in the Americas. Founded in 1997, Measutronics is a solution provider that brings additional expertise in marine positioning, guidance, mapping and underwater imaging to the Teledyne Marine portfolio.

**Seatronics**, an Acteon company, has announced a collaboration with Canadian-based manufacturer, **Inuktun Services Ltd**. Seatronics is working with Inuktun to supply the Inuktun ROV Manipulator as a standardized option for the Seatronics Predator ROV elite system.

**Trelleborg Sealing Solutions** has opened a dedicated climate-controlled swivel stack seal inspection facility for the validation of bespoke seals. The global facility is based in Barendrecht, in the Netherlands, and has been unveiled in a move to help ensure FPSO operators achieve the highest possible standards in seal quality.

**Ocean Signal** has appointed **Marinplus AB** as its exclusive distributor in Sweden. Marinplus will supply a comprehensive range of Ocean Signal products, including its rescueME devices and SafeSea portfolio of GMDSS products.

# CALENDAR & EVENTS

February 9-10, 2016
**Deep Sea Mining Summit**
Aberdeen, Scotland
www.deepsea-mining-summit.com

February 23-25, 2016
**Decommissioning and Abandonment**
Houston, TX
www.decomworld.com/decommissioning

February 21-26, 2016
**AGU Ocean Sciences Meeting**
New Orleans, LA
osm.agu.org/2016

February 23-25, 2016
**ICOE**
Edinburgh, UK
www.icoe-conference.com

February 23-25, 2016
**Underwater Intervention**
New Orleans, LA
www.underwaterintervention.com

March 6-10, 2016
**NACE Corrosion**
Vancouver, BC
www.nacecorrosion.org

March 15-17, 2016
**Oceanology International**
London, UK
www.oceanologyinternational.com

March 16-18, 2016
**Asia Pacific Maritime**
Singapore
www.apmaritime.com

March 21-23, 2016
**Maritime Security East**
Norfolk, VA
www.maritimesecurityeast.com

March 22-24, 2016
**Subsea Tieback**
San Antonio, TX
www.subseatiebackforum.com

March 22-25, 2016
**OTC Asia**
Kuala Lumpur, Malaysia
www.otcasia.org

April 3-5, 2016
**Canadian Underwater Conf & Expo**
Halifax, Nova Scotia
www.underwaterconference.ca

April 5-7, 2016
**MCE Deepwater Development**
Pau, France
www.mcedd.com

April 11-13, 2016
**SPE HSSE-SR**
Stavanger, Norway
www.spe.org/events/hse/2016

April 18-21, 2016
**ONR/MTS Buoy Workshop 2016**
Woods Hole, MA
www.whoi.edu/buoyworkshop/2016

April 18-21, 2016
**SubOptic**
Dubai, UAE
www.suboptic2016.com

May 2-5, 2016
**OTC**
Houston, TX
www.otcnet.org

May 16-19, 2016
**Canadian Hydrographic Conference**
Halifax, Nova Scotia
www.chc2016.ca

# OCEAN NEWS & TECHNOLOGY

www.oceannews.com

## JANUARY
**Editorial:** Underwater Navigation; Manned Submersibles
**Distribution:** Underwater Intervention; GOM Oil Spill & Ecosystem
**Product & Services Focus:** Multibeam & Side Scan Sonars; Research & Development Services

## FEBRUARY
**Editorial:** Oceanology & Meteorology; Decom & Abandonment
**Distribution:** Decommissioning and Abandonment Summit; Oceanology International
**Product & Services Focus:** Buoys & Monitoring Instrumentation; Environmental Monitoring/Testing Services

## MARCH
**Editorial:** Subsea Fiber Optic Networks; Maritime Security
**Distribution:** Canadian Underwater Conf & Expo; SPE HSSE-SR; SubOptic
**Product & Services Focus:** Connectors; Cables & Umbilicals; Diver Detection Systems

