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News for the Ocean Industry

& Technology

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January/February 2013

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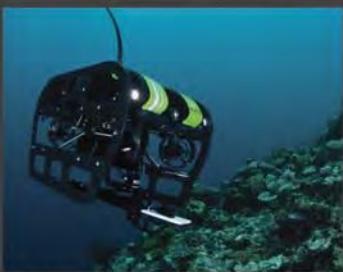
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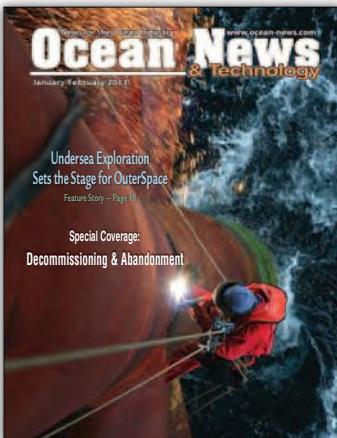
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By John Manock

Ocean News & Technology

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2013: Opportunity and Caution for Subsea Fiber

likelihood of large-scale outages.

The other set holds demand down. This set includes the huge advances made in upgrade technology—allowing older cables to carry far more capacity than originally designed—and the global economic uncertainty that is causing investors to be hesitant to commit funding for very expensive subsea fiber projects.

These two sets of forces are keeping demand steady, but, unfortunately, at a level that does not provide enough business for all of the cable manufacturers to be fully occupied. This is a major change from the past when the boom years were so good that suppliers could afford to wait out the bust periods until the next boom.

As a result, there is considerable turbulence among the major subsea fiber suppliers. For them, it is still a boom and bust cycle—a boom when they get one or two of the few large-scale supply contracts awarded each year, a bust when they don't. The response to this has been varied, with one of the few major suppliers capable of building a transoceanic system reported to be looking to sell its business, while others are expanding their product lines and introducing new technologies.

Meanwhile, two other groups are showing widely divergent views of the market. Developers planning future subsea fiber systems are incredibly optimistic. 2012 saw the largest quantity of new cable projects announced in a single year since the Radar Screen Report began. Developers proposed building a huge number of new projects, among these some of the largest and most ambitious subsea fiber projects ever envisioned.

The other group is not so optimistic, however. Potential investors, especially financial institutions, appear more hesitant to invest in large subsea fiber networks than at any time since the last bust period a decade ago. This can be seen in the number of new supply contracts awarded in 2012, which was the lowest in years.

That these two groups can simultaneously have such divergent views on the future of the market is curious, but that is the subsea fiber industry's nature—a constant dichotomy. Given today's economy, there are many fears and concerns for the future, but there are also many reasons for the industry to look forward to 2013. It will not be a boring year.



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Undersea Exploration Sets the Stage for OuterSpace

By: Steve Werblow on behalf of SonTek

Exploring a coral reef is a big adventure for most people. But for a multidisciplinary team of dedicated scientists, it's a testing ground for an even bolder mission—expeditions to near-earth asteroids, the Moon, or Mars.

University of Delaware oceanographer Art Trembanis says the accurate GPS data from CastAway CTDs mounted on underwater cameras greatly improved image analysis following the NEEMO 15 and 16 missions.

The undersea environment provides many of the same challenges as space exploration—microgravity, remote sites, finite capacity to take physical samples, limited communications, and the need for remotely operated data-gathering platforms. Over the years, the National Aeronautic and Space Administration (NASA) has extensively funded research underwater—even under Arctic ice—to test approaches to space exploration and train astronauts. As part of that effort, the NEEMO (NASA Extreme Environment Missions Operation) Program, a joint effort comprising NASA, the National Oceanic and Atmospheric Administration (NOAA) and the University of North Carolina at Wilmington, has conducted annual underwater missions to fine-tune the art and science of space exploration.

"Going to space is expensive and pretty time-limited," notes University of Delaware associate professor of oceanography and geology Art Trembanis, a NEEMO veteran and expert in autonomous underwater vehicles (AUVs). "We've got to go through dress rehearsal as much as possible before hand." And though Aquarius Reef Base—a live-aboard underwater mock-up of a space station that has been home to the NEEMO missions for the past decade—is only about 6 mi off Key Largo, Florida, it is a perfect testing ground for the NASA's remote science-gathering protocols and practices.

"You're always facing new challenges, like the Apollo 13 mission and also new discoveries that are unexpected," says Trembanis.

CastAway: New frontiers

The NEEMO 15 mission, conducted in October 2011, teamed Trembanis' instrument-loaded AUV with single-operator DeepWorker submersibles and SCUBA divers to collect a wide variety of data in a number of ways.

Outfitting the project's DeepWorker single-person subs, Trembanis realized that the versatile vehicles offered plenty of microgravity pilot training, but little in the way of data gathering.

"We realized when we were out there that the DeepWorker subs were designed more for a commercial landscape than for the scientific arena, so it didn't have a lot of science equipment on it," Trembanis notes. "There's a depth gauge the pilot can refer to, but no recording of data—that sort of thing. I had this little 'Aha!' moment: 'I've got this CastAway unit. Can we strap it to the vehicle?'"

The CastAway CTD is a palm-sized, flow-through instrument that samples conductivity, temperature, and depth (CTD), profiling the water column and computing sound-speed readings that aid in correcting a host of underwater sonar measurements.

Accurate and durable

Since the CastAway was introduced in 2010, Trembanis and his team have employed it to take vertical profiles that determine how to ballast their AUV. They found temperature data and sound-speed profiles to be virtually identical to results from their Seabird, Trembanis notes.

Trembanis had no worries about the ability of the CastAway to come back intact from its “space voyage” on the reef. The instrument’s bright-orange PVC case is a familiar sight on his introductory geology field trips, where dozens of students use it to try their hand at taking field measurements.

“It definitely passes the student-approved test,” Trembanis says. “We’ve even thrown it like a football into the surf zone to get temperature and salinity readings.”

The initial reason for strapping CastAway to the DeepWorker submersibles was to simply gather data for the sake of the drill. However, Trembanis notes, the precise location data from the CastAway helped the team to better analyze video footage collected by the submersibles, which could aid in his ongoing study of barrel sponges. Also, the sensitivity of the CastAway yielded insight into the spatial relationships among water masses of different salinity and temperature along the reef.

“There aren’t big differences, but shades of grey can be significant in the reef environment,” he points out.

EXO2 sonde goes deep

As the NEEMO 16 mission date—June 2012—neared, Trembanis was eager to outfit the DeepWorker submersibles with CastAway instruments again.

He contacted Chris Heyer, technical sales representative for YSI, to see if he had a CastAway he could borrow for the project, but Heyer presented an even more exciting option—a pre-release model of YSI’s new EXO2 multi-parameter advanced water quality monitoring platform.

Designed for use as deep as 250 m—well beyond NEEMO mission parameters—the EXO2 measures pH, dissolved oxygen (DO), temperature, salinity, turbidity, depth, total algae (using a dual-channel sensor for chlorophyll as well as a phycocyanin sensor for blue-green algae), and fluorescent dissolved organic matter (DOM).

It sounds complicated, but Trembanis says working with the EXO2 was highly intuitive. “I had several students on the expedition, and we had to spend a couple of hours one day going through the operation of the EXO2,” he recalls. “Then I assigned it to a couple of students who operated it by themselves. All I had to say was, ‘change the batteries and wave the little magnet over it until the light turns blue, then hand it over to the submarine guys so they can attach it.’”



“At the end of the day, we could connect it to the laptop via Bluetooth and transfer all our data files,” Trembanis says. “We could look at the data on the laptop while someone else was cleaning the unit.

“We changed the batteries every day just to be safe, though the sonde could run for days on one set of batteries,” he notes. “We had it running continuously for 5 or 6 hours a day at its maximum rate, and it was already loaded with plenty of memory—turns out we could have conceivably set it up to run for weeks.”

Magic wand

Trembanis was enchanted by the possibilities created by the EXO2. Immediately, he recognized the opportunity to give NASA pilots a mission while gathering valuable data about the water dynamics in and around the mysterious barrel sponges that dot the reef.

“We mounted it on the manipulator arm of the submersible,” he explains. “I told the pilots, ‘I want you to wave it like a magic wand. Pass it over vertically, pass it up and down.’”

It was no easy feat to wave the manipulator arms around, no matter how compact the sonde was—a lesson better learned off the coast of Florida than hovering over a hurtling asteroid. Undaunted, Trembanis and a colleague carried the EXO2 down to the reef in a SCUBA dive to study the flow dynamics around the huge sponges. The versatility illustrated to Trembanis why the EXO2 fits his philosophy of underwater research—whether for NASA or for any other aspect of science.

“We’re in a time of some amazing platforms in oceanography, whether gliders or ROVs or AUVs or moored systems,” he says. “That level of flexibility is great because I can say, ‘I know this sensor. All I need to know is how I bring it to work today.’”

Heyer points out that the YSI team took the very same approach when developing a multi-parameter sonde that could be deployed anywhere, from wells to the ocean, in applications ranging from quick sampling to long-term, unattended deployments lasting weeks or months. Of course, they never imagined the EXO2—or the CastAway, for that matter—would be part of the NASA space program.

“With Art [Trembanis], we get exposure to a lot of research capabilities we probably never would think of,” Heyer laughs. “He gives us those outside-the-box applications.”

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OCEAN INDUSTRY

FIU to operate Aquarius Reef Base



Photo courtesy of Stephen Frink

Florida International University (FIU), located in Miami, Florida, has been awarded a grant to continue stewardship of the Aquarius Reef Base, the world's only operational underwater research center.

As a member of the Cooperative Institute for Marine and Atmospheric Science CIMAS, FIU received a grant to continue maintenance and monitoring of the facility for NOAA in 2013. This will enable FIU to develop a new business model to fund operations at Aquarius. NOAA's National Undersea Research Program, including Aquarius, was not included in the President's fiscal 2013 proposal, however, NOAA recognizes that the Aquarius Reef Base is a unique and valuable asset to the scientific community. The new business model would include research and education activities supported by Federal, State, and local government funding as well as fees for services from science and engineering teams from government and industry that use the facility. Donations from private benefactors also will be key to ensuring the future of Aquarius.

FIU biology professor Jim Fourqurean is the director of the Marine Education and Research Initiative for the Florida Keys in SEAS, and he will be overseeing activities at Aquarius Reef Base. The existing Aquarius team will become FIU employees.

Aquarius provides unparalleled means to study coral reefs and the ocean, test state-of-the-art undersea technology, train specialized divers, and engage the imagination of students and the public across the globe in ocean science, coral reefs, conservation, and underwater technology. The undersea lab even offers training opportunities for astronauts headed to space.

"Living and working in Aquarius is perhaps the closest thing on earth to actually being in space," said William L. Todd, program manager for Exploration Analogs at NASA's Johnson Space Center.

Todd commanded the first-ever NASA Extreme Environment Mission Operations (NEEMO) at Aquarius in 2001. NEEMO is a joint NASA-NOAA program to study human survival in the underwater laboratory in preparation for future space exploration.

For more information, visit www.fiu.edu.

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Dan White retires from publishing

In 1992, Dan White purchased *Waves* magazine from former publisher and friend Deam Given and founded Technology Systems Corporation (TSC). The magazine, now called *Ocean News & Technology*, has been edited and published by White for 20 years. "I am very proud of Ocean News and its success in the ocean industry and feel confident that its new editor, Ladd Borne, will carry on the mission of providing important and relevant news and technology developments to the ocean industry," commented White on his time with the magazine. He also founded three conferences during his 20 years with TSC: *EnergyOcean*, *Offshore Communications*, and *Subsea Survey IMMR*. Although he is leaving TSC, White will support Ocean Specialists, Inc. (OSI), and OSI's subsidiary Radius Oceanic Communications, Inc. TSC and OSI are subsidiaries of Continental Shelf Associates, Inc. of which White is a stock holder and partner. White is an ocean engineer who previously worked for the U.S. Navy, offshore oil & gas, and academia. He is a Fellow of the Marine Technology Society (MTS) and former MTS Board Member.



2013 MATE international ROV competition date set

The 12th annual MATE international ROV competition is taking place 20-22 June 2013 at the Weyerhaeuser King County Aquatic Center in Federal Way, Washington. This year's competition focuses on ocean observing systems and the role that ROVs play in their installation, maintenance, and operation. Regional events leading up to the international competition are also taking place. For more information, visit www.marinetech.org/events/.

Phoenix recovers U.S. Air Force F-16

Phoenix International Holdings, Inc. (Phoenix) announced the successful underwater search and recovery of a U.S. Air Force F-16 aircraft from over 16,400 ft of sea water. In early August 2012, at the direction of the Naval Sea Systems Command's Director of Ocean Engineering, Supervisor of Salvage and Diving (SUPSALV), Phoenix mobilized the Navy's ORION deepwater side-scan sonar system, the CURV 21 ROV, and the Navy's motion compensated, 30,000-lb Fly-Away Deep Ocean Salvage System.

Liquid Robotics® marine robot completes 9,000 nmi cross-Pacific journey

U.S.-based Liquid Robotics®, announced that the first Pacific Crossing (PacX) Wave Glider, “Papa Mau,” completed its 9,000-nmi (16,668 k) scientific journey across the Pacific Ocean to set a new world record for the longest distance traveled by an autonomous vehicle. Throughout its journey, Papa Mau navigated along a prescribed route under autonomous control, collecting and transmitting unprecedented amounts of high-resolution ocean data never before available over these vast distances or timeframes.

Underwater Intervention 2013

The annual Underwater Intervention conference and exhibition was held at the Ernest N. Morial convention center in New Orleans 15-17 January 2013. Underwater Intervention is a non-profit conference and exhibition that is co-owned by the Remotely Operated Vehicles (ROV) Committee of the Marine Technology Society and the Association of Diving Contractors.

During the convention, the 50th Anniversary of the Marine Technology Society was celebrated.

A notable highlight on the 26,000 sq. ft exhibit floor was the Demonstration Tank and Market Showcase, where vendors were demonstrating their products and services.

A renewed focus on its roots was the platform for an oil and gas interest for the technical program at Underwater Intervention. From its inception, Underwater Intervention has always been a joint venture between ADCI and the ROV Committee of the Marine Technology Society. The combination of the commercial diving industry and the work class ROV industry proved highly successful and now includes all underwater operations.



The Underwater Intervention Committee hit the ground running and is already recruiting speakers and exhibitors for the next conference to be held in New Orleans, 11-13 February 2014. As of press time, 75% of the exhibit space has been reserved, and reservations are open for the Demo Tank and Market Showcase.

For more information, visit www.underwaterintervention.com.

ABS awards \$3 Million to Stevens Institute of Technology

ABS, the leading provider of classification services to the global offshore industry, has awarded Stevens Institute of Technology U.S. \$3 million. The donation will be used to create a new civil, mechanical, and naval engineering laboratory complex in the Davidson Laboratory. The new complex will bear the Bureau's name.

Stevens will construct a 25,000-sq. ft facility above the historic Davidson Laboratory, including new laboratories critical to the Stevens strategic plan. The complex will meet the research and instructional needs of approximately 800 Stevens students annually working in such areas as robotics, underwater systems, land- and water-based vehicles, and ocean and weather sensors.

With the opening of the new complex, the former wave tank in the Davidson Laboratory will be preserved as a significant historical center to educate students about its importance to the development of ship design during World War II.

For more information, visit www.stevens.edu.

CSA International, Inc. changes name to CSA Ocean Sciences Inc.

CSA International, Inc. (CSA) is pleased to announce that as of 1 January 2013 it is changing its name to CSA Ocean Sciences Inc. (CSA) to better reflect its core business. Founded in 1970 as a marine environmental consulting firm, CSA specializes in multidisciplinary projects concerning potential environmental impacts of activities throughout the world. Through a distinctive corporate organization comprising two functional staffing groups (Science and Marine Services) that work both cooperatively and independently, CSA provides a unique and unrivaled skill set to the coastal and ocean sciences industry.

For more information, visit www.csaocean.com.

OceanGate Inc. discovers Grumman F6F Hellcat off the coast of Miami

OceanGate Inc., a global provider of deep-sea manned submersible solutions, announced the discovery of a World War II-era Grumman F6F Hellcat plane off the coast of Miami Beach. The plane was discovered during one of an ongoing series of dives in which OceanGate has been using its Teledyne BlueView high-frequency sonar and HD photo and video equipment to gather data pertaining to the artificial reefs in Miami-Dade County waters. Recognizing the potential historical and military significance of the find, OceanGate contacted officials at both the Smithsonian Institution and the U.S. Navy, who identified the wreck as a Grumman F6F Hellcat fighter aircraft.



Findings from initial surface-sonar side-scans, provided by NOAA, displayed a 33-m (100-ft) long target, which led the OceanGate team to assume it was a sunken vessel. However, during the initial dive to the site on 29 June 2012, the sonar technology on OceanGate's Antipodes submersible produced the first-ever, close-range, underwater scans of the 28-ft long, distinctive Grumman F6F Hellcat at a depth of more than 240 ft. Since the first dive, the OceanGate team has returned for additional observation and data collection on eight missions, including a recent long-duration dive of 8 hrs.

OceanGate will donate its collection of photographs, videos, and technical scans of the Hellcat to the Naval History & Heritage Command in Washington, D.C., as a way to mark the recent Veterans Day holiday. The files will be used in the preservation of this federally protected site and in possible future research on the plane.

For more information, visit www.opentheoceans.com.



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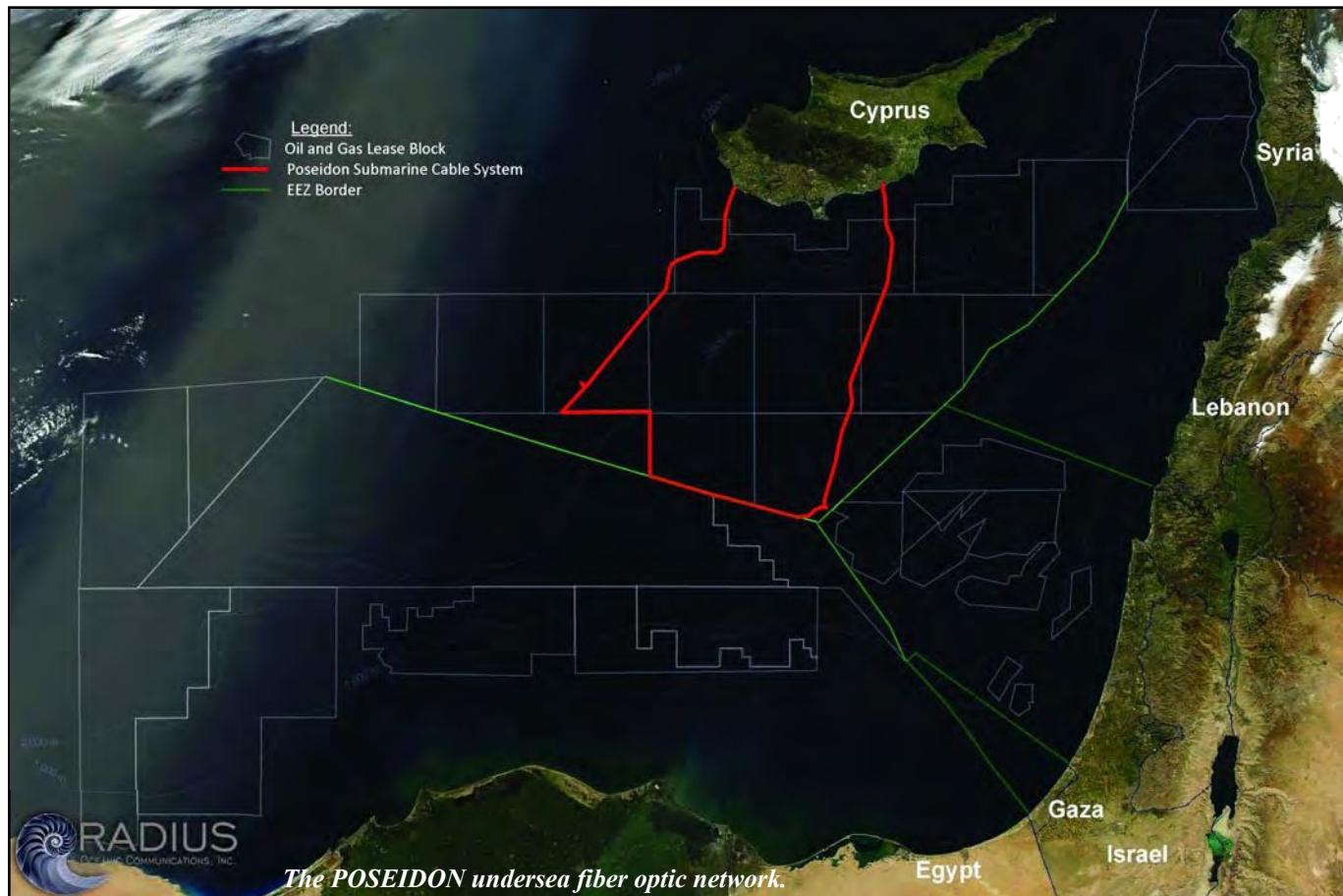
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POSEIDON System Moves Ahead

*By: Dan White, Vice President
Radius Oceanic Communications, Inc.*

Following the recent boom in offshore gas discoveries in the Levant Basin, Radius Oceanic Communications, Inc. (Radius) was formed to provide broadband telecommunications services to the offshore oil and gas industry operating in Cyprus and the Eastern Mediterranean region. To deliver these services, Radius is constructing the POSEIDON undersea fiber optic cable network, which will allow deepwater offshore oil and gas assets in the Eastern Mediterranean to connect to their headquarters and other onshore operations worldwide over a secure, high-bandwidth, low-latency international network.