## APRIL
**Editorial:** Offshore Technology; Ocean Mapping & Survey
**Distribution:** OTC; AUVSI; Deepwater Decommissioning Workshop
**Product & Services Focus:** Subsea Tools & Manipulators; Batteries; Training/Safety

## MAY
**Editorial:** UW Imaging & Processing; Marine Salvage/UW Archeology
***Special Focus Section:*** *Executive Profiles*
**Distribution:** UDT (Norway) PORTS; Seawork International
**Product & Services Focus:** Magnetometers; Water Dredges & Airlifts; Diving Services

## JUNE
**Editorial:** Autonomous Unmanned Vehicles; Defense & Naval Systems;
***Special Focus Section:*** *New Product Profiles*
**Distribution:** Clean Pacific
**Product & Services Focus:** Tracking & Positioning Systems; Seismic Monitoring; Equipment Leasing/Rental Services

## JULY
**Editorial:** Ocean Engineering; Marine Construction
***Special Focus Section:*** *Company History Profiles - Then and Now*
**Distribution:** TBA
**Product & Services Focus:** Navigation, Mapping & Signal Processing; Data Processing Services

## AUGUST
**Editorial:** Workclass ROVs; Deepwater Pipeline/Repair/Maintenance
**Distribution:** Offshore Northern Seas
**Product & Services Focus:** Cameras, Lights & Imaging Sonars; Oil Spill Clean-Up Services

## SEPTEMBER
**Editorial:** Ocean Observing Systems; Subsea Telecom; Offshore Wind Installation & Maintenance
**Distribution:** AWEA Offshore Windpower; Oceans '16 MTS/IEEE Monterey; Teledyne Marine Technology Workshop
**Product & Services Focus:** Water Sampling Equipment; Cable Installation Services

## OCTOBER
**Editorial:** Offshore Communications; Subsea Inspection, Monitoring, Repair and Maintenance
**Distribution:** OilComm; Offshore Energy; Clean Gulf; Offshore Asset Retirement Conference; Offshore Well intervention GoM
**Product & Services Focus:** Acoustic Modems, Releases & Transponders; Marine Communications; Survey & Exploration Services

## NOVEMBER
**Editorial:** Offshore Support, Supply & Emergency Vessels; Deep Sea Mining
**Distribution:** International Workboat
**Product & Services Focus:** Ship Protection Systems; Cranes, Winches & Control Systems; Vessel Charter/Leasing Services

## DECEMBER
**Editorial:** Light Workclass ROVs; Commercial Diving; Year in Review; UI Pre-show issue
**Distribution:** Offshore & Deep Sea Mining
**Product & Services Focus:** Diving Equipment & Services; Buoyancy Materials; Construction & Repair Services

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OCEAN NEWS & TECHNOLOGY
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# OCEAN INDUSTRY *MONTHLY* DIRECTORY


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## ACOUSTIC SYSTEMS

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Website: www.appliedacoustics.com
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**Ocean Sonics Ltd.**
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E-mail: info@oceansonics.com
Website: www.oceansonics.com

*Ocean Sonics designs and manufactures the **icListen Smart Hydrophone**, a compact self-contained easy to deploy digital instrument. As the world leader in gathering ocean sound, Ocean Sonics combines very high signal performance with innovative ease of use to give customers the best digital hydrophone technology available. This enables users to collect, record, measure, process and interpret calibrated sound data from the ocean.*

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**Rowe Technologies, Inc.**
12655 Danielson Ct.
Suite 306
Poway, CA 92064
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E-mail: sales@rowetechinc.com
Website: www.rowetechinc.com
Contact: Ray Mahr

*Rowe Technologies Inc. [RoweTech] specializes in the design and manufacture of underwater acoustic Doppler products and imaging systems for the oceanographic, hydrographic and hydrologic markets. Founded in 2009, Rowe Technologies is a technology-based private company with the main office located in Poway CA, USA. Rowe's ADCP/DVL electronics suite is superior to others due to a powerful compact single-unit configuration which allows simultaneous current profiling and bottom tracking.*