The POSEIDON system will extend into the deepwater Eastern Mediterranean for approximately 800 km from two shore landings in Cyprus, forming a self-healing ring that borders the Cypriot EEZ and enveloping the offshore oil and gas lease blocks established for development by the Republic of Cyprus. Through the POSEIDON system, Radius will offer managed broadband services on a subscriber basis to offshore exploration, production and support facilities throughout the Eastern Mediterranean.

POSEIDON will make landfall at two locations in Cyprus—Pentaskhinos and Yeroskipos—and is hosted by Radius' Cypriot partner in the POSEIDON project, the Cyprus Telecommunications Authority (Cyta), which owns and operates the shore landing stations. Cyta provides POSEIDON hosting and co-location services at the landing points and, on commissioning, will provide geographically diverse international transit circuits to allow Radius to bring POSEIDON traffic from its customers' offshore properties directly to their onshore company headquarters or operations centers at any location worldwide.

The system has been designed such that it can provide communications to those operators working offshore Cyprus as well as to deepwater properties in neighboring countries in the region. The initial POSEIDON backbone system has been designed for continual expansion throughout its system life, allowing Radius to extend the backbone and its branch cables throughout the deepwater Eastern Mediterranean region as and when there are new offshore lease block developments. POSEIDON is also designed to be able to extend to future shore landings of the backbone segments in neighboring countries, giving the system both increased flexibility and resiliency as it grows in the region.

Radius has signed a Service Level Agreement with CSnet International, Inc. (CSnet) to connect CSnet's existing Offshore Communications Backbone (OCB) to Radius' POSEIDON undersea fiber system. As an anchor tenant on POSEIDON, CSnet will be able to provide its scientific and government customers with secure, low-latency broadband oceanographic, seismic, and metocean data. The agreement to provide services to CSnet has allowed Radius to move quickly to establish the POSEIDON footprint in Cypriot waters and be poised for expansion as new oil and gas properties come online.

POSEIDON was designed by Ocean Specialists, Inc. (OSI) in collaboration with system supplier TE SubCom and will be operated by Radius. POSEIDON is being supplied and will be installed by TE Subcom in late 2013 utilizing a Reliance-class cable ship.

Eastern Mediterranean gas activity

Five years ago, there was primarily just talk of the possibility of large gas deposits in the Eastern Mediterranean Sea; however, many discoveries have been made since that have confirmed the presence of hydrocarbons offshore.

The biggest hydrocarbon deposits happen to be located in the most sensitive political areas where much controversy exists over EEZ boundaries and hydrocarbon rights. The U.S. Geological Survey reported in June 2010 that some 223 tcf of undiscovered and recoverable natural gas exists in the region, mainly in Cyprus, Israel, and Lebanon. These discoveries come at a critical time for these countries that have, in the past, relied on gas imports to meet their needs.

In 2007, Cyprus had an offshore lease block sale and awarded just one block (Block 12) to Noble Energy in 2008. In November of 2011, Noble discovered gas in Block 12. This follows Noble's discoveries offshore Israel at Tamar and Leviathan, which represent over 24 tcf of natural gas. Recently, Cyprus awarded Italian energy company ENI Exploration and Production Sharing Contracts for Cypriot blocks 2, 3, and 9. Many more recent discoveries offshore Israel are fueling the excitement in the region, and these discoveries will allow energy independence for both Israel and Cyprus for many decades to come. The believed reserves are well in excess of the domestic energy needs of Cyprus, which appears to be in position to become an energy hub for the export of natural gas to Europe.

The POSEIDON undersea cable system

System description

The design and components of POSEIDON are based on state-of-the-art transoceanic undersea fiber technology, focused to serve the deepwater offshore industry in the Mediterranean. The backbone is a powered, repeatered, Trunk-and-Branch fiber backbone, with offshore properties connected to the backbone via subsea Optical Add-Drop Multiplexing (OADM) branching units.

The POSEIDON cable system will provide redundant 10 Gbps wavelength connections from each landing to offshore properties connected to each branching unit. This dedicated-wavelength architecture provides complete operational independence between offshore properties and maximizes network security.

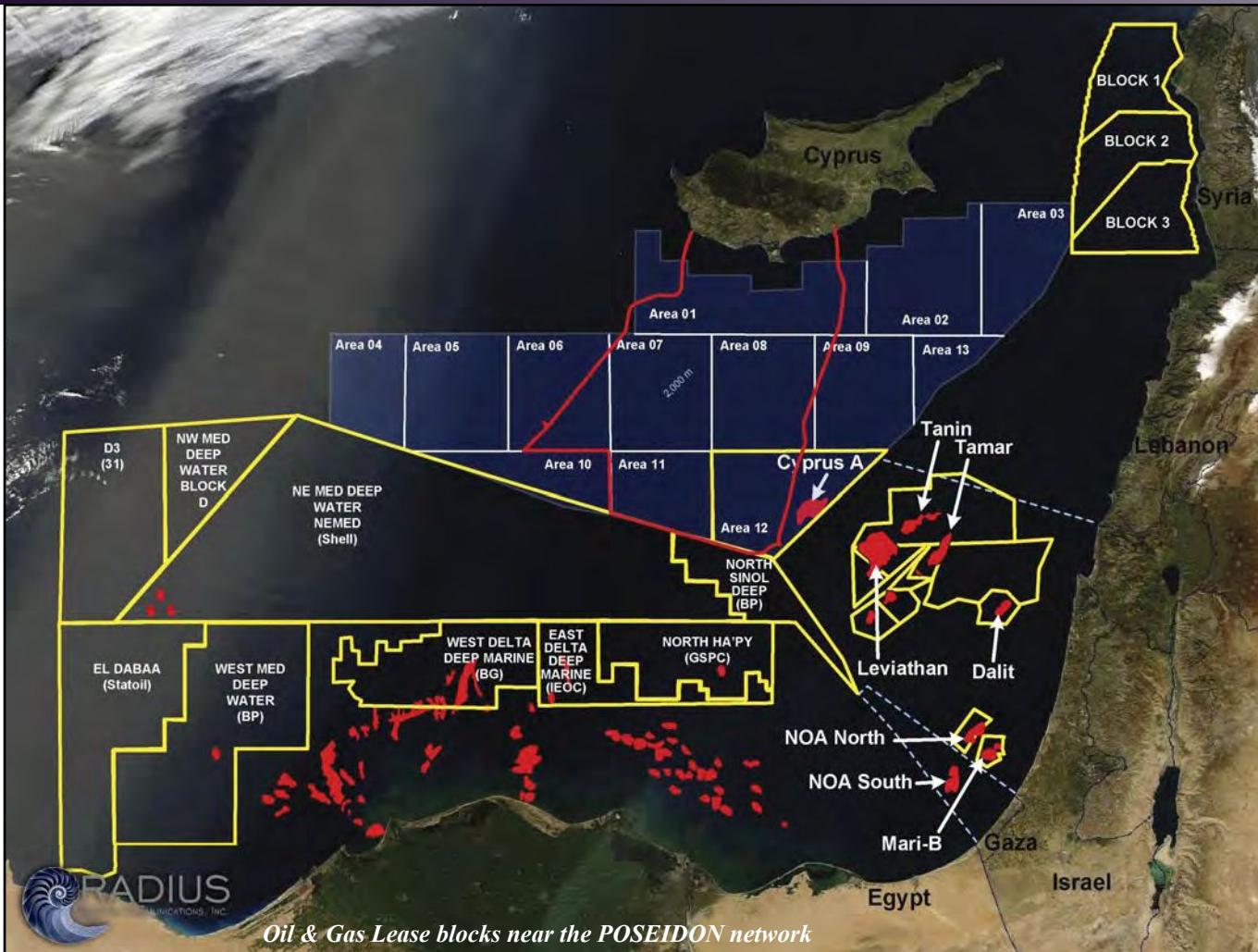
POSEIDON carries eight fiber pairs, with six of the pairs capable of carrying between 32 and 64 wavelengths each at 10 Gbps, upgradeable in the future to 40/100 Gbps.

Last-mile connections

While POSEIDON is primarily a fiber optic backbone, its flexible design and significant bandwidth capacity will allow each property connected to the system backbone to serve many other assets in the vicinity, thereby allowing a single processing platform to provide broadband, low-latency fiber backhaul to drillers, support contractors, and other vital assets in or near the lease block. Examples include the following:

- Connect nearby drilling platforms via wireless connections or fiber connections provided in remote drill centers around the field;

Editorial Focus



- Provide roaming services to marine and aviation operations via WiFi or WIMAX connections hosted at the platform;
- Provide bandwidth to production facilities in adjacent fields;
- Provide broadband, low-latency wireless services to in-field construction vessels during critical construction or inspection operations;
- Provide real-time streaming ROV video feed of inspection or construction operations; and
- Provide real-time streaming of large data sets from sub sea and downhole inspection operations.

Drilling operations support

Increasingly, deepwater fields are being networked with fiber optic connections to remote drilling and production centers around a particular field. For connected fields, future drilling operations may make use of subsea fiber connections via wet-mateable fiber optic connections.

The ability for drilling operations to connect into a fiber backbone during development drilling cycles and, in some cases, during the exploratory drilling phase represents a substantial opportunity to evolve and improve offshore drilling operations in terms of safety, efficiency, and effectiveness.

Dynamic riser for drilling operations

Establishing a subsea fiber connection from a mobile offshore drilling platform requires a fiber optic riser or umbilical to be installed between the platform and the seabed connection. The need for rigorous design and analysis of a dedicated riser has traditionally made such a connection impractical for a temporary drilling platform connection.

Radius and our technology partner OSI will employ the patented Portable Dynamic Riser technology to allow the deployment of a modular, low-cost, re-usable riser to allow for temporary connections between a mobile drilling asset and a seafloor fiber connection.

Secure connections to key land bases worldwide

Radius broadband services do not stop at the beach. Radius will offer seamless service from each customer's offshore facilities to its designated shore locations around the world. Through its partner Cyta, Radius is able to offer diverse transoceanic routes and secure circuit connections to Europe, the U.S., Southeast Asia, and the Middle East.

Redundant, geographically diverse Network Operations Centers (NOCs) will ensure that every element of the POSEIDON system and its associated network is monitored



and that performance in the delivery of network services to customers is optimized.

Expansion strategy

While POSEIDON terminates in Cyprus, it is engineered to provide a footprint to service the offshore oil and gas properties throughout the Mediterranean basin. POSEIDON's design ensures the network is capable of connecting all vital offshore facilities in the region as well as establishing multiple international shore landings as required to best serve our customers.

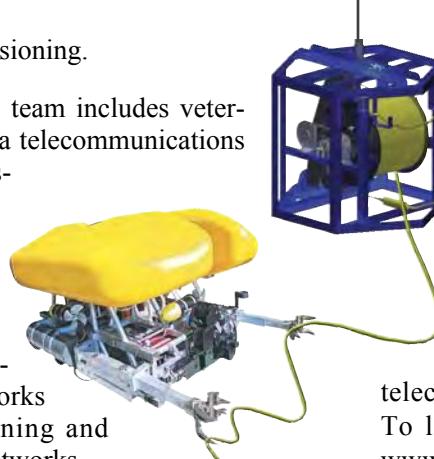
The Radius team

The Radius leadership and technical teams have been involved in the implementation of undersea fiber optics in the oil and gas industry since 2000. Since that time, Radius team members have led the development and implementation of major offshore oil and gas fiber networks in Asia, West Africa, and the U.S. Gulf of Mexico.

The Radius project development team possesses unparalleled industry experience in assisting Oil and Gas Operators in the development of undersea fiber optic networks, including key activities such as the following:

- Benefits analysis and internal business justification support;
- Network design;
- Platform connection mechanical and optical design;
- Seafloor routing;
- Permitting; and
- Construction and commissioning.

Additionally, the Radius team includes veterans of international undersea telecommunications carriers as well as major systems suppliers—giving our team the well-rounded experience required for the development of major undersea systems, such as the engineering and construction of undersea networks as well as the commissioning and operation of international networks,



including the establishment of NOCs, international transit circuits, and domestic backhaul to customer facilities.

The Radius project development team also includes specialists in key areas that drive cost, schedule, and risk in the development of offshore oil and gas fiber infrastructure, including permitting and Geographic Information System (GIS) maintenance archival.

Permitting

The Radius permitting team has decades of experience in the permitting and assessment of offshore oil and gas infrastructure projects and has specialized in the permitting of undersea fiber optic cable systems for the telecommunications and oil and gas industries. Specifically, the Radius team is unsurpassed in its experience in the permitting of offshore oil and gas undersea fiber networks.

GIS and maintenance archival

The Radius GIS team works on an ArcGIS platform and supports the planning, permitting, construction, and operations phase of the undersea cable network. MakaiPlan software allows for comprehensive cable route planning and as-built archival. Following system commissioning, the GIS database allows the Radius team to plan and coordinate future system expansions and track future pipeline and cable crossings.

About Radius Oceanic Communications, Inc.

Radius is a communications provider that offers broadband communications to the offshore oil and gas industry worldwide. The Radius team consists of leading industry professionals in the fields of undersea fiber optic telecommunications engineering, development, and operations. The Radius project development team has participated in leading roles in the development of offshore oil and gas undersea fiber projects in West Africa, the Gulf of Mexico, and the Asia Pacific regions since 2000. For more information, please contact Dan White at dwhite@radiusocean.com or visit www.radiusocean.com.

About Cyprus Telecommunications Authority

Cyta is the primary telecommunications provider in Cyprus. Its product portfolio covers the whole spectrum of electronic communications, ranging from fixed and mobile telephony to Internet service provision and broadband applications. Through its strategic business unit Cytaglobal, Cyta is particularly active in the area of undersea cable systems, providing wholesale products and services on a global basis, and has established Cyprus as a regional telecommunications hub in the Eastern Mediterranean. To learn more about Cyta or Cytaglobal, please visit www.cytaglobal.com.

The need for windfarm construction vessels is growing rapidly

This year marks the start of a period of rapid growth in the wind farm construction vessel market, and it coincides with new operational demands that require careful consideration, particularly in the design of jack-up systems. DNV highlights the need for owners and yards to consider both class and flag state requirements when evaluating limited operation designs. At least 20 new wind farm installation vessels will be required by 2020 only to meet Europe's anticipated growth in offshore wind capacity which the European Wind Energy Association expects to reach 40 GW.

IMCA Publishes DP station keeping incidents

In 2010, 56 accounts of incidents that took place on 41 vessels were submitted for the annual Dynamic Positioning (DP) Station Keeping Incidents report produced by the International Marine Contractors Association (IMCA). These incident accounts have been analyzed and included in the newly published report IMCA M 218. The largest percentage (37%) of incidents had "reference" as their main cause, with many support submitters commenting that references had been a cause for concern. Electrical (21%), computer (11%), and power (9%) were the next highest scorers. Finally, human error (5%), environment (7%), propulsion (4%), and procedure (4%) were the least of the main causes. Although human error does not figure highly, this may be due to the analysis as it can be argued that causes such as "procedure" could also be categorised as human error, with procedures being unavailable, overlooked, or ignored. February is the month that saw the greatest number of reported incidents and January the least. The report is available to download free of charge on the IMCA website at www.imca-int.com.

Dockwise Vanguard christened

The christening ceremony of the Dockwise Vanguard took place at Ulsan, South Korea. Around 200 guests from all corners of the oil and gas industry as well as various other stakeholders participated. At the event, Mrs. Dale Varnado christened the Dockwise Vanguard, fulfilling her role as Godmother. After the traditional champagne-breaking moment, all the guests went up to the wheel house for the ribbon cutting and horn blasting ceremony. Dockwise Vanguard will become the largest heavy lift vessel in the world. It features a bow-less design developed by Dockwise and Delta Marine and is equipped with movable casting. The Vanguard has an overall length of 275 m, moulded breadth of 70 m, depth of 15.5 m, and a submerged draft of 31.5 m. The deadweight of the vessel is 117,000 tons. The ship is provided with a free deck space of 275 m x 70 m. The loading deck extends the entire length of the vessel.

PortVision® launches PortVisionTV for AIS-based business optimization information

PortVision®, a leading provider of business intelligence solutions for the maritime industry, announced that the company has created PortVision® TV, a series of online videos designed to inform viewers about the benefits of combining AIS-based vessel tracking with enterprise-class analytics, reporting and process-improvement tools to enhance maritime business operations. The videos are available for viewing at www.portvision.tv. Video content is also available on YouTube and on the company's public website at www.portvision.com. PortVision® TV launches with three channels, and includes segments on AIS vessel monitoring with historical playback, marine terminal optimization (including dock management), and fleet management. The mission of PortVision® TV is to educate and inform PortVision®'s user community on how PortVision® products and services can be used to drive efficiency and organizational improvement.

Maritime Craft Services orders three more Damen fast crew suppliers



Maritime Craft Services (Clyde) Ltd (MCS) has ordered three more Damen Twin Axe Fast Crew Suppliers just months after taking delivery of its first FCS 2610 catamaran. Based in Largs, Ayrshire (UK), MCS signed for three Twin Axes in November. The vessels will be delivered in the first quarter 2013.

With more than 30 years of experience, the Scottish firm operates a 16-strong fleet of tugs and workboats internationally and already has several Damen vessels, including Multi Cats, Shoalbusters, and Dredge Helpers. MCS has been active in the offshore wind market for many years, but decided to enter the crew transfer market in 2011.

The company's first Twin Axe FCS 2610, MCS Sirocco, was delivered in April this year and the second, MCS Pampero, is awaiting a heavy lift carrier in Singapore and is due to arrive in Rotterdam before the end of the year.

Arjen van Elk, Damen sales manager North, West & South Europe, says that these latest two MCS vessels are built according to the new "Damen standard" FCS 2610, which has evolved and is now outfitted with a larger wheelhouse and superstructure, providing more accommodation space than the first models.

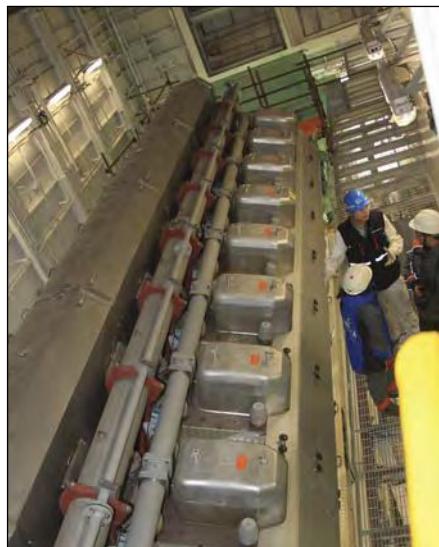
The Twin Axe design is a further development of Damen's pioneering and highly successful Sea Axe concept. This unique hull form provides excellent seakeeping behavior and means that the vessel can travel at full speed (26 kts), while still providing a safe and comfortable ride for the crew. The vessel can easily handle 2.5-m significant wave heights without losing any performance, and extensive tests have proven that the vessel reduces bow slamming entirely under certain conditions.

Introduced to the market in June 2011, the Damen Twin Axe Fast Crew Supplier 2610 is already establishing itself as "the industry standard" in the offshore wind industry when it comes to a number of maintenance tasks. Damen was delighted when a major wind turbine manufacturer recently put out a tender requiring that companies deploy Twin Axe vessels when handling its turbines. Damen is the only manufacturer of this type of catamaran, which was developed in close cooperation with the Delft University of Technology and other scientific research institutes.

Although the vessel has been eagerly adopted by the offshore wind industry, the vessel is suitable in multiple roles and provides a very stable platform for diving support. In addition, it can easily be converted back into a basic crew supplier overnight.

For more information, visit www.damen.com.

Groundbreaking Wärtsilä-powered FPSO completes full load tests



The new P-63 Floating Production Storage and Offloading (FPSO) vessel featuring Wärtsilä 50DF dual-fuel engines, the first such ship to utilize gas engines to produce more than 100 MWe of power, has successfully completed all the required full 100% load tests. The tests were carried out at the Cosco shipyard in Dalian, China, and the vessel will commence operations in Brazil's offshore oil fields in 2013.

With this validation of the P-63's capability to fulfil all the required performance criteria as part of a complex offshore project, the viability of Wärtsilä's dual-fuel technology is again verified. The Wärtsilä dual-fuel engines are capable of being run on treated well gas or treated crude as well as marine diesel oil (MDO), which means that virtually no MDO will need to be shipped to the P-63. This will notably reduce operating costs. Furthermore, this efficient gas-fired power solution will also have significantly lower levels of CO₂ emissions compared to conventional technologies. In real terms, it is estimated that the level of carbon emissions will be reduced by as much as 93,000 tons per year.

For more information, visit www.wartsila.com.

Jackson Offshore to build two next-gen offshore support vessels

Lee Jackson, president and CEO of Jackson Offshore Operators, announced the company has contracted Guido Perla & Associates (GPA), BAE Systems, and Rolls Royce to build two qualified

Jones Act offshore support vessels for delivery in 2013 and 2014.

The M/V Thunder and M/V Breeze will be 252-ft long and 60-ft wide. They will be equipped with two Azipull propulsion thrusters, tunnel thrusters, a low-voltage front-end diesel electric system, and Acon automation and Icon Dynamic Positioning (DP-2) systems – all supplied by Rolls Royce.