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**MetOcean**
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Website: www.metocean.com
Contact: Emily MacPherson

*MetOcean designs and manufactures drifting buoys, environmental platforms, and the world renowned NOVATECH locator beacon product line. MetOcean's drifting buoy family consists of environmental and weather monitoring, oil spill response, and search and rescue drifters: NOVA profiling float, Iridium SVP (iSVP), iSPHERE, Argosphere, SLDMB, and iSLDMB.*

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**DeepWater Buoyancy, Inc.**
394 Hill Street
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Tel: +1 207 502 1400
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E-mail: sales@deepwb.com
Website: www.DeepWaterBuoyancy.com
Contact: Dan Cote, Sales Manager

*DeepWater Buoyancy creates subsea buoyancy products for leading companies in the oceanographic, seismic, survey, military and offshore oil & gas markets. Thousands of customers have relied on our products for over thirty years, from the ocean surface to depths exceeding six thousand meters.*

**Subsalve USA**
P.O. Box 2030
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Fax: 401-884-8868
E-mail: richard@subsalve.com
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Contact: Richard Fryburg

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21614
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+49 (0) 41618 66250
info@nautilus-gmbh.com
www.vitrovex.com
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Fax: +1 760 471 4970
E-mail: sales@falmat.com
Website: www.falmat.com
Contact: Shawn Amirehsani

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**South Bay Cable Corp**
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Idyllwild, CA 92549
Phone: (951) 659-2183
Fax: (951) 659-3958
E-mail: Sales@southbaycable.com
Website: www.southbaycable.com
Contact: Gary Brown, Sales Manager

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Fax: +1 310 762 1616
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Website: www.ak-ind.com
Contact: Allan Kidd

*AK Industries is an agile high tech manufacturer of rugged low cost underwater electrical connectors. The HydroVolt line of connectors is the most rugged and reliable low cost connector available. AK Industries is also ideally suited to provide unique solutions engineered to customer requirements.*

**BIRNS, Inc.**
1720 Fiske Place
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USA: +1 888 BIRNS 88 (+1 888 247 6788)
E-mail: service@birns.com
Website: www.birns.com
Contact: Eric Birns

*BIRNS, Inc. has been serving the subsea industry since 1954, and is an ISO 9001:2008 certified global leader in the design and manufacturing of high performance connectors, custom cable assemblies and lighting systems. With a NAVSEA PRO-020 certified molding facility, the company leads the industry with sophisticated connector lines, including exceptional electrical, electromechanical, coaxial, electro-coax, optical, electro-optical and electro-opto-mechanical hybrid options. BIRNS provides the industry's highest volume of cost-effective hydrostatic and helium pressure testing, and has a wide range of ABS Product Design Assessment (PDA) certified fiber optic and electrical penetrators. BIRNS also delivers brilliant LED and tungsten-halogen marine, chamber, security and commercial diving lights trusted in the world's most extreme environments.*

**BIRNS Aquamate LLC**
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Fax: +1 401 753 6342
E-mail: sales@birnsaquamate.com
Website: www.birnsaquamate.com
Contact: Eli Bar-Hai

*Birns Aquamate design and manufacture underwater electrical connectors, cable assemblies, and cable terminations. The company produces a wide range of standard industry connectors such as the 5500 Series, SC, MC, LP, FAWL/FAWM, Rubber Molded, etc. BIRNS Aquamate is the only underwater connector producer that guarantees compatibility with other manufacturers. Birns also specializes in fast turn-around for custom design of special connector solutions. Stocking dealers in the UK, South Africa and Holland as well as dealers in Canada, Germany, Belgium, Norway, China, and Brazil.*

**SEACON**
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E-mail: seacon@seaconworldwide.com
Website: www.seaconworldwide.com

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**Teledyne Impulse**
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+1-858-842-3100
Fax:+1-858-565-1649
E-mail: impulse@teledyne.com
Website: www.teledyneimpulse.com