For more information, visit www.jolloc.com.



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SeaRobotics delivers autonomous hull cleaning system

SeaRobotics Corporation has delivered the first HullBUG (Hull Bio-inspired Underwater Grooming) System to the Center for Corrosion and Biofouling Control at the Florida Institute of Technology in Melbourne. This is in support of their newly commissioned Large-Scale Seawater Facility for HullBUG Development funded by the U.S. Navy Office of Naval Research (ONR).

The HullBUG System is an autonomous underwater vehicle designed to crawl on ship hulls or other underwater structures and "proactively groom" the surface. Developed by SeaRobotics and funded by ONR, this highly automated proactive grooming (or light cleaning) process will revolutionize hull maintenance, allowing ship hulls to remain in a clean state at all times. The benefits of improved hull condition are dramatic—the estimated 5% improvement in fuel efficiency achieved through proactive grooming translates into a savings of \$15 billion



per year for the shipping industry worldwide as well as reduction in the 1 billion tons of greenhouse gases emitted by the fleet.

"The financial benefits to the commercial shipping industry of HullBUG-enabled proactive grooming are enormous. Equally impressive are the associated environmental benefits derived from the operations with improved hull efficiency," stated Don Darling, President of SeaRobotics.

HullBUG is a small autonomous vehicle weighing 30 to 40 kg that attaches to the hull and performs a gentle cleaning function, or grooming. Numerous embedded computers perform navigation and sensing tasks to allow the grooming of the majority of the ship hull. Its ability to be attached to ferrous, non-ferrous, and fiberglass

hulls and to deploy various sensors makes the HullBUG the best choice to overcome the numerous challenges involved in inspection and grooming. Opportunities in commercial shipping, oil and gas, nuclear, and conventional power generation markets are under discussion.

SeaRobotics specializes in small, smart vehicles that are remotely or autonomously operated. Its clients include major military and commercial organizations, both U.S. and foreign. SeaRobotics' marine survey software interfaces with most data acquisition hardware, software, and sensing systems to produce multi-spectral, DGPS-stamped data for survey, research, or surveillance efforts. Applications for SeaRobotics vehicles range from hull grooming and inspection to bathymetric and hydrographic surveys to coastal, harbor, and riverine surveillance. Many SeaRobotics vehicles are small, modular, and man-portable, allowing for rapid deployment in remote areas.

For more information, visit www.searobotics.com.

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The modular design, user friendly user interface, comprehensive help and support of international standards and exchange formats, mean QINSy is equally well suited to less complex bathymetric surveys as it is to highly complex multi-vessel and multi-sensor offshore construction projects.

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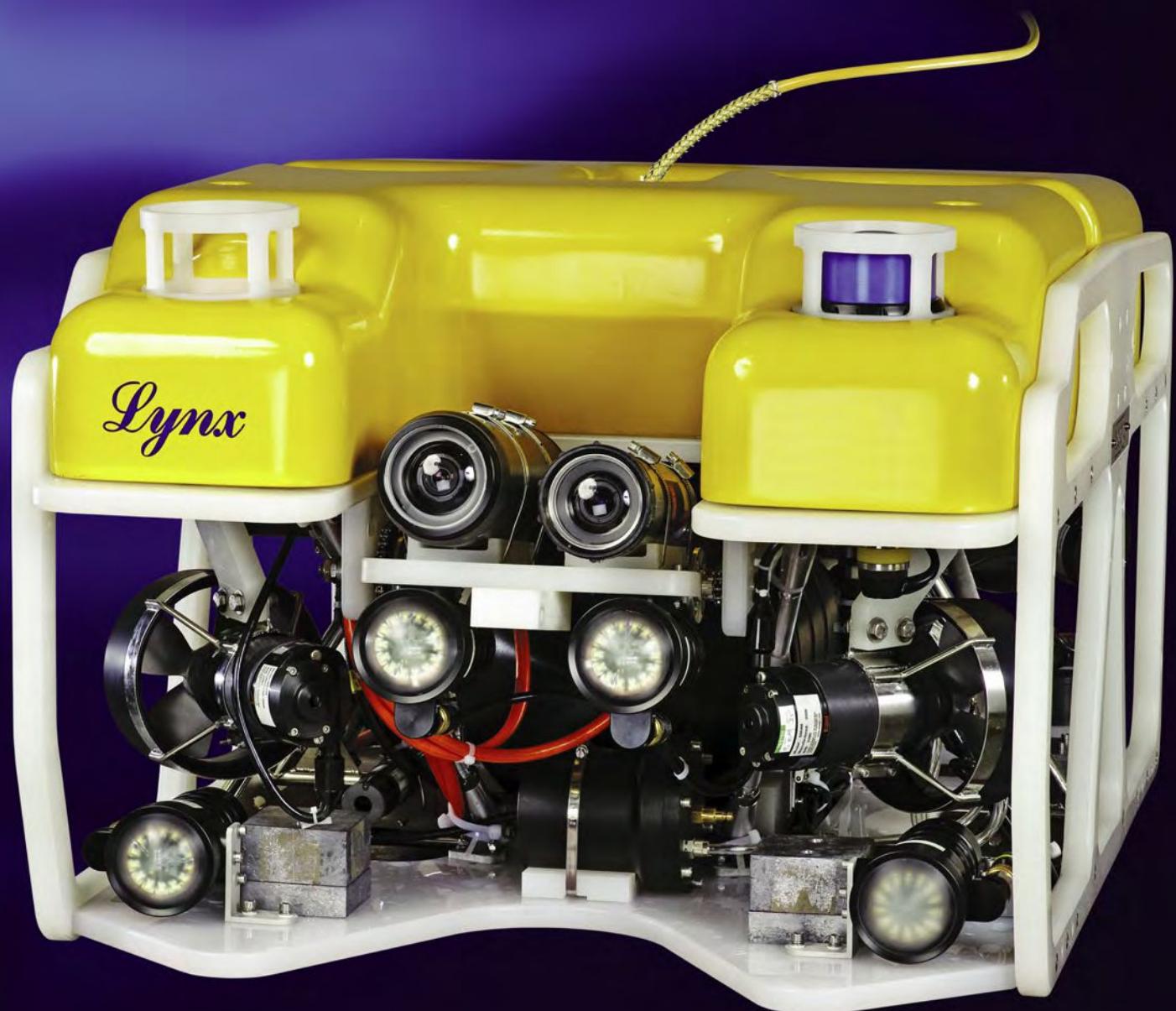
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Numerical study suggests subsea injection of oil-dispersing chemical at Macondo well did not prevent oil from rising to the surface

A new study published in *Environmental Science & Technology*, led by University of Miami (UM) Rosenstiel School of Marine & Atmospheric Science Associate Professor of Applied Marine Physics Claire Paris, is the first to examine the effects of the use of unprecedented quantities of synthetic dispersants on the distribution of an oil mass in the water column based on a modeling approach. The team of researchers included UM Rosenstiel School Assistant Scientist Matthieu Le Henaff and Research Associate Professor Villy Kourafalou, UM Center for Computational Science Scientist Judith Helgers and Research Associate Professor Ashwanth Srinivasan, Ph.D. Candidate Zachary Aman from Colorado School of Mines, Research Associate Professor Ajit Subramaniam from Lamont Doherty Earth Observatory at Columbia University, and Professor Dong-Ping Wang from the School of Marine and Atmospheric Science of SUNY at Stony Brook. Together, they developed and tested models to show that the application of oil-dispersing chemicals had little effect on the oil surfacing in the Gulf of Mexico. The researchers estimated the distribution of oil droplet sizes with and without injection of dispersant at the wellhead. They then applied a novel oil-mass tracking model of the Connectivity Modeling System developed shortly after the Deepwater Horizon incident with a RAPID award from the National Science Foundation and presented a three-dimensional simulation of the DWH spill showing the unfolding of the disaster to examine the effect the synthetic dispersant may have had on the oil transport in the water column. The model indicated that the dispersant injected at BP's Macondo wellhead was not necessary to break up the oil. The subsea application of dispersant did not have its expected outcome.

Study documents the natural relationship between CO₂ concentrations and sea level

By comparing reconstructions of atmospheric CO₂ concentrations and sea level over the past 40 million years, researchers based at the National Oceanography Center, Southampton have found that greenhouse gas concentrations similar to the present (almost 400 parts per million) were systematically associated with sea levels at least 9 m above current levels. The study determined the 'natural equilibrium' sea level for CO₂ concentrations ranging between ice-age values of 180 parts per million and ice-free values of more than 1,000 parts per million. It takes many centuries for such an equilibrium to be reached; therefore, while the study does not predict any sea level value for the coming century, it does illustrate what sea level might be expected if climate were stabilized at a certain CO₂ level for several centuries.

Marine PSO and bioacoustic monitoring training

The Marine Mammal Business Line of CSA Ocean Sciences Inc. (CSA) is offering a course on Marine Protected Species Observation (PSO) and Passive Acoustic Monitoring (PAM) that meets BOEM/BSEE seismic mitigation regulations. The 3-day course will be offered 1-3 March 2013 near West Palm Beach, Florida. Further details on the course and registration are posted on the CSA website www.csaocean.com.

How the giant squid was finally revealed



Courtesy of AFP Photo / NHK / NEP / Discovery Channel

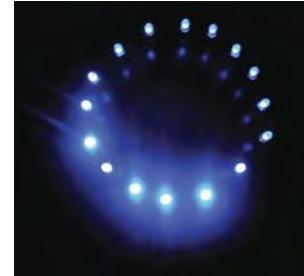
Filmed for the first time in its natural habitat, the giant squid (*Architeuthis*) has finally been exposed to the world. This achievement has been a long time coming. There have been previous such expeditions—all failures. This time was different. There were many factors that came together to make this effort such a resounding success. One of these was a new approach to deep ocean exploration that pays heed to the natural visual environment of the vast midwater realm that is home to these leviathans. This is a world of the very dimmest of lights—both sunlight filtered through hundreds of meters of ocean and bioluminescence, the living light that animals use to aid their survival in a light-limited world. The enormous eye of the giant squid—the largest in the animal kingdom—attests to how important vision must be to its survival. Using optical lures that imitate bioluminescence to attract the squid and far red light invisible to the squid in order to see without being seen proved to be the key to success.

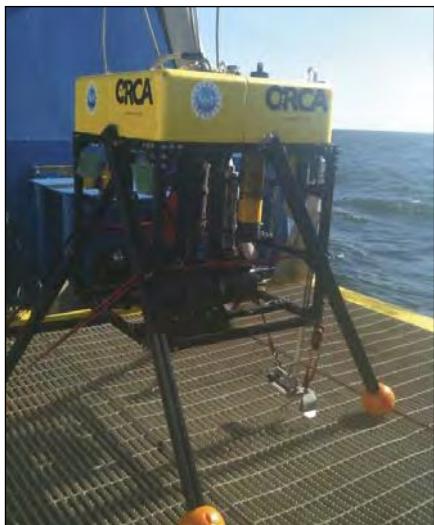
The expedition was initiated with financing from the Japan Broadcasting Corporation, NHK, which was inspired to undertake the high risk endeavor—despite the failures of previous attempts—by the success of Japanese squid expert Dr. Tsunemi Kubodera who was the first person to capture still images of the giant squid using a baited underwater camera.

Dr. Widder was invited to join the expedition because of her successes with the Eye-in-the-Sea, a deep-sea camera observatory that she developed as a means of exploring the deep ocean unobtrusively. The Eye-in-the-Sea uses low-light imaging in combination with far red illumination that is invisible to most deep-sea animals.

The primary motivation for its development was the desire to observe animals that would normally be disturbed or frightened away by the white lights and noisy thrusters used on standard observation platforms.

She also developed a novel optical lure that imitates certain





bioluminescent displays, thought to be attractive to large predators. Known as the electronic jellyfish, or e-jelly, the lure imitates the bioluminescent burglar alarm display of the common deep-sea jellyfish *Atolla wyvillei*. Bioluminescent burglar alarms are a scream for help—the last ditch efforts of an animal that is caught in the clutches of a predator and has no other hope for

survival than to attract the attention of a larger predator that may attack their attacker and, thereby, afford them an opportunity for escape. It was hoped that such a display would be of great interest to a visual predator like the giant squid.

The Eye-in-the-Sea has gone through several incarnations, including a moored version that was the world's first deep-sea web cam. The version used during this mission has been dubbed the Medusa because it can operate in the midwater as well as on the bottom. For the deployment off Japan, it was deployed in mid-water mode, suspended on 700 m of line by a float at the surface outfitted with a satellite tracking beacon.

The e-jelly was mounted on a bar in front of the camera. Activated with a magnetic switch prior to each deployment, it alternated 1 min on (in pinwheel display) with 1 min off. Each deployment was approximately 30 hr, which was the maximum recording time allowed by the battery charge.

For more information, visit www.teamorca.org.

NOAA explorers discover deepwater gas seeps off U.S. Atlantic coast

NOAA ocean explorers used an advanced multibeam sonar mapping system on NOAA Ship Okeanos Explorer last month to discover and map the first deepwater gas seeps found off the U.S. Atlantic Coast north of Cape Hatteras. The seeps were found at water depths greater than 1,000 m (3,300 ft). Based on preliminary information, scientists believe the seeps are likely emitting methane gas.

Locating seeps with this advanced technology will expand opportunities for researchers to study how seeps in the deep ocean environment affect ocean chemistry.

"Finding and mapping deep-ocean seeps is vitally important, but has been limited by technology," said Stephen Hammond, Ph.D., acting chief scientist in NOAA's Office of Ocean Exploration and Research. "With advanced multibeam sonar, it may become routine to discover seeps while we systematically explore our poorly known ocean."

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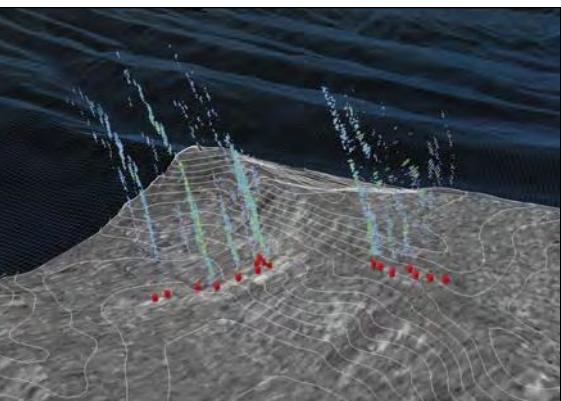
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EXHIBITING AT OCEAN BUSINESS 2013	• APRIL 9TH - 11TH	• SOUTHAMPTON, UK	• BOOTH #N6



The seeps were mapped between 2 and 20 November at three locations with water depths of 1,000 to 1,600 m (3,300 to 5,250 ft). Approximately 25 distinct seafloor gas seeps were identified based on plumes rising into the water column as high as 1,100 m (3,600 ft). The sites are between 147 and 163 km (91 and 101 mi) offshore, with one site east of Cape Henry, Virginia and two sites south and southeast of Nantucket Island, Massachusetts.

"NOAA tested the ship's multibeam sonar last year in the Gulf of Mexico and confirmed that its advanced signal processing made it a highly capable new tool to detect gaseous seeps at great depths and over wide areas," said Robert Detrick, Ph.D., assistant administrator of NOAA Research. "This technology and the information it delivers is extremely valuable to researchers and ocean resource managers in NOAA, in other agencies, and across the nation."

For more information, visit <http://oceanexplorer.noaa.gov>.

Oceana explores undersea mountains with Falcon ROV

Oceana, the largest ocean conservation organization, has explored a number of undersea mountains in the Atlantic and Mediterranean using the small, deep-swimming Falcon DR ROV.

They recorded many species and habitats needing protection and conservation—from carnivorous sponges to lobsters and sharks.

Never before has such an enterprise been undertaken by an NGO, says executive director of Oceana in Europe, Xavier Pastor, explaining that efforts to preserve biodiversity have overlooked deep-sea areas.

"Oceana is a pioneering NGO in the use of ROVs," says Xavier Pastor, who understands the important role technology plays in documenting habitats and species that require protection.

Oceana started the current project

some 240 km off the Portuguese coast in the range of marine mountains called the Gorrige Bank.

Here, scientists filmed algal forests and hundreds of species and noted the ecological value that undersea mountains, called seamounts, offer to many species, including whales, dolphins, and swordfish.

Director of research in Europe, Ricardo Aguilar, says they have found species whose existence on the Gorrige Bank was unknown in an ecosystem that needs conservation.

He adds that when they later explored the Chella Bank—offshore Almeria in South East Spain—they found protected species such as a carnivorous sponge and angular rough shark at risk from damage to their seamount habitat by recreational and commercial fishing.

Oceana benefited from having an ROV that is small enough to be man-handled from its vessel, yet has advanced distributed intelligence technology that allows a host of advanced systems to be fitted. These include systems such as video and the HD cameras manufactured and supplied by Marine Vision, who also supplied the ROVs.



Scientists use marine robots to detect endangered whales

Two robots equipped with instruments designed to "listen" for the calls of baleen whales detected nine endangered North Atlantic right whales in the Gulf of Maine last month. The robots reported the detections to shore-based researchers within hours of hearing the whales (i.e., in real time), demonstrating a new and powerful tool for managing interactions between whales and human activities.

The team of researchers, led by Woods Hole Oceanographic Institution (WHOI) scientists Mark Baumgartner and Dave Fratantoni, reported their sightings to NOAA, the Federal agency responsible for enforcing the Marine Mammal Protection Act. NOAA Fisheries Service, in turn, put in place



Photo by Nadine Lysiak, Woods Hole Oceanographic Institution

on 5 December 2012 a "dynamic management area," asking mariners to voluntarily slow their vessel speed to avoid striking the animals.

The project employed ocean-going robots called gliders equipped with a digital acoustic monitoring (DMON) instrument and specialized software allowing the vehicle to detect and classify calls from four species of baleen whales—sei, fin, humpback, and right whales. The gliders's real-time communication capabilities alerted scientists to the presence of whales in the research area in the first successful use of technology to report detections of several species of baleen whales from autonomous vehicles.

The oceanographic research project was underway from 12 November through 5 December, operating in an area called the Outer Fall, about 60 mi south of Bar Harbor, Maine, and 90 mi northeast of Portsmouth, New Hampshire. Right whales are thought to use this area every year between November and January as a mating ground.

Two gliders were deployed by Ben Hedges and Nick Woods, also of WHOI, on 12 November from the University of New Hampshire's 50-ft research vessel, the Gulf Challenger. The vehicles surveyed the area for 2 weeks, sending data to the researchers every 2 hrs via satellite, prior to the scientific team's arrival 28 November on the University of Rhode Island's research vessel Endeavor. The gliders continued to survey for another week before being recovered by the Endeavor on 4 December. "We put two gliders out in the central Gulf of Maine to find whales for us," says Baumgartner, who specializes in baleen whale and zooplankton ecology. "They reported hearing whales within hours of hitting the water. They did their job perfectly."

For more information, visit www.whoi.edu.

OSIL install two data buoys to monitor environmental concerns in Lake Victoria, Kenya

OSIL recently completed the installation of two data buoys along Lake Victoria in Kenya to help manage the local environment monitoring of various environmental concerns, including hyacinth menace and contamination of the lake water.

In addition to monitoring atmospheric components of the lake, such as moisture, oxygen levels, and temperature, the sensors on the data buoys will also measure wind direction and levels of potentially harmful chemicals in the lake. By better understanding the environment, one benefit is that fishermen will be provided with real-time information on wind patterns, helping them to avoid being trapped by regions of floating hyacinth blown across the lake.

The 5-m tall data buoys measuring 2.6 m in diameter were designed and built to be robust and protected from the local wildlife to ensure the security of the data collected. These real-time data will be relayed to base stations at 15- to 30-min intervals where the data will then be analyzed and studied, trending changes to the lakes environment.

Deepest coral reef ever found on the Great Barrier Reef

A team of scientists from the Catlin Seaview Survey has discovered reef coral living at 125 m, the deepest ever found on the Great Barrier Reef.

The remarkable find of a community of reef corals was made on the outer edge of the Ribbon Reefs off the north of the Barrier Reef. The extreme depth is more than four times the depth of the shallow reef coral habitat (0 to 30 m) that scuba divers can access and that has made the Great Barrier Reef such an iconic natural feature.

Dr. Pim Bongaerts from the Global Change Institute at the University of Queensland, who led the expedition's deep reef team, said: "It's intriguing. When we began our survey, we were amazed to see significant coral communities at depths of around 60 m. However, it is truly mind-blowing to see reef coral at more than twice that depth—and four times deeper than most scuba divers can reach."

"We found the plating *Leptoseris* corals at a depth of 125 m. Although the corals are small and the community at such depth only consists of few species,



it shows that there are viable communities living down there. The corals were attached to the rock surface and were certainly not individual corals which have fallen down to this depth."

The Catlin Seaview Survey is sponsored by global specialty insurer Catlin Group Limited. Catlin supports the collection of scientific data so experts can better understand climate change and its risks and, therefore, inform the decisions needed to manage the consequences. The Great Barrier Reef expedition is part of an ambitious program to survey many of the world's coral reefs that are under threat.

For more information, visit www.catlinseaviewsurvey.com.

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Dutch offshore wind park**Luchterduinen awarded to Van Oord**

Van Oord has been awarded the construction of the offshore wind park Luchterduinen. The wind farm will be located 23 km from the Dutch coast between Noordwijk and Zandvoort. The client is the joint venture Eneco-Mitsubishi Corporation. The 43 wind turbines will have a combined capacity of 129 MW and will generate green electricity for nearly 150,000 households. Construction will start in July 2014 and will be completed after the summer of 2015. As EPC (Engineering, Procurement and Construction) contractor, Van Oord shall be responsible for the monopiles, the electrical infrastructure, the offshore transformer station, and the installation of turbines. Van Oord will deploy transport and installation vessel Aeolus to install the 43 wind turbines. "This award confirms that our leading role in this market is growing," says CEO Pieter van Oord.

OPT receives approximately \$1.5M

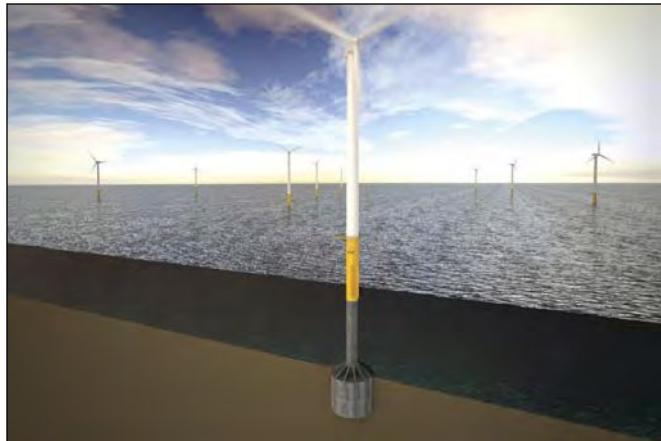
Ocean Power Technologies, Inc. (OPT), a leading wave energy technology company, announced that it recently received approximately \$1.5 million under the State of New Jersey's Business Tax Certificate Transfer Program. The Program enables companies to raise cash to finance their growth and operations and is administered by the New Jersey Economic Development Authority (NJEDA) and the New Jersey Department of the Treasury's Division of Taxation. Under the Program, New Jersey-based technology or biotechnology companies with fewer than 225 U.S. employees may be eligible to sell New Jersey State net tax operating losses and research and development tax credits to unaffiliated corporations for at least 80% of their value, up to a maximum lifetime benefit of \$15 million per business. The State of New Jersey was the originator of the Program and the first state to implement and fund it.

Potential commercial leasing for wind power offshore New York

BOEM received an unsolicited request from NYPA for a commercial wind lease on the OCS offshore New York. NYPA submitted its request on behalf of the "Long Island-New York City Offshore Wind Collaborative," a public-private entity consisting of NYPA, the Long Island Power Authority, and Consolidated Edison Company of New York, Inc. The Collaborative's goal is to develop the proposed project to supply the Long Island and New York City region with renewable energy, consistent with New York State's and the City of New York's renewable energy initiatives. NYPA's proposed project, the "Long Island-New York City Offshore Wind Project," is designed to generate at least 350 MW of electricity from offshore wind resources, with the ability to expand generation capacity to as much as 700 MW. The project would be located approximately 11 nmi south of Long Beach, New York in water depths ranging from 60 to 120 ft.

Fugro to undertake geological survey of Virginia Wind Energy Area

Governor Bob McDonnell, of the Commonwealth of Virginia, U.S. has announced that Fugro Atlantic has been appointed to conduct a geological and geophysical survey for the Virginia Wind Energy Area (WEA) within the Atlantic Outer Continental Shelf. Governor McDonnell described the regional ocean survey as representing "... a positive move forward toward the development of offshore wind energy, an important and promising component of my plan to develop all of the Commonwealth's domestic energy from local resources to make Virginia the 'Energy Capital of the East Coast.' The WEA encompasses 112,799 acres at a distance of 23.5 nmi offshore Virginia Beach and the Port of Hampton Roads. The project supports Virginia's goal to accelerate commercial leasing and development of the Virginia WEA and offshore energy industry supply chain.

First Olsen pioneers Universal Foundation's cost effective "Bucket Foundation"

A wholly owned subsidiary of First Olsen Ltd., which is owned 50/50 by Bonheur ASA and Ganger Rolf ASA, has acquired 60% of Danish company Universal Foundation A/S, formerly known as MBD Offshore Power A/S, developers of an innovative "Bucket Foundation" for offshore wind farm development. The remaining interests are held by the Danish utility company DONG Energy Power Holding A/S, Novation ApS, and Aalborg University, with whom the concept foundations have been developed and tested. The Bucket Foundation is aimed directly at the offshore wind energy sector, enhancing technical performance while also reducing the significant costs for offshore foundation installations.

Universal Foundation's revolutionary design combines the benefits and main proven aspects of a gravity base foundation, a monopile, and a suction bucket into one product—the Bucket Foundation. The design has been developed for nearly a decade and, after successful prototype installations of the foundation for both met masts and turbine foundations, it is now entering full-scale commercial production and supply to the offshore wind market. Importantly, the design also includes a patented cost efficient installation system that controls the vertical alignment of the total foundation as it sucks itself into the seabed, reducing total installation time significantly.

With the acquisition of Universal Foundation, Fred Olsen-related companies are now positioned to provide a full, packaged solution for offshore wind farms foundations—from feasibility study/design to finished installation of an integrated system of foundation and turbine.

Søren A Nielsen, chief technology officer at Universal Foundation, commented, "Following almost a decade of research, development, and testing, we are very proud to be in a position to offer a commercial solution to the market together with other Fred Olsen-related companies who bring a heritage of relevant experience to the proposition."

For more information, visit www.universalfoundation.dk.



Honolulu Seawater Air Conditioning to begin construction

Honolulu Seawater Air Conditioning (HSAC) is set to begin construction on a project designed to utilize ocean thermal energy technology to provide air conditioning to as many as 40 large commercial buildings in the downtown area of Kakaako, Honolulu. All contractors have been selected, and the project is pending approval from the Army Corps of Engineers and State Health Department. Construction, including the installation of pipes ranging from 60 in. to 72 in. in diameter to deliver seawater from deep offshore to shore, is pegged to start in the first half of 2013 with operation expected to begin as early as 2014.

As one of the most significant alternative energy projects in Hawaii, Honolulu Seawater Air Conditioning's cooling system eliminates the need for 178,000 barrels of oil by saving enough electricity to power more than 10,000 homes a year. It also reduces potable water consumption for air conditioning by more than 260 million gallons, reduces sewage discharge by up to 84 million gallons, and avoids emissions of 84,000 tons of carbon dioxide—the equivalent of removing 15,000 cars from the road each year. The project is anticipated to generate over \$200 million in construction spending in Honolulu and create more than 900 construction jobs.

For more information, visit www.honoluluswac.com.

DCNS to take control of OpenHydro

DCNS will increase its holding in OpenHydro to 59.7% of the capital through an acquisition of shares from the current shareholders and an increase in capital restricted to the Group. This investment is evidence of the confidence and commitment of DCNS to the development of OpenHydro. OpenHydro will retain its team and its brand and will benefit from the experience and the competencies of DCNS.

The ambition of DCNS is to achieve annual sales of at least 1 billion euros by 2025 in the tidal energy market.

Founded in 2004, OpenHydro has developed an innovative turbine capable of producing electricity at competitive prices. OpenHydro is a technological and commercial leader in the tidal energy market, where it has strong growth potential. The company has formed commercial partnerships with leading electricity suppliers in order to develop

some of the world's best tidal sites. It is testing turbines in various areas in Europe and North America.

Based in Dublin and Greenore (Ireland), OpenHydro has 90 employees. It is now working, with EDF on the installation of turbines at Paimpol-Bréhat (Brittany) and with SSE Renewables to install turbines in the Pentland Firth (Scotland).

For more information, visit www.dcnsgroup.com.

Scira awards local contract for services

Norfolk-based wind farm operator Scira Offshore Energy has confirmed the award of a 3-year contract effective 1 January 2013 for operational services for Sheringham Shoal Offshore Wind Farm to Great Yarmouth-based company, 3sun Group.

The Group will provide two specific services for the Sheringham Shoal Wind Farm. Firstly, a statutory certification and

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inspection service for all onshore and offshore equipment of the Sheringham Shoal Offshore Wind Farm, including the 88 wind turbines, two offshore substations, and the onshore substation at Salle near Cawston. Secondly, the provision of general engineering services, including design, supporting calculations, production of engineering documentation, fabrication, painting, mechanical and electrical installation/assembly, and retro-fit works.

Sheringham Shoal Offshore Wind Farm is owned equally by Statoil and Statkraft through joint venture operating company Scira Offshore Energy.

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

Marine license approved for first wave hub deployment

OceanEnergy Ltd (OEL) has been granted a 3-year marine license for the deployment of the first wave energy device at Wave Hub. The Marine Management Organization has granted consent to Cork-based OEL to deploy its €9 million OE Buoy wave energy converter at Wave Hub, approximately 10 miles off the north coast of Cornwall



in South West England.

Wave Hub expects the deployment of the 1 MW device to take place later this year. OEL is currently in discussions with local supply chain companies about support with fabrication and deployment and hopes to operate from the newly refurbished North Quay in Hayle Harbour.

For more information, visit www.oceanenergy.ie.

Principle Power awarded DOE advanced technology grant

Principle Power, Inc. announced the award of a \$4 million U.S. Department of Energy grant and up to \$47 million in total funding total to support the

WindFloat Pacific Demonstration Project, a 30 MW floating offshore wind farm planned to be located in the Pacific Ocean, approximately 15 mi due west of the Oregon's Port of Coos Bay. The scope of work for the grant will be finalized in the coming months with particular focus on public outreach, front-end engineering design, and initial project permitting. Project partners include Siemens Wind Power, Houston Offshore Engineering, the Pacific Northwest National Laboratory, the Northwest National Marine Renewable Energy Center, the National Renewable Energy Laboratory, MacArtney Underwater Technology, RPS Evan Hamilton, Herrera Environmental, Forristall Ocean Engineering, the American Bureau of Shipping and Det Norske Veritas.

The WindFloat is a patented floating foundation for offshore wind turbines. The WindFloat's innovative features allow wind turbines to be sited out-of-sight from shore in deepwater locations where the wind is stronger and more consistent.

For more information, visit www.principlepowerinc.com.

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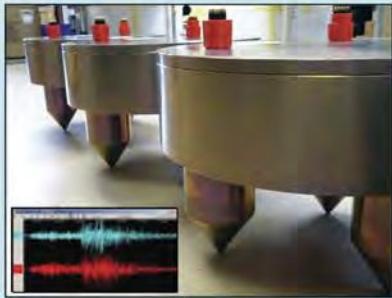
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CSnet offers end-to-end solutions providing global users a pre-engineered, expandable, portable system that can be deployed and redeployed anywhere – in water depths up to 3,000 meters. Meeting the needs for a wide range of spatial, power or bandwidth requirements, the Offshore Communications Backbone (OCB) serves research, industrial and government applications, providing the infrastructure needed to deliver power in support of continuous 24/7 monitoring; delivering data and providing command and control on-shore via satellite or shore-ended cable.

Offshore Communications Backbone

The OCB is a modular seafloor communications network that is directly connected to the Internet. Clients can provide and control their own sensors and data outputs, or CSnet can provide a suite of sensors from the surface to the seafloor with data directly forwarded to the client's onshore facilities. CSnet's OCB allows for individual component and end to end networked testing of power and communications functionality during the buildup and pre-deployment phases, ensuring a cost effective and successful installation. The OCB represents a proven network module that has been designed, constructed and tested, eliminating upstart time and cost. Each OCB module is expandable and so can be configured to accommodate large or small applications at a predictable cost.

General Dynamics awarded \$4.6B for submarine programs

General Dynamics Electric Boat was recently awarded three U.S. Navy contracts totaling \$4.6 billion to design and develop the next-generation strategic deterrent submarine and to continue construction and purchasing of materials for Virginia-class attack submarines. Under a 5-year, \$1.85 billion Ohio Replacement Program contract, Electric Boat will perform research and development work for this new class of ballistic-missile submarine, which is scheduled for a 2021 construction start. Additionally, Electric Boat will continue development of the joint U.S. Navy/Royal Navy Common Missile Compartment for Ohio Replacement submarines and the UK Successor-class ballistic-missile submarine. The potential value of this contract is \$1.995 billion. Electric Boat also received a \$2.5 billion award to build two Virginia-class submarines—South Dakota (SSN-790) and Delaware (SSN-791)—the 17th and 18th ships of the class. Construction of Virginia-class submarines is shared between Electric Boat, the prime contractor, and its teammate, Newport News Shipbuilding. Under the third award, Electric Boat will receive \$308 million to purchase long lead-time materials for the as-yet unnamed Virginia-class submarines SSN-792, SSN-793, and SSN-794.

Britian pledges \$3.56 million for anti-piracy

Britian has earmarked the money to support U.N. anti-piracy efforts with most of the money going to the U.N. Office on Drugs and Crime's Post Trial Transfer Program. The money will be used to construct a new prison designed to hold convicted pirates. British Foreign Office Minister Alistair Burt cautioned that just because piracy attacks on international shipping off the Solalisa coast were down last year that it would be foolish to claim "mission accomplished." "One-hundred-eight hostages remain in pirate hands, often subjected to terrible conditions with no knowledge of when, or even if, they will be released," Burt said in address to the U.K. Chamber of Shipping.

New hurricane-resistant Coast Guard station dedicated after being rebuilt

A new efficient, environmentally friendly, and hurricane-resistant Coast Guard station was dedicated during a ribbon-cutting ceremony held at the new Station Sabine Pass (PDF). The old station was finally demolished and rebuilt after hurricanes Rita, Humberto, Gustav, and Ike all took their toll on the unit. Extensive, wide-spread damage was done by Ike, which prompted Congress to authorize supplemental funding to rebuild and improve Coast Guard facilities that were affected.

U.S. Navy extends charter of Austal high-speed vessel

The U.S. Navy's Military Sealift Command (MSC) has extended the charter of the Austal high speed vessel WestPac Express for 6 months with the award of a US\$7.0 million modification to the contract announced in December 2011. This modification exercises the second of three 6-month charter options in the contract. The first was exercised in August 2012. As a result, the 101-m catamaran will continue to support the operations of the U.S. Marine Corps' Third Marine Expeditionary Force from its base in Okinawa, Japan until at least August 2013. WestPac Express has been performing this role since July 2001. Since that date, the ship has achieved in excess of 99% technical availability.

Bollinger delivers the CGC Robert Yered

Sister ship of the Robert Yered, Bernard C. Webber operating in the U.S. Gulf of Mexico.

Bollinger Shipyards, Inc. has delivered the Robert Yered, the fourth Fast Response Cutter (FRC), to the U.S. Coast Guard (USCG).

The announcement was made by Bollinger executive vice president of new construction, Chris Bollinger, "We are very pleased to announce the delivery of the Robert Yered to USCG Sector Miami. We look forward to the vessel's commissioning and honoring Robert J. Yered."

The 154-ft patrol craft Robert Yered is the fourth vessel in the Coast Guard's Sentinel-class FRC program. To build the FRC, Bollinger Shipyards used a proven, in-service parent craft design based on the Damen Stan Patrol Boat 4708. It has a flank speed of 28 kts, state-of-the-art command, control, communications, and computer technology, and a stern launch system for the vessel's 26-ft cutter boat. The FRC has been described as an operational "game changer" by senior Coast Guard officials.

The Coast Guard took delivery 17 November 2012 in Key West, Florida and is scheduled to commission the vessel in Miami, Florida in late February 2013.

Each FRC is named for an enlisted Coast Guard hero who distinguished him or herself in the line of duty. This vessel is named after Coast Guard Hero, Engineman First Class Robert J. Yered for gallantry in action while engaged in military operations involving conflict with an armed hostile force in the Republic of Vietnam. The President of the United States presented Robert J. Yered with the Silver Star.

Bollinger Shipyards, Inc. is a leading designer and builder of fast military patrol boats, ocean-going double hull barges, offshore oil field support vessels, tug boats, rigs, liftboats, inland waterways push boats, barges, and other steel and aluminum products from its new construction shipyards. Bollinger has 10 shipyards and all are strategically located between New Orleans and Houston with direct access to the Gulf of Mexico, Mississippi River, and the Intracoastal Waterway. Bollinger is the largest vessel repair company in the Gulf of Mexico region, with a total of 28 dry-docks in Louisiana and Texas.

For more information, visit www.bollingershipyards.com.

Austal delivers first Joint High Speed Vessel - USNS Spearhead (JHSV 1)

The first Joint High Speed Vessel (JHSV), USNS Spearhead (JHSV 1), was officially delivered by Austal to the U.S. Navy on 5 December 2012. The signing event was attended by Craig Perciavalle, senior vice president of Austal USA, representing the builder. The USNS Spearhead successfully completed Acceptance Trials in September and will sail away later this year.

Austal USA interim president and chief financial officer, Brian Leathers, had this to say regarding the delivery of Austal's first JHSV: "The delivery of the USNS Spearhead is a significant achievement for Austal and adds to the rich history of Mobile as a hub of shipbuilding activity in the United States. Austal USA has delivered 12 ships in 11 years, certainly a major contributor to the shipbuilding legacy of Mobile, Alabama."



The 103-m (338-ft) long aluminium catamarans are designed to be fast, flexible, and maneuverable, even in shallow waters, making them ideal for transporting troops and equipment quickly within a theater of operations. The ship has the ability to support a variety of operations, supporting the warfighter through traditional logistics missions, humanitarian support projects, disaster response, or maritime law enforcement activities.

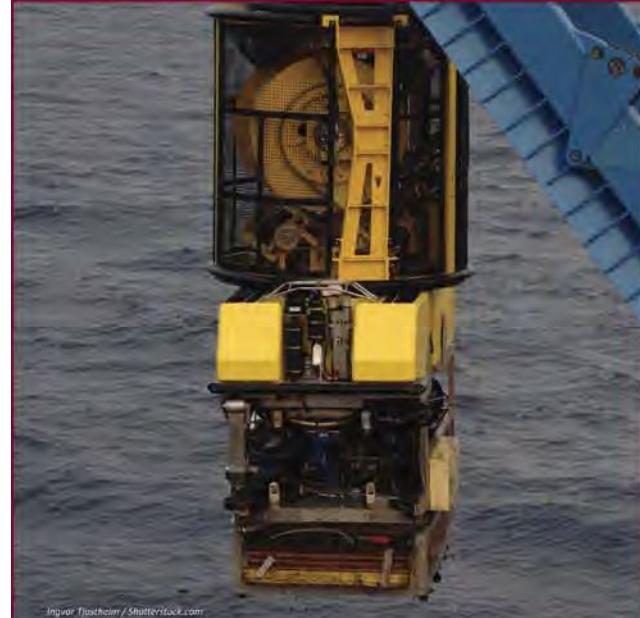
Austal is currently under contract with the U.S. Navy to build nine 103-m JHSVs under a 10-ship, US\$1.6 billion contract and five 127-m Independence-variant LCS class ships, four of which are a part of a 10-ship, US\$3.5 billion contract.

For more information, visit www.austal.com.

Falling up: DARPA to launch just-in-time payloads from bottom of the sea

Today, cost and complexity limit the Navy to fewer weapons systems and platforms, so resources are strained to operate over vast maritime areas. Unmanned systems and sensors are commonly envisioned to fill coverage gaps and deliver action at a distance. However, for all of the advances in sensing, autonomy, and unmanned platforms in recent years, the usefulness of such technology becomes academic when faced with the question, "How do you get the systems there?" DARPA's Upward Falling Payloads (UFP) program seeks to address that challenge.

The UFP concept centers on developing deployable, unmanned, distributed systems that lie on the deep-ocean floor in special containers for years at a time. These deep-sea nodes would then be woken up remotely when needed and recalled to the surface. In other words, they "fall upward."



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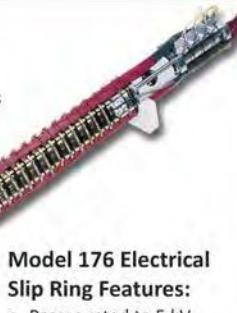
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"The goal is to support the Navy with distributed technologies anywhere, anytime over large maritime areas. If we can do this rapidly, we can get close to the areas we need to affect, or become widely distributed without delay," said Andy Coon, DARPA program manager. "To make this work, we need to address technical challenges like extended survival of nodes under extreme ocean pressure, communications to wake-up the nodes after years of sleep, and efficient launch of payloads to the surface."

Almost half of the world's oceans are more than 4 km deep. This provides considerable opportunity for cheap stealth. The vastness and depth make retrieval costs prohibitive. Despite this, the UFP program is specifically not a weapons program, and the risks to losing any single node will be minimal.

Depending on the specific payload, systems would provide a range of non-lethal but useful capabilities such as situational awareness, disruption, deception, networking, rescue, or any other mission that benefits from being pre-distributed and hidden. An example class

of systems might be small unmanned aerial vehicles (UAVs) that launch to the surface in capsules, take off and provide aerial situational awareness, networking or decoy functions. Waterborne applications are sought as well.

For more information, visit <http://go.usa.gov/4Cjh>.

SAAB receives order for AUV62

Defense and security company Saab has signed a contract on delivery of autonomous underwater vehicles systems, AUV62, in training configuration.

The order has a total value of MSEK 269 and comprises supply and long-term maintenance and support of AUV62, the latest version of the advanced training target for Anti Submarine Warfare (ASW) training.