*Teledyne Impulse designs and manufactures highly reliable electrical and optical interconnection systems for a range of harsh environments. From underwater sensor connectors, to ROV connectors, to the largest vehicle systems, Impulse products are proven performers in demanding applications, which include oceanographic exploration, defense, oil and gas production, and wastewater management.*

**Teledyne ODI - A Teledyne Technologies Company**
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Toll Free: (888) 506 2326
E-mail: ODI_marketing@teledyne.com
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## DESIGN AND ENGINEERING

**Hydro Leduc NA, Inc.**
19416 Park Row, Ste. 170
Houston, TX 77084
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E-mail bogden@hydroleduc.com
Website: www.hydroleduc.com

*Hydro Leduc is a specialist in the design and manufacture of hydraulic piston pumps, hydraulic motors, hydro pneumatic accumulators, and customized hydraulic components satisfying customer needs with reliable products from a reliable source. As the leader in micro hydraulics, it is feasible to obtain several tons of force from a minimal power source within a restricted space envelope. The techniques of micro hydraulics allow simple solutions to problems that are often beyond the limits of traditional mechanical options. Hydro Leduc's expertise is at your service in varied applications such as oil service tools, oceanographic instrumentation, aeronautics, and any extreme working condition of temperature, pressure, medium, and environment.*

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Fax: +44 1752 56 90 90
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Fax: 985-346-8444
E-mail: Bleblanc@okeanus.com
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Contact: Benton LeBlanc

*Okeanus is the premier rental provider for oceanographic and marine scientific research equipment utilized in nearshore and offshore projects around the world. Focused on providing industry-leading customer service, Okeanus offers advanced, high-quality technology coupled with knowledgeable and experienced staff that can deliver dedicated support regardless of a project's location.*

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Fax: +1 902 468 2249
E-mail: focal@moog.com
Website: www.moog.com/marine
Contact: Shawn Taylor

*Focal, A Moog Inc. Company, specializes in providing electrical slip rings, fiber optic rotary joints, hydraulic utility swivels and fiber optic multiplexer solutions for the worldwide marine industry including ROV, seismic, FPSO turret and oceanographic applications. Product features include hybrid packages that combine fiber, electrical and fluid rotary joints for harsh environments.*

**Ocean Specialists Inc.**
8502 SW Kansas Ave
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Fax: +1 772 219 3010
Email: jbyous@oceanspecialists.com
Website: www.oceanspecialists.com
Contact: Jim Byous

*Ocean Specialists, Inc (OSI) is a submarine fiber optic network development company with global project capabilities. OSI works with clients during all project phases of subsea network development, from planning and design to procurement and implementation. Our customers, primarily representing Oil and Gas, Telecommunications and Ocean Observing, recognize the value of fiber optic networks to their field and services solutions, and look to OSI to deliver the skills and experience that developing these networks require.*

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*iXBlue is a leading global provider of innovative solutions and services for navigation, positioning, and imaging.*

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E-mail: atl@atlinc.com
Website: www.atlinc.com
Contact: David Dack

*ATL specializes in the design/manufacture of custom bladder-type fluid containment systems, including tanks, inflatables, pillows and bellows for surface and subsea. ATL's flexible fluid containers boast unparalleled chemical tolerance, abrasion resistance, and remarkable durability - used with methanol, diesel fuel, gases, ethyleneglycol, hydraulic fluids and chemical cleaning cocktails. Expedited deliveries are also available.*

## MAGNETOMETERS

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Unit 5, Thorney Leys Business Park
Witney, Oxon OX28 4GE
United Kingdom
Tel: +44 (0)1993 706565
E-mail: sales@bartington.com
Website: www.bartington.com

*Bartington Instruments' products include high precision, low noise fluxgate magnetometers, gradiometers and data acquisition units for marine applications. With a reputation for performance, reliability and durability, our instruments are used for detection of magnetic anomalies such as underwater UXO, pipe and cable location, magnetic signature analysis, and oil and mineral exploration.*