"We are very proud of the confidence our customers place in the AUV62 system and are satisfied to have been able to secure this order for the system," says Görgen Johansson, senior vice president and head of business area dynamics.



The industry's nature is such that depending on circumstances concerning the product and customer, information regarding the customer will not be announced.

The AUV62 is an advanced and highly modern and capable system for cost-efficient training of a navy's ASW forces. The AUV62 is an artificial acoustic target that mimics a submarine in a way that is compatible with any torpedo- and sonar system on the market today. The AUV62 system fully replaces the use of a submarine in the role as a maneuvering training target. With the AUV62 Saab offers a state-of-the-art training capability for demanding customers investing in the future.

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Huntington Ingalls Industries' AMSEC subsidiary wins U.S. Navy contract

Huntington Ingalls Industries announced that its AMSEC LLC subsidiary has been awarded a contract by the U.S. Navy's Space and Naval Warfare Systems Command (SPAWAR). The contract is in support of design, acquisition, production, integration, testing, installation, and configuration management of certified C5ISR capabilities (command, control, communications, computers, combat systems, intelligence, surveillance, and reconnaissance), with a specific focus on submarine and surface ship new construction.

AMSEC was one of several contractors awarded an indefinite-delivery/indefinite-quantity contract that contains a 1-year base period with four 1-year option periods that, if exercised, would bring the cumulative ceiling value for all awardees to approximately \$900 million.

"This competitive award solidifies AMSEC's position as an industry leader in C5ISR services and enables AMSEC to provide support to SPAWAR's critical mission," said Harris Leonard, HII vice president and president of AMSEC operations. "We have an exceptional team ready to support the Navy and continue our record of innovation and superior performance."

The work will be performed worldwide and is expected to be completed by December 2017 if all options are exercised. The Space and Naval Warfare Systems Center Atlantic in Charleston, South Carolina, is the contracting activity.

For more information, visit www.huntingtingalls.com.

Ohio class submarine replacement details emerge

The Ohio Replacement is scaled back from the initial Analysis of Alternatives (AoA) for the program, then dubbed SSBN(X), conducted by NAVSEA in 2009. The initial AoA called for a boat that would have cost \$6 to \$7 billion. But, with the reduction in capability, the Ohio Replacement drove costs down to \$5.6 billion a copy. The eventual goal of the reductions is to produce the boats at \$4.9 billion a copy.

Ohio Replacement is slated to begin construction in 2021 for a planned 2027 delivery when the first Ohio boats are due to be decommissioned. The first strategic deployment for the new class is scheduled for 2031.

Instead of a direct mechanical connection to the Ohio Replacement's propulsion system, the new design will have the boat's nuclear power source run electric motors that will propel the ship. Electric drives could prove to be much quieter than the current direct-drive method.

The Ohio Replacement will have 16, 87-in. missile tubes to field the legacy Trident II D5 ballistic missile. Development of missile "quad-packs" is being conducted in cooperation with the UK Royal Navy for its Successor-class boomer.

USS Guardian investigation to include faulty chart data

A U.S. Navy investigation to assess the circumstances surrounding the USS Guardian (MCM 5) grounding that occurred in Philippine waters will include information on faulty digital navigation chart data that misplaced the location of Tubbataha Reef.

The U.S. National Geospatial-Intelligence Agency (NGA) provided the Navy preliminary findings of a review on Digital Nautical Charts (DNC) that contain inaccurate navigation data and may have been a factor in the Guardian grounding that occurred in the Sulu Sea on 17 January Philippine time.

This action followed up on initial contact made by NGA when the mapping organization first realized there might be a potential inaccuracy regarding the Tubbataha Reef digital chart. NGA has reviewed data from more than 150,000 sq. nmi in the surrounding area and found no additional errors.

Since DNC mapping is used for safe navigation by Guardian and other U.S. Navy ships, Navigator of the Navy Rear Adm. Jonathan White released precautionary guidance to all Fleet and ship commanders. White's message states, "Initial review of navigation data indicates an error in the location of Tubbataha Reef" on the digital map.

"While the erroneous navigation chart data is important information, no one should jump to conclusions," said U.S. Pacific Fleet spokesman Capt. Darryn James. "It is critical that the U.S. Navy conduct a comprehensive investigation that assesses all the facts surrounding the Guardian grounding."

The Avenger-class mine countermeasures ship had just completed a port call in Subic Bay and was en route to Indonesia and then on to Timor-Leste to participate in a training exercise when the grounding occurred.

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Offshore Oil and Gas Decommissioning



*By: Eur. Ing. Brian Nixon, B.Sc. CEng. FIMechE. FEI
Chief Executive, Decom North Sea*

Decom North Sea (DNS) is spearheading a number of initiatives to support the decommissioning industry.

DNS was established to represent the North Sea's oil and gas decommissioning industry and has grown to more than 220 members from the full range of companies and organizations active in the sector. The industry forum is dedicated to developing models and guidelines for the sector, improving efficiency, containing costs, and ensuring economic benefit.

The decommissioning conference, jointly hosted by DNS and Oil & Gas UK, was designed by the industry, for the industry, and has been attended by a growing number of companies each year. The 2012 conference followed on two previously sold-out conferences, with delegates from the UK, Norway, The Netherlands, and the United States.

A number of industry experts shared their knowledge of decommissioning and encouraged delegates to partici-

pate in a range of interactive discussions on topical issues, updates on current projects, and case studies from recent experience. Time was also devoted to delivering updates on various industry initiatives that are underway, including the following:

- Standard template for decommissioning programs;
- Reuse Joint Industry Project (JIP);
- Remuneration models; and
- Knowledge transfer and market information.

Standard template for decommissioning programs

During the conference, DNS launched a streamlined template for the submission of decommissioning programs. The template will now be used by Operators to obtain approval for decommissioning programs in the North Sea.

It followed 6 months of collaborative work facilitated by Decom North Sea, supported by the Department of Energy and Climate Change (DECC) and a working group of DNS member companies (BP, Talisman, CNRI, Marathon Oil, GP Decom, and Optimus Decom), with additional input from Perenco and Wood Group PSN.

Delegates at the conference heard from DECC about its support for this initiative as well as from an Operator who is now testing the template on a live decommissioning project. The template will be validated with a small number of Operators and any details that arise will be incorporated into a streamlined template and adopted by DECC in 2013 for a 1-year trial period.

This has been a great first example of DNS members working collaboratively with the government to deliver something that will help the industry to get its decommissioning plans authorized more quickly and easily by DECC.

Reuse Joint Industry Project (JIP)

DNS is project managing a JIP on behalf of partners Marathon, BP, Shell, CNRI, and DECC to promote and stimulate the reuse of equipment released during oil and gas decommissioning. This will encompass a range of activities, including a pilot project focusing on the refurbishment and reuse of valves, a study on reuse cases across the oil and gas industry, and a third strand to examine platform inventories and their potential reuse/resale value.

On behalf of the JIP participants, Marathon Oil gave an update on the Reuse JIP Project at the Offshore Decommissioning Conference, encouraging conference delegates to focus on reuse as well as recycling and giving examples from other industries in which reuse is prevalent. Given the potential economic, environmental, and market benefits, it is important for North Sea industry and governments to work together to overcome the challenges preventing reuse. There needs to be a shift in their approach to focus on the waste

hierarchy—with reuse as the first option to consider.

Remuneration models

In 2010, Accenture partnered with Robert Gordon University and coached a group of MBA students to develop model contracting strategies for decommissioning in the North Sea. DNS provided context and direction for the study and brought together an industry support group to assist in the research development. This initial research led to further development of the models to address each phase of decommissioning from a risk perspective.

A draft framework was presented by Accenture during the 2011 Offshore Decommissioning Conference, when 200+ delegates were asked to assess the framework and provide input for one decommissioning phase or type of structure relevant to their experience. Over 70% of the delegates supported the need to further develop the framework.

Having obtained this industry endorsement, a detailed questionnaire was developed and issued to all DNS member companies to obtain the industry perspective of the various types of risk that occur throughout a typical decommissioning project. The survey also assessed how controllable these risks are across a number of different types of offshore structures, with respondents providing their views on appropriate remuneration models for each set of conditions.

The results of this survey and analysis of the remuneration models were presented at the 2012 Offshore Decommissioning Conference and are available to DNS members on the website. Building on the success of this analysis of different decommissioning risks, consideration is being given to developing the appropriate contracting models for different phases of decommissioning.

Knowledge transfer and market intelligence

Knowledge transfer among the industry remained an important aspect of the Conference. This year, Shell shared its experience on the Brent project to date; BP presented on the

subsea (decommissioning) aspects of the BP Schiehallion redevelopment project; an update on progress on the Ekofisk programme was given; and a case study was presented on the removal of Wintershall Q8 A&B platforms in the Dutch sector of the Southern North Sea. Among delegates, there was a genuine willingness to share ideas and information and consider innovative approaches.

Future market information remains an issue for the industry, but progress is being made in the level of detail now available from the industry's annual surveys. Specific focus is now directed on the next 5-year period, indicating forecast expenditure in the UK Continental Shelf alone of £4.5 billion between 2013 and 2017.

New Event

Building on the output from this year's conference, DNS will stage a focused industry event on 27 March 2013 at the Aberdeen Exhibition and Conference Centre to explore the decommissioning challenges faced by both Operators and the rest of the industry and to identify how these challenges can be overcome. The aim of the event, titled Decom Offshore – Confronting Challenges, Creating Opportunities, is to introduce Operators and major contractors to innovative technologies and solutions that can help overcome key challenges faced in decommissioning projects, recognizing that many such innovations may emerge from small or very small organisations. The event will also highlight some of the issues faced by individual companies when trying to enter or expand into the decommissioning market. DNS hopes that the event will identify widespread industry issues that can then be addressed through future projects.

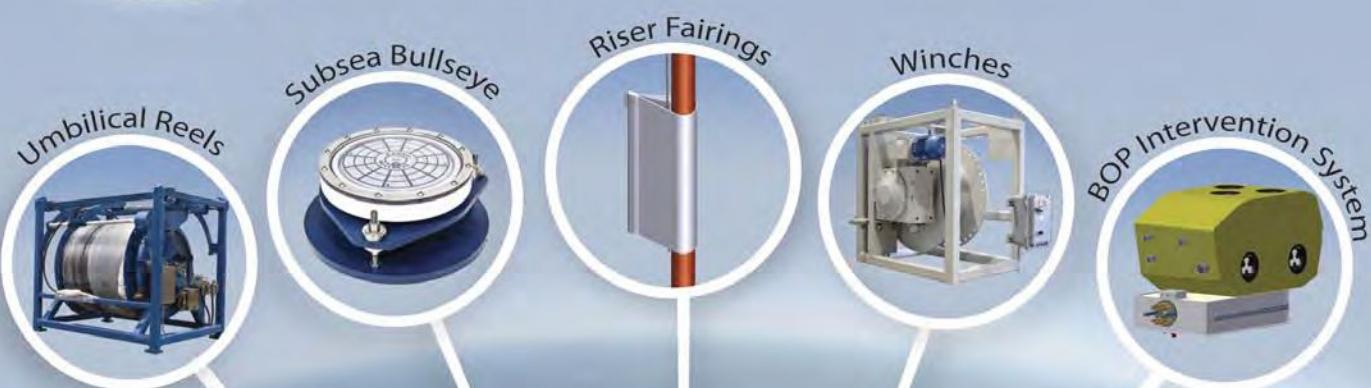
The Offshore Decommissioning Conference 2013, jointly organized by Decom North Sea and Oil & Gas UK, will be held on 2-3 October at the Fairmont Hotel, St Andrews.

For more information about this event, visit www.decomnorthsea.com.



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OFFSHORE INDUSTRY

A record \$254B in oil and gas M&A deals reported for 2012

Global merger and acquisition activity for upstream oil and gas deals in 2012 totaled \$254 billion in 679 deals, PLS Inc., in conjunction with Derrick Petroleum Services, reported. The dataset is from their industry global M&A energy transactions database and includes all upstream oil and gas deals with values disclosed.

Total deal value in 2012 surged 50% higher versus 2011 to a record \$254 billion, eclipsing the prior record of \$212 billion in 2010, according to Houston-based PLS.

However, during 2012, three mega-deals accounted for \$97 billion, or 38%, of the total: Rosneft's \$62 billion acquisition of TNK-BP, CNOOC's \$18 billion acquisition of Nexen, and Freeport-McMoRan Copper & Gold's \$17.2 billion buy of Plains E&P.

Excluding these mega-deals, 2012 activity in terms of deal value is on par with the prior 5-year annual average of \$160 billion. Also, during the fourth quarter of 2012, PLS said it witnessed an unusually high level of deal activity totaling \$137 billion in 181 deals, as many sellers were motivated to complete deals in advance of the uncertainties surrounding the second term of President Obama and the implications of U.S. government policy changes regarding the fiscal cliff.

Singapore benefits from global FPSO vessel demand: GBI report

Orders for FPO and FPSO conversions have work booming in Singapore, concludes a GBI Research report. It found about 70% of the global FPSO construction work is being done in Singapore in addition to the regular ship repair work usually in progress.

Keppel shipyard has three conversion contracts worth \$82 million, one each from Petro Vietnam Technical Services (PTSC) Asia-Pacific Pte Ltd., Perenco Group, and BC Petroleum.

PTSC has contracted the shipyard to convert a tanker into a FPSO to be deployed in the Thang Long and Dong Do oil fields in the Cuu Long basin offshore Vietnam, with a scheduled completion date of late 2013.

The contract with Perenco involves

the conversion of a tanker into an FPSO unit to be deployed in the Lucina field offshore Gabon in 2013.

The contract with BC Petroleum involves the conversion of a tanker into an early production vessel to be deployed in the Balai Cluster oil fields offshore Malaysia.

Keppel is already engaged in six FPSO and FSO contracts.

Global markets to drive 2013 oil and gas spending: Barclays

Oilfield activity outside North America will drive a 7% increase in 2013 global energy exploration and production (E&P) spending to a record high of \$644 billion, according Barclays analysts.

While budgets will grow 9% in international markets to \$460 billion, North America spending will "take a breather" after years of growth and be roughly flat in 2013, Barclays found after surveying more than 300 oil and gas companies.

Companies are basing their 2013 spending plans on oil prices of \$98 Brent and \$85 West Texas Intermediate and U.S. natural gas prices of \$3.47, Barclays said.

"These projections suggest our early look at 2013 spending levels may underestimate total spending levels," it added.

BP and affiliates suspended from federal contracts over GoM oil spill

The U.S. Environmental Protection Agency (EPA) has imposed a temporary suspension on UK-based BP and all its affiliates from new Federal government contracts, following its response over the 2010 Gulf of Mexico oil spill.

EPA said the decision to suspend BP was taken considering the firm's "lack of business integrity" in dealing with the disaster that posed substantial environmental challenges for the United States.

EPA would consider lifting the temporary ban on BP, only after proper evidence of "present responsibility" is provided by the company that it would comply with Federal business standards to conduct business with the U.S. government. In response to the suspension, BP issued a statement saying that it had already submitted a present responsibility statement and provided answers to EPA's questions over submission.

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ExxonMobil sees 35% growth in energy demand from 2010-2040

Global energy demand in 2040 will be about 35% higher than in 2010, ExxonMobil Corp. projects in its "Outlook for Energy" report. It concludes that future energy needs will be supported by more efficient energy-saving practices and technologies, increased use of less carbon-intensive fuels such as natural gas, nuclear and renewables, and the development of unconventional energy sources that were previously inaccessible without technology advances.

"Energy is fundamental to our way of life and essential to grow our economy," said Rex W. Tillerson (photo), Exxon's chairman and chief executive officer.

Oil will continue to be the most widely used fuel, but natural gas—the fastest-growing major fuel—is expected to overtake coal by 2025 as the second most-used fuel. Demand for natural gas will increase by about 65% through 2040, and 20% of global production will occur in North America, supported by growing supplies of gas from shale and other unconventional sources.

New technologies will continue to be key to development of reliable and affordable energy, which is central to economic growth and human progress, the Outlook for Energy Report concludes. Significant advancements in oil and natural gas technologies have safely unlocked vast new supplies, already changing the energy landscape in North America and expanding supplies to help meet growing global energy demand.

The report projects that North America is likely to transition to a net energy exporter by 2025. Over the next two decades, more than half of the growth in unconventional natural gas supply will be in North America, providing a strong foundation for increased economic growth across the country.



BP spill settlement gets final U.S. government approval

A Federal judge has given final approval to BP's settlement with a bulk of businesses and individuals who lost money because of the 2010 oil spill in the Gulf of Mexico. BP has estimated it will pay \$7.8 billion to resolve economic and medical claims from more than 100,000 businesses and individuals hurt by the nation's worst offshore oil spill. The settlement has no cap; the company could end up paying more or less.

U.S. District Judge Carl Barbier, who gave his preliminary approval in May, made it final in a 125-page ruling.

"We believe the settlement, which avoids years of lengthy litigation, is good for the people, businesses, and communities of the Gulf and is in the best interests of BP's stakeholders," company spokesman Scott Dean said in a statement.

A statement from plaintiffs' attorneys Steve Herman and Jim Roy praised the settlement program's administrator, Pat Juneau. "This settlement has — and will continue to — bring the people and businesses of the Gulf the relief they deserve," the attorneys wrote.

In mid-November, BP agreed to pay \$4.5 billion in a settlement with the U.S. government, while pleading guilty to 11 counts of misconduct or neglect of ship officers relating to the loss of lives. As part of the resolution, the company also agreed to plead guilty to one misdemeanor count of a violation of the Clean Water Act and one misdemeanor count of a violation of the Migratory Bird Treaty Act.

Coast Guard launches investigation into Kulluk grounding off Alaska

Shell's Kulluk drilling rig was towed to a safe harbor at Kiliuda Bay, Alaska, about a week after running aground New Year's Eve off Sitkaliadak Island. No signs of oil discharge were seen during the transit, according to a statement from Unified Command. Meanwhile, the U.S. Coast Guard launched a formal investigation into the grounding.

Unified Command, which includes the Coast Guard; Noble; Shell; Alaskan local, State, and regulatory agencies; and local community stakeholders, had been trying to regain control of the Kulluk after it came loose from the MV Aiviq 28 December. At the time, the rig was being towed from Alaska to Seattle for repair work. However, severe weather conditions hampered efforts for vessels to re-establish a link with the rig.

The Kulluk floating drilling platform was being used by Shell for exploratory



Kulluk drilling rig runs aground in Alaska

drilling in Alaska's Beaufort Sea.

The anchor-handling vessel MV Aiviq towed the rig an average speed of 4 mph over 45 nmi, which took roughly 12 hours. The Kulluk had refloated from its position in Ocean Bay off Sitkaliadak Island late 6 January.

The Kulluk was to remain connected to its support vessels while it underwent assessment in Kiliuda Bay, approximately 30 mi north of Ocean Bay. The rig's final location for assessment within the bay was to be determined by weather and other environmental conditions.

The Coast Guard cutter Alex Haley escorted the rig to Kiliuda Bay along with two oil spill response vessels and other support vessels. A 500-yard radius safety zone around the Kulluk followed the escort and remained in place in Kiliuda Bay.

EIA sees U.S. crude oil production increasing to 7.9M b/d in 2014

The U.S. Energy Information Administration (EIA) estimates in its latest "Short Term Energy Outlook" report that total U.S. crude oil production averaged 6.4 million b/d in 2012, an increase of 800,000 b/d from the previous year. Domestic production is projected to increase to 7.3 million b/d in 2013 and to 7.9 million b/d in 2014, which would mark the highest annual average level of production since 1988.

However, total U.S. liquid fuels consumption fell from an average of 20.8 million b/d in 2005 to 18.6 million b/d in 2012. EIA expects total consumption to rise slowly over the next 2 years to an average 18.8 million b/d in 2014, driven by increases in distillate and liquefied petroleum gas consumption, with flat gasoline and jet fuel consumption.

EIA expects that the Brent crude oil spot price, which averaged \$112 per barrel in 2012, will fall to an average of \$105 per barrel in 2013 and \$99 per barrel in 2014. The projected discount of West Texas Intermediate (WTI) crude oil to Brent, which averaged \$18 per barrel in 2012, falls to an average of \$16 per barrel in 2013 and \$8 per barrel in 2014, as planned new pipeline capacity lowers

the cost of moving Mid-continent crude oil to the Gulf Coast refining centers.

EIA expects that falling crude prices will help national average regular gasoline retail prices fall from an average \$3.63 per gallon in 2012 to annual averages of \$3.44 per gallon and \$3.34 per gallon in 2013 and 2014, respectively. Diesel fuel retail prices averaged \$3.97 per gallon during 2012 and are forecasted to fall to an average of \$3.87 per gallon in 2013 and \$3.78 per gallon in 2014.

Natural gas working inventories, which reached a record-high level in early November, ended 2012 at an estimated 3.5 tcf, slightly above the level at the same time the previous year. EIA expects the Henry Hub natural gas spot price, which averaged \$4 MMBtu in 2011 and \$2.75 MMBtu in 2012, will average \$3.74 MMBtu in 2013 and \$3.90 MMBtu in 2014.

Ken Salazar to step down as U.S. Interior secretary in late March

Interior Secretary Ken Salazar, who led the response to the 2010 BP oil spill in the Gulf of Mexico and administered a controversial moratorium on offshore drilling, said he plans to relinquish his Cabinet post in late March and return home to Colorado.

Salazar, 57, spent 8 years in Washington, 4 years in the U.S. Senate, and 4 years as head of the Interior

Department. He was most prominent when he spearheaded the Administration reaction to the BP Deepwater Horizon drilling rig explosion and oil spill in the Gulf of Mexico. He issued a 6-month drilling moratorium

after the 20 April 2010, disaster, which killed 11 workers and spilled millions of gallons of oil from a ruptured well.

Critics, including Republican leaders, Gulf State officials, and Gulf Coast residents, slammed the ban. They said it would hurt oil and gas workers in the already hard-hit coastal communities, where hundreds of jobs were lost because of the disaster.

"As you know, the Secretary and I have had different views on some issues for some time. However, while I've disagreed on the policy, we haven't been disagreeable on a personal level," Jack Gerard, chief executive officer of the American Petroleum Institute, told reporters at an event hosted by the U.S. Energy Association.

DNV launches design framework for a floating structures in ice

The oil and gas industry has lacked adequate and transparent design practices for floating structures in ice-covered Arctic waters. Now, DNV and key industry players have developed an enhanced design framework for such structures, adapted from existing and established design practices used for open waters in other harsh areas. The approach represents a shift in Arctic design philosophy.

In order to ensure a common, transparent, and documented approach to achieving acceptable safety levels for offshore structures in cold-climate regions, a DNV-led joint industry project (JIP), ICESTRUCT, has since 2009 worked to develop a designer-friendly and reliable framework based on the ISO 19906 Arctic Offshore Structure standard.

Per Olav Moslet, Arctic technology research program director at DNV, explained that the governing design loads for offshore structures in Arctic areas are usually based on interaction with ice, and it is extremely important that these loads and their effects are treated consistently. Due to the lack of a common industry approach for floating structures in ice, he said, it has previously been difficult for designers to establish the appropriate design loads effects.

"Because of its nature, ice can generate considerable loads, and structures designed for Arctic operations may look different to structures in open seas," Moslet added. "However, ice loads and associated load effects should be treated in the same way as any other environmental load when designing a structure since, in principle, an Arctic offshore structure is no different from any other offshore structure when it comes to assessing adequate structural strength."

JIP has developed a methodology for determining ice load effects. Rather than having a specific custom-made Arctic design practice for ice loads, the methodology developed in the JIP is consistent with existing methods for determining other environmental load effects. Consequently, the existing offshore design practice that has been used for several decades in the North Sea and elsewhere can be used for the design of offshore floating structures in ice.

"The advantage of the new DNV framework is that the same design practice can be used irrespective of the type of structure and environment — Arctic or open sea. That said, the nature and variability of the ice and its complex interaction with structures need to be taken into account," Moslet says.



Per Olav Moslet

Iceland awards first offshore oil and gas exploration licenses

Orkustofnun, the National Energy Authority of Iceland, has awarded the country's first offshore oil and gas exploration licenses on the Icelandic Continental Shelf (ICS). As part of the licensing, the agency identified two blocks in the Dreki (Dragon) region in Iceland's part of the Jan Mayen Ridge and awarded licenses to two UK-based consortiums.

Orkustofnun said the blocks on offer in

the Dreki area are spread across 12,500 sq.mi at depths of between 2,600 and 6,600 ft. As part of the license, the two consortiums can begin exploration and production of hydrocarbons in the Dreki area, where the presence of sedimentary rocks and an active hydrocarbon system has been observed from seabed samples.

The first license was awarded to a consortium that included Faroe Petroleum, Iceland Petroleum, and Petoro; each holding 67.5%, 7.5%, and 25% interest, respectively. The second

license was awarded to another consortium led by Valiant Petroleum, holding 56.25%. Other members of the consortium include Petoro (25%) and Kolvetti (18.75%). Petoro Iceland, a wholly owned subsidiary of Norwegian firm Petoro, won the ICS contract as part of a bilateral agreement signed between Iceland and Norway in 1981. The Dreki area is part of the Norwegian island of Jan Mayen and is located between the Norwegian and Greenland continental shelves.

Drilling activity on UK Continental Shelf jumped 33% in 2012: Deloitte

A broader range of tax allowances and a sustained high oil price boosted drilling activity on the UK Continental Shelf (UKCS) by one third in 2012, according to a new report by business advisory firm Deloitte.

The report, compiled by Deloitte's petroleum services group (PSG), which documents last year's drilling and licensing activity across Northwest Europe, shows 65 exploration and appraisal wells were drilled on the UKCS in 2012, marking a 33% increase on the previous year's total of 49. This compares to lower drilling activity levels reported in Norway in 2012, down by 19% when compared to the previous year. A range of other key indicators suggest positive prospects for the sector in 2013, following a range of tax breaks introduced by the UK government to stimulate activity in the North Sea during 2012.

Last year also saw a surge in deal activity (where oil and gas fields are bought and sold). Across Northwest Europe, 129 deals were announced, 80 of which took place in the UK. This equates to a 30% increase on the UK's 2011 deal figure. These were split almost equally between farm-ins — companies taking a stake in another company's field — and deals to purchase oil and gas fields, at 40% and 43%, respectively. This compares to 64% of all deals in 2011 being farm-ins and deals to purchase fields only representing 14%. The fact that companies are buying more fields outright is another indicator of rising investor confidence, Deloitte reported.

Interest in field development also reached a 10-year high. The Department of Energy and Climate Change (DECC) granted 21 field development approvals, and eight incremental projects — investment in older fields for redevelopment — were sanctioned. Last year was also the fourth consecutive year in which steady growth in field development approvals was reported, the firm added.

Supporting safe, efficient and cost-effective decommissioning

By: Mike Duncan, UK Operations Director, and Bas Pauwels, product line director for relocations, Stork Technical Services

Decommissioning projects across the globe are on the rise despite the high oil price and drive to extract more reserves from existing fields. Douglas-Westwood and Deloitte predicted in the North Sea Decommissioning Market Report, released in November 2011, that the cost of North Sea decommissioning could exceed £47.5 billion over the next 40 years.

As the industry approaches the challenges of cessation of production and the decommissioning of assets it is essential that in the effort to reduce costs, projects are carried out safely, efficiently and competently. Organisations that provide integral support services, such as specialist cleaning, waste removal and management, NDT (non-destructive testing) and access solutions, have a direct role in delivering decommissioning to these high standards.

Lessons learned and experience gained by Stork Technical Services (Stork) demonstrates that involving contractors in the early planning process, having a key focus on safety and training, and developing and deploying innovative technology significantly improves the safety, efficiency and cost-effectiveness of the related workscopes.

Managing the risks

When the decision is taken to cease production and decommission an asset it is essential that, in the effort to reduce costs, projects are carried out safely, efficiently and competently. An installation may have been producing for thirty years with the same core workforce operating on it since hook-up and commissioning. For these individuals in particular, and the rest of the offshore team, it is important to realise that it is not 'business as usual'.

A platform's risk profile changes when the production of hydrocarbons has ceased and the installation moves into the engineering down and cleaning, and module process and utility separation phases. The move from hydrocarbon production to an active reduction in the hydrocarbon inventory changes the working practices and other specialist service providers, such as waste handling specialists and heavy lift contractors, become involved in the project.

Clarifying the workscopes, developing the methodology, working practices and quantifying the resources required to progress the project, will help ensure it is delivered in a

safe and efficient manner. The detailed plans developed as a result of this process will allow the work to be scheduled to maximise resource utilisation, optimise activity and improve logistics. Integrated project plans with multi-skilled teams is one way to improve efficiency while reducing the numbers of personnel offshore, for example, mobilising multi-disciplined technicians that utilise rope access solutions.

Making safety the priority

With separation, lifting and removal taking place in various areas across the installation, safety escape routes may not be available as they were during the operational phase and it is not uncommon for them to change on a daily basis. Work will also be undertaken in modules that have been partly decommissioned and work may be required to enhance the working environment for safe operations, such as walkway enhancement workscopes.

The introduction of many new personnel who are unfamiliar with the installation can often be perceived as a potential risk by the existing platform team. However, personnel that are new to the installation can offer a different perspective and see potential hazards that may have not been immediately obvious to the incumbent platform team. Feedback from new personnel should be actively encouraged to ensure the points highlighted are acted upon.

Stork's decommissioning philosophy and operations centre around its REACH safety initiative. REACH is at the heart of the company's decommissioning activity and is a crucial focus for all project planning, training and operations, from competency evaluations to in-depth inductions and preparing workpacks.

Innovation in decommissioning

Developing and deploying innovative technology also plays a major role in delivering decommissioning projects cost-effectively and to the highest HSEQ standards. Stork is currently involved in a major North Sea decommissioning project and recently saved its client almost £5million on an upcoming fabric maintenance workscope through the use of innovative inspection and coatings technologies.

Stork inherited a number of substantial drill derrick paint-

ing workscopes after winning the contract but as the asset will be fully decommissioned by 2015, the company's project delivery team challenged the requirement to deliver these as agreed.

A comprehensive close visual inspection reduced the quantity of surface area to be treated from 4365m² to 2553.43m², a saving of 42%. In addition, the introduction of a wax oil preservative coating to treat the drill derrick realised further savings of 1,725 man-hours. The wax oil will allow the coating works to be completed in around 14 days compared with six weeks for conventional paint treatment. The reduction in time means it can also be delivered during a planned pause in drilling operations rather than an unplanned shutdown which can cost up to £100,000 per day.

Conclusion

Decommissioning an offshore installation is a long complex process which requires the operator and contractors to work together to safely deliver the project. Involving contractors in the early planning stages can significantly improve the efficiency of workscopes and optimise the working processes to reduce man-hours and personnel onboard.

Safety remains of the utmost importance and the relevant training must fully explain the potential hazards of moving from a live to a hydrocarbon reduction environment and the changes in risk profile. As well as ensuring the correct personnel with the right skills are mobilised, deploying innovative technology and working practices can deliver significant HSEQ and bottom-line benefits. Working to these standards and operating practices, contractors can help operators reduce costs while ensuring a focus on achieving the highest safety standards are maintained.



Maintaining safe working conditions in a changing environment is critical to decommissioning projects

Helix has oil discovery at Wang in Green Canyon
 Helix Energy Solutions Group has a Gulf of Mexico oil discovery at the Wang exploration well in the Phoenix field located in Green Canyon Block 237. The well, 93 mi offshore Louisiana, found more than 100 ft of net pay. It was drilled to a total depth of 18,300 ft in 2,300 ft of water. It was being completed and will produce via a subsea tieback to the Helix Producer 1 FPU in the second quarter of 2013. "Preliminary data from downhole test tools confirmed oil in the Wang well with over 11,800 psi of bottomhole pressure. We are moving ahead to complete the well," said Johnny Edwards, president, Energy Resource Technology GOM, a Helix subsidiary. ERT is operator and holds a 70% working interest in the well. Sojitz Energy Venture Inc. owns the other 30%.

Aker to supply Ichthys subsea tie-in connectors
 Aker Solutions has signed a contract with McDermott for delivery of subsea tie-in connectors to the Ichthys LNG project offshore northwestern Australia for \$90 million. The scope of work includes the delivery of 6-in to 18-in. horizontal and vertical diverless tie-in connectors to be included in the McDermott umbilicals, risers, and flowline scope for the Ichthys LNG project. McDermott is the lead contractor for the Ichthys LNG SURF field development project. The tie-in connector project will be executed by Aker Solutions' headquarters at Fornebu, Norway. Manufacturing will be handled by the strategic supply chain network, and the expected delivery date is from 2013-2014. The connectors will be used to connect flowlines to subsea structures, manifolds, and export riser bases.

Total returns to Technip for Girassol Phase 2
 Total E&P Angola has awarded Technip an engineering, procurement, construction, and commissioning contract for Phase 2 of the Girassol Resources Initiatives 131 mi offshore Angola in 4,264 ft of water. The project includes 13 mi of umbilicals; 8 mi of interconnecting power cable between the Dalia and the Girassol FPSO recovery; and disposal of four rigid spools and the installation of eight new flexible spools. The flexible spools will be fabricated at Technip's manufacturing plant in Le Trait, France. The offshore campaign is scheduled for the end of 2014, with the main installation vessel from Technip's fleet. Girassol came onstream in late 2001.

Subsea 7 receives \$1.3B in various contracts
 Subsea 7 S.A. was awarded a subsea, umbilical, riser, and flowline (SURF) contract valued at about \$800 million from Total E&P Norge AS for the development of the gas field Martin Linge, located 180 km west of Bergen in the North Sea. The company also announced extension of both of its underwater services contracts by Shell Upstream International Europe. The extension of both contracts will commence in 2014 and continue until at least 2016. The extension in aggregate is worth approximately \$360 million. It also was awarded a topside contract valued at approximately \$150 million from Chevron.

Cobalt, Noble Energy score GoM discoveries

E&P independents Cobalt International Energy and Noble Energy have notched separate discoveries in deepwater Gulf of Mexico, with Cobalt's North Platte find alone ranging in size up to a whopping 850 MMboe.

Cobalt said it struck oil at its North Platte prospect on Garden Banks Block 959. Based on extensive wireline evaluation, the discovery well encountered several hundred feet of net oil pay in multiple Inboard Lower Tertiary sands.

"North Platte is particularly important for Cobalt because it confirms our geologic model of the Inboard Lower Tertiary Trend where Cobalt holds a substantial acreage position with several follow-on prospects," said James W. Farnsworth, Cobalt's chief exploration officer.

"We are also pleased that based on our preliminary analysis of well and wireline data, North Platte is in line with the pre-drill estimate of net pay. This success is an important reminder that the Gulf of Mexico continues to hold prolific hydrocarbon potential."

Cobalt's pre-drill "mean upside" resource estimate for North Platte was 400 to 850 MMboe, with a "mean" net pay thickness of 350 ft.

North Platte is located in about 4,400 ft of water and was drilled to a total depth of roughly 34,500 ft. Cobalt first attempted to drill this prospect in May 2010 and had a rig on the North Platte well location preparing to spud when the Department of the Interior implemented the 2010 drilling moratorium, requiring Cobalt to move the rig off the well location.

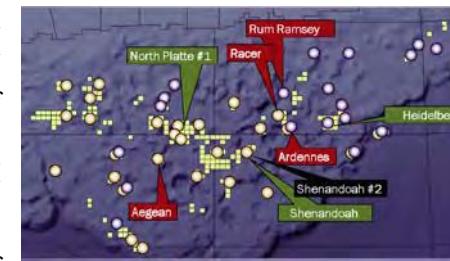
Cobalt is the operator of North Platte and has a 60% working interest in the prospect. Total E&P USA, Inc. is Cobalt's partner in the discovery, with a 40% working interest.

Meanwhile, Noble Energy reported a discovery at its Big Bend prospect in Mississippi Canyon Block 698. The exploration well, drilled in 7,200 ft water depths by the ENSCO 8501 rig to a total depth of 15,989 ft, encountered around 150 ft of net oil pay in two high-quality Miocene reservoirs.

The Big Bend well results "appear at least as good as our pre-drill mean resource expectations" and provide momentum for development of the company's nearby Troubadour prospect, said Charles Davidson, Noble Energy's chairman and chief executive officer.

Noble Energy has said the Big Bend and Troubadour fields combined could hold an estimated 90 MMboe.

Noble Energy has a 54% operated interest in Big Bend, with partners W&T Energy (20%), Red Willow Offshore (15.4%), and Houston Energy Deepwater Ventures (10.6%). Noble operates Troubadour with 87.5% interest.



ENSCO 8501 drilling rig

Gulf of Mexico



Western GoM lease sale exceeds \$133M in apparent high bids

High bids from November's Western Gulf of Mexico lease sale totaled more than \$133 million on 116 tracts covering 652,522 acres, according to the U.S. Bureau of Ocean Energy Management (BOEM). Each bid was to go through an evaluation process within BOEM to ensure the public receives fair market value before a lease is awarded. A total of 13 offshore energy companies submitted 131 bids in Lease Sale 229.

ConocoPhillips and Chevron were the most active players, together netting 90 high bids. Other active companies included BHP Billiton Petroleum with 10 high bids and Exxon Mobil with four.

Most of the interest was in the Alaminos Canyon, where Shell's Perdido platform is located, and the East Breaks area. Water depths on the blocks range from 656 ft to more than 5,248 ft.

The highest bid on a single tract was \$17,221,317 by Chevron for East Breaks Block 546. Chevron U.S.A., Inc. submitted the highest total amount in bonus bids, totaling \$56,031,099 on 28 tracts. Chevron won drilling rights in four East Breaks blocks.

BOEM also announced that the next Central Gulf of Mexico lease sale, proposed Lease Sale 227, will take place on 20 March 2013, covering 38 million acres offshore Louisiana, Mississippi, and Alabama.

Technip to start construction work for the Heidelberg spar in U.S. Gulf

Technip received instructions from Anadarko Petroleum Corp. to begin the engineering, construction, and transport of a 23,000 ton Truss Spar(1) hull for their Heidelberg field development. The field is located in the U.S. Gulf of Mexico at a water depth of 5,310 ft.

The Letter of Intent allows Technip to begin construction work on the project and other early works, including purchase of long-lead items for the hull and start of fabrication in advance of the expected project sanctioning around mid-2013, after which it will enter into Technip's backlog.

The Heidelberg Spar(2) will have a capacity of more than 80,000 b/d of oil and 2.3 million m³ of natural gas per day.

Technip's operating center in Houston, Texas will provide the overall project management and engineering. The detailed hull design and fabrication will be carried out by Technip's construction yard in Pori, Finland where most of Technip's Spar projects have been manufactured.

"After Lucius, awarded last year and

currently being built in our yard in Pori, Heidelberg will be the eighth Spar delivered by Technip to Anadarko," noted David Dickson, Technip's senior vice president, North America Region. "Not only does it (Letter of Intent) strengthen our long-lasting relationship with Anadarko, but it also confirms its continuous trust in the Group's extensive know-how and expertise in Spar technology."

The spar will be the 17th delivered by Technip (out of 20 worldwide).

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New Allseas positioning contract for entire fleet goes to Veripos

Allseas, a global leader in offshore pipeline installation and subsea construction, has awarded Veripos a further 3-year contract for continuing provision of specialist GNSS positioning services for its entire fleet of vessels headed by the world's largest pipelaying vessel, the 300 m Solitaire.

Other vessels concerned include companion DP pipelayers Audacia and Lorelay in addition to the DP trenching



World's largest pipelaying vessel Solitaire

support and subsea installation vessel, Calamity Jane; the anchored pipelay barge, Tog Mor; and the ROSVs Highland Fortress, Highland Navigator, and Highland Rover. Allseas expects to add to its fleet during the course of the contract what will be the world's largest construction support vessel, the platform installation-decommissioning and pipelayer, Pieter Schelte, presently under construction at Daewoo Shipbuilding & Marine Engineering in South Korea.

All vessels are to be provided with Veripos's full range of proprietary high-precision GNSS positioning services, typically realizing continuous meter-level accuracies, including its latest Apex2 service utilizing precise point positioning (PPP) methods in conjunction with both GPS and Glonass satellite constellations. Associated vessel hardware being provided includes modular LD6 integrated mobile units that can be readily configured to accommodate an extensive range of positioning solutions.

Veripos said the deal marked a further important stage in the company's status as one of the world's foremost suppliers of dedicated positioning services to the international offshore industry.

South Korea's Daewoo to build two LNG carriers for Teekay

South Korea-based Daewoo Shipbuilding & Marine Engineering will build two liquefied natural gas (LNG) carriers for Teekay LNG Partners. Teekay said the carriers will be among the largest to pass through the Panama

Canal, therefore enabling the United States to make LNG exports through the channel upon completion of the expansion project.

The new carriers will join the fleet of Teekay, which charters LNG, LPG, and crude oil marine transportation services to energy and utility companies under long-term contracts. The company's fleet includes 27 LNG carriers, five LPG multigas carriers, and 11 conventional tankers.

Teekay expects to sign long-term lease contracts for the two new carriers before they are delivered in 2016.

Peter Evensen, Teekay GP chief executive officer, said the delivery of the vessels is timed to coincide with the next wave of increased demand for LNG carriers, which is expected when a large number of new liquefied natural gas export projects come on-stream from late-2015.

Design consultant Metizoft rises to major challenge offshore Brazil

Fast-growing marine design consultant Metizoft believes a new consultancy contract offers western Norway's floating offshore engineering expertise an unprecedented opportunity to tap into Brazil's expanding oil and gas drilling industry.

Metizoft, based in Fosnavåg, has secured a project support contract from LMG Marin, Bergen. Naval architecture and marine engineering specialist LMG Marin won a major design contract from two Brazilian yards earlier this year, anticipating construction of 14 drillships in Brazil for delivery 2015-2019. The drillships will be deployed in waters up to 3,000 m deep offshore Brazil.

Consulting engineering firm Metizoft concentrates on project management, quality control, and project support work for the shipbuilding and offshore industries, with its services backed up by tailor-made engineering processing software.

It is one of the world's first companies to offer a Green Passport-Inventory of Hazardous Materials approval and verification package for newbuilds and existing vessels. The company broadened its maritime offering in 2011 by merging with Tomrefjord-based consultants Novomar.

"We have a strong network of diverse professionals at our disposal, brought together so that customers can call in the required expertise to their project work as and when they need it," said Metizoft managing director Gry Cecilie Sydhagen.