**Geometrics, Inc.**
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San Jose, CA 95131
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Fax: +1 408 954 0902
E-mail: sales@geometrics.com
Website: www.geometrics.com
Contact: Ross Johnson

*Geometrics, a member of OYO Corporation, manufactures, sells, and services portable geophysical instruments for land, marine, and air investigations of the subsurface. Geometrics' product line includes proton precession and cesium magnetometers, high-resolution seismographs, and electrical conductivity imaging and resistivity systems. Geometrics' instruments are used around the world for natural resource exploration, geotechnical and environmental assessments, ordnance detection, locating archeological and treasure sites, teaching and research.*

## MARINE ENVIRONMENTAL CONSULTING SERVICES

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Fax: +1 772-219 3010
E-mail: gstevens@conshelf.com
Website: www.csaocean.com
Contact: Gordon Stevens

*CSA Ocean Sciences Inc. (CSA) is a marine environmental consulting firm specializing in multidisciplinary projects concerning potential environmental impacts of activities throughout the world. With extensive experience in environmental sciences and technical field operations, CSA is staffed and equipped to offer a complete range of services for projects in offshore, nearshore, estuarine, wetland, and freshwater environments.*

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Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com

*Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries*

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Eau Claire, WI 54703
Tel: +1 715 839 0628
Fax: +1 715 839 8248
E-mail: info1@watson-gyro.com
Website: www.watson-gyro.com
Contact: Tom Henke

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Fax: +49 (0) 30 4679 862-01
E-mail: sales@evologics.de
Website: www.evologics.de

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Cataumet, MA 02534-0315 USA
Tel: +1 508 564 7640
E-mail: fsi@falmouth.com
Website: www.falmouth.com

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56700 Hennebont, France
Tel: +33 2 97 36 41 31
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E-mail: info.instrumentation@nke.fr
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*Contact : Valérie Le Pen - vlepen@nke.fr or Goulven Prud'homme - gprudhomme@nke.fr*
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*Contact: Patrice Brault - pbrault@nke.fr*



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Tel: +47 67 17 45 00
E-mail: inquiry@nortek.no
Website: www.nortek.no

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E-mail: info@rbr-global.com
Website: www.rbr-global.com

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B0N 1Z0
Tel. +1 (902) 466-7000
Fax. +1 (902) 466-4880
E-mail: Sales@romor.ca
Website: www.romor.ca
Contact: Darrin Verge, President & CEO

*ROMOR Ocean Solutions provides instrumentation solutions for the geophysical, oceanographic, defense, security, oil & gas, and renewable energy industries. By partnering with world renowned manufacturers, ROMOR is able to offer technical knowledge, value added services, logistics expertise, and the most reliable instrumentation on the market.*

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Contact: Calvin Lwin, Sales

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Gardabaer, Iceland
Tel: +354 533 6060
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E-mail: baldur@star-oddi.com
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Contact: Baldur Sigurgeirsson

*A manufacturer of miniature data loggers with sensors as temperature, depth/pressure, salinity, tilt/acceleration, compass direction/magnetometer, light levels, acoustic receiving/transmitting. The loggers are used for various researches, including oceanography, fishing gear studies, equipment behavioral monitoring and fish tagging. Data is presented in the application software with a time-stamp for each measurement.*

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Website: www.saivas.no
Contact: Gunnar Sagstad

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Contact: Bill New

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Fax: +1 508 563 3445
E-mail: glester@hydroid.com
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Contact: Graham Lester

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Website: www.iver-auv.com
Contact: Jim Kirk

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Fax: +1 408 436 1108
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Website: www.deepocean.com
Contact: Bill Charbonneau

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Contact: Katarina Tehlirian

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Website: www.oceaneering.com
Contact: Bill Mallin

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Contact: Alasdair Murrie

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E-mail: sales@rovsco.com
Website: www.rovsco.com
Contact: Jessica McKenney

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Website: www.hawboldt.ca
Contact: Paul Phillips

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