"We also have a long track record working in partnership with LMG Marin. This breakthrough contract will see our experts working closely with LMG



Artist's impression - LMG drillship design

Marin's world-renowned Maritime Consulting & Construction Management team."

Keppel signs \$1.2B contract with Naftogaz for Black Sea drilling rigs

Keppel FELS has signed a contract with Ukraine's Naftogaz for construction of two semi-submersible drilling rigs for operations in the Black Sea. This follows an announcement last November from Naftogaz regarding the selection of Keppel FELS for execution of the \$1.2 billion contract.

The rigs incorporate the DSS 38U design that has been jointly developed and owned by Keppel's Deepwater Technology Group and Marine Structure Consultants.

The key features of the rigs include double-skin columns to provide additional protection to machinery spaces in the event of a ship collision, a separate blow-out preventer, and "Christmas Tree" used to control the flow of oil or gas out of the well. A compact pipe handling system will enable efficient drilling.

Equipped with a 2000-kips drilling derrick suitable for drilling up to depths of 30,000 ft, the design has been customized to suit the Black Sea's harsh weather conditions, including extreme freezing temperatures, storms with strong winds, and heavy seas.

The rigs will use durable grades of steel with increased thickness and have winterization features, such as machinery cladding, advanced heating systems to prevent equipment and pipes freezing, and enhanced air conditioning for living quarters.



Naftogaz platform in Black Sea

Rigs & Vessels

Wärtsilä to design six offshore vessels for China Oilfield Services

Norway-based marine solutions and services provider Wärtsilä said it will design six new oilfield vessels for China Oilfield Services (COSL) as part of a recent contract. Out of the six, two are platform supply vessels (PSVs), while the remaining four are anchor-handling tug supply (AHTS) vessels.

Once the order is complete, COSL will initially deploy the vessels to support its offshore exploration work in the South China Sea and Bohai Bay.

Based on Wärtsilä Ship Design's VS 485 PSV MKIII design, the two PSVs are expected to offer high levels of energy as well as being eco-friendly.

Equipped with an optimized hull design, Wärtsilä said the PSVs are able to provide greater efficiency and significantly reduce emissions into air.

The VS 485 PSV MKIII-designed PSVs have the necessary tank capacities and a flexible cargo system and are easy to operate in rough seas and challenging weather conditions.

Wärtsilä will use its VS 4612 AHTS design for developing four AHTS vessels, which will be primarily used to set anchors for drilling rigs and tow mobile drilling rigs from one position to another as part of subsea operations.

Petrobras-led group signs letter of intent to charter FPSO Iracema Norte

Petrobras, as operator of the BM-S-11 Consortium, along with its partners BG Group and Petrogal Brasil, and through its affiliate Tupi-BV, has signed a letter of intent with Schahin Petróleo e Gás S.A. and Modec Inc. for the charter of the FPSO that will be used in the production development project of the area known as Iracema Norte, in Block BM-S-11 in the pre-salt of Santos Basin.

The project includes the interconnection of 16 wells to the FPSO — eight production and eight injection wells — and production is expected to start in December 2015.

The FPSO will be deployed 300 km off Brazil's coast, at a water depth of 2,234 m. The platform will have a processing capacity of 150,000 b/d of oil and 8 million m³/day of natural gas. It will be operated by the companies responsible for the construction and chartered to the Consortium for a 20-year period.

The schedule of the project determines the delivery of the FPSO 35 months following the signature of the letter of intent, Petrobras said.

The BM-S-11 Consortium is operated

by Petrobras (65%), in partnership with BG E&P do Brasil Ltda. (25%) and Petrogal Brasil S.A (10%).

McDermott signs shipyard contract for construction of S-Lay vessel

McDermott International, Inc. said one of its subsidiaries has signed a contract for the design and construction of a new high-spec, highly capable, dynamically positioned combination S-Lay vessel with a 2,000 ton crane. The vessel,

tentatively named Derrick Lay Vessel 2000 ("DLV2000"), will be constructed at Keppel Singmarine in Singapore and is expected to take about 2.5 years to build. Developed by Keppel's ship design arm, Marine Technology Development, DLV2000 is equipped to support advanced deepwater pipelay operations that will allow pipelines to be installed at depths of up to 10,000 ft. Vessel transit speed is expected to be 12 kts, with a top speed of 14 kts.

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Eni discovers more gas deposits in Mamba complex off Mozambique

Italy's Eni has made two more giant gas discoveries in the Mamba complex in Area 4 offshore Mozambique.

The Mamba South 2 and Coral 2 delineation wells have added 6 tcf to the Area 4 reserves base, now estimated to hold 23 tcf-plus in place, with potential of 75 tcf throughout the Mamba complex.

Mamba South 2 was drilled in 6,293 ft of water to a TD of 14,107 ft, 6 mi east of Mamba South 1 and 31 mi from the Capo Delgado coast. It intersected 197 ft of gas pay in good quality Oligocene reservoirs.

The well also proved hydraulic communication with the same reservoir at Mamba South 1. On test it, flowed lean gas at a sustained rate of 140 MMcf/d.

Coral 2 was drilled in 6,398 ft of water to a TD of 15,502 ft, 9.3 mi northwest of Coral 1, 50 km off the Capo Delgado coast.

It encountered 459ft of gas pay in good quality Eocene reservoirs, also confirming hydraulic communication with the same reservoir of Coral 1.

Eni plans a production test of Coral 2 and to drill at least two more back-to-back delineation wells, Coral 3 and Mamba South 3.

New Zealand awards 10, 5-year oil and gas exploration permits

New Zealand has awarded 10, 5-year oil and gas exploration permits, including in the rarely explored waters in the country's southern region. The majority of the five onshore and five offshore permits were awarded in the Taranaki region, which has all the country's commercially producing oil and gas wells, with production worth around U.S \$2.1 billion a year.

A joint venture between Shell, OMV Ltd., and Mitsui E&P Australia Pty Ltd. will drill in the seldom-tapped Great South Basin off the eastern coast of the South Island.

Offshore and onshore permits were issued to New Zealand Oil and Gas Ltd., Cheal Petroleum Ltd. and East West Petroleum (NZ) Ltd., NZEC Ltd., TAG Oil (NZ) Ltd., Todd Exploration Ltd., and Cue Taranaki Pty Ltd. to explore the Taranaki Basin on the west coast of the North Island. U.S.-based Anadarko won two offshore permits to explore around 7,000 sq.km of the previously unexplored Pegasus Basin off the southern tip of the North Island.

Permit holders have committed to carrying out seismic survey work and, in several of the onshore areas, drilling exploration wells. The projects were expected to see initial spending of NZ\$82 million



Bangladesh invites bids for a dozen offshore blocks under new PSC

Bangladesh Oil, Gas and Mineral Corp. (Petrobangla) has begun the bidding process for oil and gas exploration fields in 12 offshore blocks — nine in shallow water and three in deep water.

The blocks are being offered under a new model production sharing contact (PSC) that bans the exportation of gas to other countries, while allowing companies to sell gas to domestic customers directly without involving

and could ultimately lead to expenditure of NZ\$776 million in 5 years. A total of 23 blocks were offered, with bids received for only 13 blocks.

Mediterranean Oil & Gas granted an extension for Malta Offshore Area 4

Mediterranean Oil & Gas Plc said that the government of Malta has granted a 1-year extension of the first exploration phase of the production sharing contract (PSC) for Malta Offshore Area 4 to January 2014. The Area 4 PSC license is currently owned 100% by MOG through its wholly owned subsidiary, Phoenicia Energy Company Ltd.

"We welcome the support we have received from the Maltese Authorities," said Bill Higgs, chief executive of Mediterranean Oil and Gas.

"We are progressing plans that will enable us to test the first prospect with the drill bit by the end of 2013, and we are on track to finalize the shareholding arrangement by which Genel Energy plc will join us in exploring Area 4. We intend to start awarding drilling-related contracts early in the New Year, including contracting of a drilling rig for the operations."

"We are excited to be leading this new phase of exploration activity offshore Malta."

Petrobangla, although they will have the first right of refusal over gas sales.

The new model PSC also permits the state-owned Bangladesh Petroleum Exploration & Production Co. to bid for the blocks in partnership with state-run oil companies of other nations.

In addition, two discovered shallow water fields — Kutubdia and Teknaf — are being offered as part of a special package for exploration.

Petrobangla chairman Husain Monsur informed platts.com that the potential bidders had been given 90 days to submit their bids.

"We are eyeing to award the gas blocks to bid winners by June 2013 to ensure that they can start exploration in the coming winter starting from October 2013," Monsur was quoted by platts.com as saying.

This will be the country's fourth exploration bidding round, following the previous ones in 1993, 1997, and 2008.

In the next round, Bangladesh intends to offer to the international companies the offshore blocks in Bay of Bengal, which were settled in their favor by the International Tribunal for the Law of the Seas (ITLOS) in early 2012.

Chevron deals with CNOOC over two blocks in South China Sea

Chevron Corp. said its China subsidiary has entered into production sharing contracts (PSC) with China National Offshore Oil Corp. (CNOOC) for two exploration blocks in the South China Sea's Pearl River Mouth Basin.

Under the PSC agreements, Chevron China Energy Co. will hold a 100% interest in blocks 15/10 and 15/28. During the exploration phase, Chevron China Energy will be the operator of the two shallow water blocks, which in total cover an area of about 2,233 sq.mi.

"Exploration of these blocks builds on our strategy to grow our business across the Asia Pacific region, where we are developing LNG, deepwater, shale, and sour gas resources," said George Kirkland, Chevron's vice chairman.

Melody Meyer, president, Chevron Asia Pacific Exploration and Production, added, "We welcome the opportunity to partner with CNOOC and apply our industry-leading exploration capabilities in the prospective Pearl River Mouth Basin."

In China, Chevron is working as the operator on projects through four other PSCs. It's working onshore in the natural gas fields of the Sichuan Basin and also has operator interests in three deepwater blocks in the South China Sea.

Exploration

ExxonMobil South Africa plans drilling offshore Durban

ExxonMobil Exploration and Production South Africa plans to begin drilling activities offshore Durban after signing an agreement with Impact Africa. The exploration and production affiliate of ExxonMobil has agreed with the African arm of Impact Oil & Gas to acquire a 75% stake in the Tugela South Exploration Right on the east coast of the country.

The stake will make the oil and gas giant the operator of Tugela South Exploration Right, which extends to 2.8 million acres with water depths of 6,500 ft. The agreement between the two parties also allows Exxon to acquire a 75% stake in future exploration rights in an additional 16 million acres within three offshore areas, whose technical cooperation permits are currently held by Impact Oil & Gas. The water depths of the future permits extend from the coastline to about 9,800 ft.

The agreement on the transference of the interest is subject to the approval of the South African government.

Meanwhile, the company obtained a technical cooperation permit from the country's government, which provides ExxonMobil Exploration and Production with an exclusive right to study the hydrocarbon potential of the deepwater Durban Basin for 1 year. After 1 year, the company can apply for further exploration rights in the area, which covers about 12.4 million acres offshore Durban.

BP captures four deepwater exploration permits off Canada

BP has won four deepwater exploration blocks from the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) after submitting a \$1 billion bid. The board announced that BP has the right to explore Blocks 5, 6, 7, and 8 in the call for bids NS 12-1.

The \$1 billion bid, which will be spent over 6 years, is the highest ever accepted for deepwater exploration rights in Atlantic Canada.

The blocks, located about 300 km off Nova Scotia at water depths ranging from 100 to 3,000 m, cover an area of almost 14,000 sq.ft. BP Exploration executive vice president Mike Daly said that gaining access to this "promising acreage" will play a key role in the company's future growth. "This entry to Nova Scotia's offshore plays to our strengths in the deepwater and sub-salt," Daly said.

Iranian oil company looking to drill 17 exploration wells in Persian Gulf

Iranian Offshore Oil Co. (IOOC) wants to drill 17 exploration wells in the Persian Gulf. Exploration manager Mansour Ghaibihayat told an Iranian news service these would be directed at both producing oil and gas fields and at fields where development had not yet begun. One purpose is to determine the status of fields that Iran shares with neighboring states, he added.

IOOC has signed an agreement with Petro Iran Co. on drilling 12 of the wells. A private contractor will drill the other 5 wells. The program will continue for 3 to 4 years.

Rostam Qasemi, Iran's petroleum minister, has called for improvements in the country's offshore rigs and drilling technologies to quicken the pace of drilling and lower costs. Currently, a typical Iranian onshore well takes 100 days or more to drill. Offshore wells are even slower, he said.

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Spiralling Costs Force New Focus on Closing P&A Technology Gaps

By DecomWorld

It may be irksome, like paying for yesterday's fun, but plugging and abandonment (P&A) is climbing higher on Operators' agendas as the volume of P&A activity increases in the midst of a tougher regulatory environment—and Norway's Statoil, for one, is looking to technology to reduce the impact of this necessary, but non-productive expense.

Statoil saw average time spent on P&A more than double to between 35 and 40 days per well after 2004 when a serious blowout at the Snorre A Platform as well as tougher Norsok standards on well integrity and drilling that same year ushered in more stringent requirements in effecting permanent barriers.

Statoil's Pål Hemmingsen, head of well integrity in the Operator's R&D division, told delegates at last month's 9th Annual North Sea Decommissioning Conference that P&A operations on some wells were taking up to 150 days—an expenditure in time and cost that is unacceptably high—and outlined a "technology roadmap" to 2020 with the goal of cutting the cost of permanent P&A and slot recovery by 30%. "P&A is now high on the agenda for many major Operators of the Norwegian continental shelf," Hemmingsen said in a candid presentation at the DecomWorld event in Aberdeen. With studies revealing that 71% of P&A time is used by casing operations and tripping, Hemmingsen said new technology was needed across the board to simplify the process. The technology push, he explained, should focus on cement bond logging through multiple casing strings, alternative permanent barrier materials, light well intervention techniques (LWI), and even better well design.

While the volume of permanent P&As effected at Statoil has fallen over the last decade, Hemmingsen said that trend will reverse dramatically. He said the operator expects to abandon 1,000 wells in the next 25 years—hitting a rate of 50 per year by 2016, with almost half of them being subsea. In addition, P&A techniques are needed in slot recovery operations. He said Statoil averages 30 such operations per year now, a figure that will increase as the company strives to enhance production. Overall, he estimated that a third of Statoil's drilling and well operations are now P&A-related, which is no doubt why the company set up a dedicated P&A research unit 2 years ago.

It's a challenge contractors know well. "Sometimes, you can do P&A in no time," said Delaney Olstad, intervention and abandonment champion at Weatherford. "You've got the right equipment, the right personnel, and you can perform the P&A in 4 or 5 days. But then comes the well from hell."

Bart Joppe, global business development manager for P&A at Baker Hughes, said Operators' focus has shifted firmly to the downhole challenges. "At surface, you can assess what's happening a lot easier," he said. "I think the Operators are realizing that the last conditional challenges lie below the surface, which they hadn't necessarily accounted for. In the overall decommissioning budget, P&A is taking a bigger piece of the pie than initially imagined, and that's why companies like Statoil and others express the need for technology development."

Decomworld
Business intelligence for the decommissioning industry

Substantial strides

Weatherford's Delaney Olstad believes that there are gains to be made in alternative cementing materials and that thermosetting polymers are a space to watch. He also said technology could open up new possibilities for basic oilfield tools, many of whose basic design hasn't changed since the 1930s.

"They still work for their purposes but new tubular strengths require new approaches," he said. "We're milling through very thick steel in some cases. They're coming out with abrasive cutting techniques which use a super-pressurized garnet crystal suspension shot through a mega-engineered nozzle. Those things can blast through casing, cement, and whatever they throw down holes."

However, Olstad maintained that substantial strides in P&A speed and efficiency are already offered by its own rigless approach to intervention and abandonment. He told delegates how its rigless pulling and jacking (P&J) unit bridges the gap between rig- and crane-based operations.

Referring to operational data provided by an unnamed Weatherford client, Olstad said that a rigless P&J unit used on all phases of a P&A job shaved 27% off the number of days required to do the intervention by a rig-based unit, and a whopping 111% off the number of days required by a crane based unit. The crane in this instance suffered a high percentage of downtime due to weather. Olstad said the same data showed that Weatherford's rigless P&J unit enabled average, per-well cost savings of 134% compared to the sturdy, but expensive rig and 60% compared to the cheaper, but weather-vulnerable crane.

Olstad said Weatherford is also pushing the boundaries in trip reduction with its M.O.S.T. tool—short for mechanical outside-latch single-trip—which can run off vessels of various kinds. In general, he predicted a big push in the future for rigless subsea techniques.

Casing conundrum

Meanwhile, Baker Hughes' Bart Joppe said that in P&A today the drive is towards fewer trips and better systems to deploy interventions at surface. Remote cement bond logging is one of those ideas that, today, feels somewhat blue-sky. "With today's technology, we cannot see if there is a solid medium behind the casing or not," Joppe said. "The challenge is that the signal from the logging device has to travel through fluid in the annulus to confirm a solid medium behind the casing. Today, we need to pull the completion and look. It's technically complicated to design the tool required, but that doesn't mean it will never be there."

On future-proofing well design, he said the challenge lies in the growing number of control lines used to communicate with downhole devices. At the conference, Statoil's Hemmingsen wondered what could be done with those lines. "Can we install control cables that can be part of the cement block that will enable us to actually leave the tubing in place instead of pulling it out?" he asked.

The conundrum interested Joppe as well. "In P&A, all those vertical lines by definition cannot be running through a

Decommissioning & Abandonment

permanent barrier," he said. "So, what you need to do is remove the control lines to at least a certain distance so you can set a proper barrier in between. The question is what can we do to design a completion so that is no longer an issue. Today's design should prevent excessive costs for future abandonment. And, unfortunately, we don't know what the regulator wants 20 years from now."

When it came to sealing materials, Joppe said there was still room for improvement in how cement is used. "One cement plug isn't the same as another. There is some significant technology in which plug you select for which application. It needs the right weight, the right density, and other characteristics to last over the lifetime of the well. That's where there is room for improvement."

But he did not rule out the need for alternatives. "In Norway, where you would normally need a 100-m long cement plug, you can already provide a mechanical barrier of steel and packing elements and then put 50 m of cement on top. So, the real benefit would come if a material was to be developed that was so good that you don't need 50 m of it and you get the regulatory recognition for that. Cement has very good characteristics but there is always room for improvement."

New focus on R&D

A final revelation from Statoil on the perennial problem of swarf generated by section milling sparked considerable interest at the conference. Hemmingsen said Statoil had teamed with Norway's West Group to develop a milling tool that produces smaller swarf of uniform size, which, it is

hoped, will fall downhole instead of rising and causing blockages. A milling test jig has been built, and the team is testing prototypes.

Meanwhile, the industry-funded research organization, ITF, announced that it has begun probing alternative plug materials and sonic tools for downhole cement logging. ITF analyst Anthony Onukwu announced a research project into a new metal plug concept based on a bismuth-tin (Bi/Sn) alloy that has the potential to create a high-integrity, metal-to-metal seal. The plug concept was developed by Canada's Rawwater Engineering Company Ltd (RECL) and Seal Well Inc. in the form of a 4-in. bismuth-tin P&A plug for two gas wells in the Suffield Development of Alberta. RECL then proposed a joint-industry project to develop the concept for offshore well plugs. Four organizations will sponsor the £1 million 2-year research project.

The second project seeks to set up a "centre of excellence" to promote sonic tools for logging the quality of the cement bond behind casing. Onukwu said five Operators are working with Dutch research institute TNO on a technology roadmap to guide development for acoustic logging.

Onukwu said the other main decommissioning issues still awaiting technological breakthrough include control cable retrieval and section milling, as there has been little progress on these fronts in recent years. "The challenges are still there, the solutions are still needed, and the challenges are the same across borders, even in the Gulf of Mexico. If there is industry collaboration, there is lower risk and greater benefit at lower cost with benefits to the end user."

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WHAT HAS BEEN SAID ABOUT THE D&A SUMMIT...

"Great forum. Very beneficial to see how others are handling decommissioning abandonment issues."

David Bowman, Petroleum Engineer, Nexen Petroleum

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Norway okays Statoil's 9th fast-track development

Norway's Ministry of Petroleum and Energy (MPE) approved the Plan for Development and Operation (PDO) of Svalin. The North Sea field is one of Statoil's fast-track developments, the ninth in a row.

"This is the first tie-in field to Grane, and it is one of the most profitable projects in the fast-track portfolio as a result of low development costs. Good cooperation internally and with the license partners has led to sound and cost-effective solutions," said Bjørn Herdlevær, project manager for Svalin.

Fast-track developments are characterized by the use of standard solutions and existing infrastructure.

The Svalin field is located about 6 km southwest of the Grane platform, at a water depth of 125 m. Recoverable reserves are estimated at about 75 MMbbl (corresponding to 12 million standard cubic meters). The reserves are about equally split between the two structures on the field: Svalin C and Svalin M.

The Svalin field will be connected to the Grane platform. The wellstream from Svalin M will be produced through



The Grane platform in the North Sea

a designated well drilled from the Grane platform. Svalin C will be a subsea facility tied in to Grane by a 6 km production pipeline. There will be a joint processing and export solution.

The gas compression facility on the Grane platform will be modified to handle gas from Svalin.

Oil from Svalin will be transported together with Grane's own production in the existing pipeline from Grane for storage and shipment from the oil terminal at Sture.

Svalin M was discovered in 2008, and production start-up is slated for the

end of 2013. Svalin C was discovered in 1992 and is scheduled to start producing during the summer of 2014.

"We are developing a field that will produce oil only, which is fairly unusual as most fields at the NCS today are also gas producers. Grane's production has been declining, and Svalin will enable us to utilize available capacity. This will alleviate the decline in oil volumes. The expected lifetime for Grane has been extended to 2030," said Herdlevær.

The Grane field is the first to produce heavy crude oil in Norway. It was discovered by Norsk Hydro in 1991 and first production occurred in September 2003. The life of the field is estimated to be 25 years.

The Grane field reached a peak production of 243,000 b/d of oil in March 2006. The field is currently producing at a rate of more than 200,000 b/d.

Statoil Petroleum, which operates the field, holds 36.67% interest in it. Petoro owns 28.94%, ExxonMobil Exploration & Production Norway 28.22%, and ConocoPhillips Skandinavia 6.17%.

Hebron oil project to proceed off Canada's East Coast: ExxonMobil

ExxonMobil Corp. plans to develop the Hebron oilfield offshore the Canadian province of Newfoundland and Labrador using a gravity-based structure that will recover more than 700 MMbbl, an increase compared to earlier estimates. Capital cost

for the project, which is expected to begin oil production around the end of 2017, is estimated at



\$14 billion. The platform is being designed for a production of 150,000 b/d.

Hebron will be developed using a stand-alone, gravity-based structure consisting of reinforced concrete designed to withstand sea ice, icebergs, and meteorological and oceanographic conditions. The base will be designed to store approximately 1.2 MMbbl and will support an integrated topsides deck that includes a living quarters and facilities to perform drilling and production.

Front-end engineering and design were completed last year, and significant progress has been achieved on detailed

engineering. Current cost estimates reflect advanced project definition and current market and foreign exchange rates. Construction of the gravity-based structure is under way at the project's primary construction site in Bull Arm, Newfoundland and Labrador. Topsides fabrication is expected to begin later this year.

Hebron will be operated by ExxonMobil affiliate, ExxonMobil Canada Properties, which holds 36% equity in the project. Hebron co-venturers are Chevron Canada Ltd. (26.7%), Suncor Energy Inc. (22.7%), Statoil Canada (9.7%), and Nalcor Energy Oil and Gas (4.9%).

Aruanã and Oliva oil discoveries off Campos basin declared commercial

Brazil's Petrobras has declared commercial the Aruanã and Oliva areas in concession BM-C-36, Block C-M-401, in the post-salt of Campos basin. In the proposal sent to the National Petroleum, Natural Gas and Biofuels Agency, Petrobras suggests that the Aruanã accumulation be named Tartaruga Verde field and the Oliva accumulation Tartaruga Mestiça.

Aruanã is estimated to hold 230 MMboe and Oliva to hold 121MMboe. The Tartaruga Verde accumulation is 79 mi from the city of Macaé, off the coast of Rio de Janeiro state. It is in 3,201 ft of water at a depth of 9,817 ft.

Tartaruga Mestiça is just under a 0.5 mi northeast of Tartaruga Verde in 3,064 ft of water and at a depth of 9,416 ft. Both contain 27 degrees API oil in Albian-age carbonate reservoirs.

JV gives Gassco okay to remove B11 platform from North Sea

The Gassled joint venture has approved operator Gassco's recommendation concerning the removal of the B11 compressor installation in the North Sea. This platform stands in the German sector and is connected to the Norpipe gas pipeline, which runs from Ekofisk in the Norwegian sector to the port of Emden in Germany. Operational in 1977, B11 is to be removed because the need for gas compression in Norpipe has declined in recent years. Before removal, the pipeline will be relaid in a bypass around B11. That job is due to be done during 2013, and, once the work has been completed, the platform will be shut down and cease to be staffed.

DeepOcean secures major PRM project for Statoil

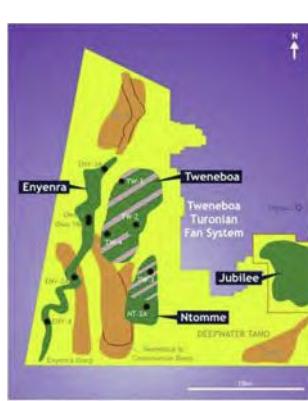
DeepOcean UK, Ltd., a subsidiary of DeepOcean Group Holding BV, received an award from Statoil AS for the installation and trenching of a permanent reservoir monitoring (PRM) system on the Snorre oilfield in the Norwegian sector of the North Sea. The project represents DeepOcean UK's largest ever contract award.

The multi-year project commences in 2013 and consists of the installation and trenching of 500 km of subsea seismic cables and associated riser in water depths in excess of 300m. Once installed, the large seismic monitoring array will assist Statoil in increasing oil recovery from the Snorre reservoir throughout the field's life.

The award builds on DeepOcean's extensive track record in the installation and trenching of PRM systems.

Tullow submits plans for third offshore Ghana project

Tullow Oil and its partners have submitted a plan of development for the Tweneboa, Enyenra, and Ntomme (TEN) fields offshore Ghana to the country's Ministry of Energy. The development is designed to allow reserves from these fields and from nearby discoveries to tieback to an FPSO.



Following the Wawa discovery on the surrounding Deepwater Tano block last July, an appraisal program is under evaluation. Drilling is under way at the Okure exploration well. The rig then moves to drill the Sapele exploration well southwest of the Jubilee complex. At the Jubilee field, acid stimulation of Phase 1 production wells has paid off, increasing overall oil production from 63,000 b/d in mid-2012 to around 85,000 b/d, which is in line with expectations.

The Jubilee Phase 1A development is progressing with five of the eight wells drilled. All have encountered good quality reservoir on prognosis.

Following unscheduled maintenance on the Sedco Energy rig, well completion operations started at the end of October. Phase 1A production should begin soon from one well, with another well brought online and a further acid stimulation completed by year-end. This work program should lift production to more than 90,000 b/d by year-end. The FPSO's production capacity should be fully occupied during the first half of 2013 as further Phase 1A production and injection wells come online.

UK approves \$1.62B Western Isles oil development

Britain's government has approved the development plan for Dana Petroleum's Western Isles project in the UK northern North Sea. The \$1.62 billion program relates to the Harris and Barra fields, 99 mi east of the Shetland Island and 7.5 mi west of the TAQA-operated Tern field.

A cylindrically shaped Sevan Marine FPSO used for the development will be built in China at COSCO's Nantong and Oidong shipyards. At least five production and four water injection wells will be drilled for tieback to the FPSO, delivering more than 40,000 boe/d at peak, with oil exported via a shuttle tanker. Start-up is slated for 2015.

Dana operates Western Isles in partnership with Cieco. The two fields hold combined oil reserves estimated at more than 45 MMbbl recoverable.

TDW's longest pipeline isolation operation

TDW Offshore Services has completed the longest ever pipeline isolation operation in company history for Origin Energy Ltd. For 299 days, the company's remotely-operated SmartPlug® pressure isolation tool remained in the Origin pipeline network offshore Australia. The purpose was to create a double-block isolation against gas pressure to depressurize a key section of the pipeline. This was necessary so that heavy lifting operations could be safely carried out to install a new 600-ton accommodation module as part of the Yolla Mid Life Enhancement (MLE) project. In addition, an emergency shutdown valve (ESDV) was replaced.

Due to adverse weather conditions that delayed the MLE heavy lifting operations, the isolation period was extended from 6 months to 10 months. "By safely isolating the Yolla A Platform from hydrocarbons, Origin was able to successfully install the extensive living quarters, secure in the knowledge that the work was being completed under safe working conditions," said Rolf Gunnar Lie, TDW's regional business development manager for the Asia Pacific.

The MLE project is situated on a section of a 14-in. gas export pipeline that extends from the Yolla A Platform in the Bass Strait between Australia and Tasmania to the Lang Lang Gas Processing Plant 70 km south of Melbourne, Australia. TDW isolated the line by pigging a 14-in. SmartPlug® tool with nitrogen through the topside piping, and then down the riser for about 984 ft into the subsea pipeline to the set location where a subsea communication skid had been installed. The SmartPlug® tool, which has a built-in pinger system and is controlled remotely via extremely low frequency (ELF) signals, was then set horizontally at the seabed in the line where it would remain until all work was completed.

To ensure that the SmartPlug® tool was accurately tracked along the pigging route and that pipeline pressure was monitored, TDW used its remotely-operated SmartTrack™ tracking and monitoring system. By using the SmartTrack™ system to remotely set the SmartPlug® tool in dormant mode, TDW was



Remotely-operated SmartPlug pressure isolation tool.



The Yolla A Platform

also able to extend the battery life of the tool so that it could remain in the line, creating an effective isolation. Throughout the ESDV replacement operation and the more complicated MLE project module installations, TDW regularly monitored the pressure and temperature in the line to make certain that the isolation was being effectively maintained.

Hydratight completes intricate corrosion project offshore Brazil

Global joint integrity and engineering services specialist Hydratight has completed an intricate major contract using its unique mechanical connector (previously known as MORGRIP) to solve corrosion problems on an oil platform off the coast of Brazil.

Nine separate leaks in high-alloy, thin-wall duplex, and super-duplex stainless steel pipelines had previously been repaired temporarily with standard split-sleeve clamps, but were at risk of leaking again due to galvanic corrosion.

Hydratight supplied 18 off flange adaptor connectors ranging from 6 to 20 in. diameter — crucially built from the same alloys as the pipework — and that had to be designed, manufactured, tested, and delivered in 17 weeks in time for a scheduled 10-day shutdown.

The project carried with it several significant challenges, both in manufacture and especially during installation.

During manufacture, the stainless raw materials were kept completely separate from standard carbon steel stock to avoid contamination that might lead to the same corrosion problems in later years. The



material also had to be cut at far slower speeds than usual to avoid galling, meaning very tight workshop management to meet the delivery deadline.

Hydratight also supplied a liner kit for each flange adaptor to strengthen the pipework internally so it could withstand the connector's massive sealing forces and provide a permanent repair. The company also supplied all the installation and service equipment for the repairs.

When it came to the installation, Hydratight engineers proved why they are among the highest-regarded in the industry.

"One of the main reasons we were asked to do the work was that the opera-

tor knew our products, knew our service quality, and knew he could rely on us to meet deadlines," explained Hydratight applications engineer Mark Fisher.

Two teams marked, cut, and repaired the damaged sections during the shutdown—the majority of the sections being in tight, hard-to-reach spaces.

The most challenging repair was to a 10-in. pipeline carrying cooling water for the platform air conditioning system. The connector was needed on a vertical pipe coming down over the side of the platform over the open sea.

Scaffolding was erected over the side, and the repair took place at night during good weather, at which point engineers found another problem: the pipe's flow valve wouldn't seal, which meant a constant flow of water in the affected pipe and a halt to the repair work.

But Hydratight technicians don't travel light: they had brought the company's Hydrablock weld-testing tool and by connecting bypass hoses to the test ports, deployed the device and isolated the line so the repair work could continue.

"We have done thousands of repairs and know every one is different and brings its own problems," Fisher said.

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Chet Morrison Contractors: Where Ingenuity Drives Progress

Chet Morrison Contractors (CMC) specializes in services ranging from marine construction to well intervention, and from production enhancements to the plugging and decommissioning of oil and gas properties. But it's the ingenuity on which the company was built, and their corporate climate of fostering creative input from service line leadership, that has given the company the vision to grow. CMC is a valuable resource to the oil and gas industry because they offer uniquely integrated services throughout the life cycle of the well. Their engineered solutions promote safer, more efficient processes within the industry as a whole.

Chet Morrison Jr., the founder and CEO of Chet Morrison Contractors and its parent company, Morrison Energy Group (MEG), started his company in 1983 as a humble, inland marine operations contracting company. Driven by his background in mechanical engineering, Morrison always exhibited a curiosity to understand the "workings" of things. Not satisfied with standard industry techniques, Morrison was always looking to make improvements, acquiring new companies and hiring personnel who mirrored his long-term vision. His willingness to apply creativity to standard procedures and recruit others who were like-minded in applying creative vision has allowed his business to adapt and flourish. Now, 30 years later, Morrison runs a company known for its solution-based contributions to the oil and gas industry and for its strong commitment to enhancing safety standards.

Operating from four strategic locations all with convenient access to the Gulf of Mexico, CMC is able to provide ample resources to its clients. The company's diving and pipelay assets offer a full spectrum of subsurface construction, repair and decommissioning services to support the production and transportation of oil and gas. Equipped with state-of-the-art accommodations with vessel adaptability, CMC can operate in any marine environment, from shallow inland waters to the deeper waters of the Gulf of Mexico. The CMC team has ample experience performing work in the inland waters, which has spurred the design of a custom construction barge perfectly suited for inland-related projects. This particular barge boasts some of the most versatile, multi-functional features for enhancing the ability to safely perform well intervention or construction projects in some of the shallowest water depths. For deeper waters, CMC utilizes its fleet of DSVs, particularly the Joanne Morrison, which is a 240' long dive support vessel equipped with a moon pool deployed, 1000' saturation diving system, and a 4-point mooring system that enables a rig-less plug and abandonment procedure. Not to mention a soon-to-be revealed new subsea abrasive cutting method that will mark another revolutionary milestone for a safer and more efficient way to remove subsea structures.

In the often volatile and unpredictable oil and gas environment, safety is paramount. It is a key mission of CMC, and is a commitment that extends

beyond the company through its involvement with organizations focused on safe solutions, such as the Gulf of Mexico Diving Safety Work Group (DSWG), an association that seeks to promote better safety measures and address regulatory safety issues within the Gulf of Mexico oil and gas industry. Not only is Chet Morrison Contractors a committed member, Kevin Lord, Manager of Subsea Operations at CMC currently serves on the Executive Board.

Chet Morrison Contractors prides itself on the fluidity and mobility of its experienced leadership, who were hired for their knowledge and expertise within their respective fields. This 'total package' process maximizes the collective experience of CMC's personnel, and advances the company's commitment to streamlined efficiency and incident-free performance. The wide breadth of Chet Morrison Contractors' resources—from its dynamic team of experts, to its company-owned equipment and diversified fleet—form a network of innovation that continues to drive the company's success.



**JDN hoists provide 200-ton handling capacity on offshore rig**

Four JD Neuhaus(JDN)type EH50 air- operated monorail hoists have been supplied and mounted by Westcon Løfteteknikk AS of Bergen to the Maersk offshore rig Guardian. These products have been specified for the synchronized lifting and handling of an 18-3/4 in. 15,000-psi BOP unit before and after drilling operations.

Two hoists are each mounted on twin parallel overhead rails, with each hoist providing 50-ton load and 20-m lift capacities for between deck operations. Removable connector bars have also been supplied for fitting between paired hoists on the individual rails to maintain a fixed working distance of 4,060 mm between the load hook centers.

With the two sets of hoists operating together, a combined lift capacity of 200 tons is made available. The minimum horizontal travel distance of the trolleys with the connector bars fitted is 14.81 m. The maximum available free travel without the connector bars in place is 18 m, with the travel distance limited by pneumatic end switches mounted on the hoist trolleys.

Synchronized operation of all linear movement and lifting operations of individual, paired, or all the four hoists when used in conjunction is provided with the F type multi-function pendant controllers also supplied by JDN. These tough, ergonomically designed controllers are suitable for the outdoor, heavy-duty operations that can be experienced offshore.

A main air emergency stop together with load monitoring device is incorporated in the controllers. The two overhead beams are 23 m in length and also carry twin energy chain power supplies, with each power chain comprising 2-in. by 1-in. diameter air supply hoses.

Hoists finished with a JDN four layer marine paint, top coat in traffic yellow RAL1023, providing a total dry thickness of minimum 280 microns.

For more information visit the company website at www.jdngroup.com.

Variable Bore Rams adds Hydril shearing blind ram to offerings

Variable Bore Rams, Inc. (VBR), one of the largest original equipment manufacturers (OEM) of blowout preventer components and ram providers in the world, has added the Hydril shearing blind ram to its offerings, said president Hines M. (Chip) Marshall, Jr.

Manufactured by Hydril, the ram is capable of completely shutting off the well after the pipe has been sheared. It is recommended for all applications using 9-5/8 in. pipe and below and available in sizes 18-3/4-10M and 18-3/4-15M.

In adherence to safety requirements, the ram is American Bureau of Shipping (ABS) and Det Norske Veritas (DNV) certified. As an added advantage, interchangeable shearing blades separate this product from competing rams.

"This product is available worldwide through VBR Inc. and benefits our clientele by providing them with a more versatile option to their operational needs," said Marshall. "As the demand for our products grow, it is imperative that we match that with an expanding inventory."

For more information, visit www.vbri.com.

Lilaas AS secures breakthrough order for new LO1 lever technology

Lilaas AS has secured the breakthrough order for its innovative electronically controlled LO1 lever range, which was officially launched at this year's SMM exhibition in Hamburg. The company will supply its first LO1 units to U.S.-based Marine Technologies LLC, which is delivering a BridgeMate thruster control system to a platform support vessel (PSV) ordered by Global Offshore at Havyard in Norway. The newbuilding, a Havyard 832 design, is due for delivery in June 2013.

The installation will be distinguished by the control system's mounting in the armrest of the captain's bridge chair, which will mean both azimuth and thruster control are possible while the



Master is in a seated position. The new lever, which is compact and rugged and designed to combine multi-functional controls in a simple and safe manner, features components pre-installed in its structure and only requires a very shallow cut-out beneath.

The LO1 can be supplied with a built-in TFT LCD display, which shows the position of the lever and feeds back information from the ship's systems. However, Marine Technologies has requested a customized model without a display, mounted in a 96-mm x 96-mm panel, as the company already shows thruster forces on its own panel indicators. The company has also specified levers in black and grey to match the colors of the BridgeMate series.

For further information, contact Terje Akerholt, Lilaas AS; phone: +47 33 03 18 50; messages: +47 95 99 12 20; e-mail: terje.akerholt@lilaas.no.

Guardian® II Variable Speed Drive optimizes well production

Robbins & Myers Energy Services Group offers the Guardian® II Variable Speed Drive (VFD), an advanced technology digital solution for effective oil and gas well production control. The Guardian II VFD is specifically designed to operate PCP systems in the harshest conditions with maximum efficiency and flexibility. Integrated inside the Guardian II is a PCP Speed Controller. This integration with the VFD and PCP Speed Controller means the Guardian II is ready to take on demanding tasks with simple startup steps.



The PCP Speed Controller was designed to minimize downtime and provide the logic and control functionality needed to diagnose, prevent, adjust, and repair problems that may occur in the field without multiple trips to the site. Performance and production information is stored in a local (on-site) data repository that can easily be displayed in a simple browser-based user interface. This can be used as an analysis aid to determine if the action was correct or if any operational parameters need to be adjusted.

Pump optimization is implemented in the Guardian II system to maximize the production available while still maximizing pump life.

For more information visit www.rmenergy.com.

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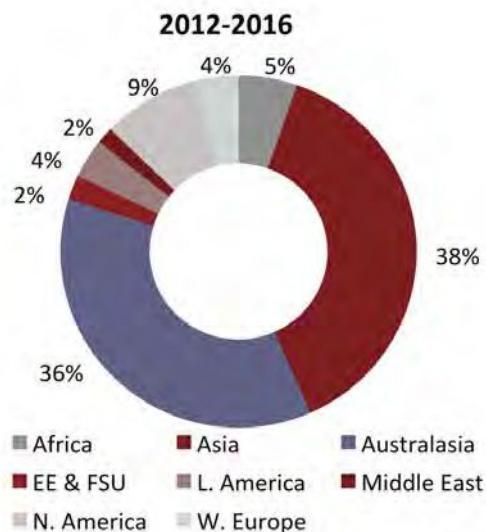
LNG Import & Export Growth to be Driven by Activity in the Pacific Basin

By: Murray Dormer, Douglas-Westwood

Douglas-Westwood's new LNG Market Report examines new prospects for liquefaction and regasification (import) terminals and liquefied natural gas (LNG) carriers, looks at the technology underlying the LNG business, and presents market forecasts for activity in the sector over the 2012-2016 period.

A shift in geographic focus

During the 2006-2010 period, much of the LNG export construction activity was focused on the Middle East, particularly Qatar. The next 5 years will see a shift in regional focus to Asia and Australasia, where there are a number of terminals planned or under construction. Australia will dominate Australasian expenditure during this period; investing around \$60 billion. Papua New Guinea will also see development as the country moves towards its first LNG terminal in 2014.



Global LNG capital expenditure by region, 2012-2016

Source: Douglas-Westwood, World LNG Market Forecast 2012-2016.

Australasia

Australia has three operational LNG facilities offering a combined export capacity of 24 mmtpa: North West Shelf, Darwin LNG, and Pluto. There has been discussion around the expansion of the Darwin and Pluto projects; however, this will depend on whether substantial gas discoveries are made and, therefore, is not expected within the forecast period.

The nearby Asian consumer markets offer the highest

gas prices of any region, with an average price of \$15 per million BTU. This, coupled with large coal-bed methane (CBM) reserves, has led to considerable investment in Australian export infrastructure. There are currently seven facilities under construction in the country, which are expected onstream 2014-2017 and will provide an additional 49-mmtpa capacity. Notably, Australia can contribute a further 46% capacity with a number of potential projects to come onstream beyond the forecast period.

Australian projects can be split into three categories: onshore terminals that source their gas from offshore fields, CBM to LNG export projects, and Floating LNG (FLNG). A potential downside to unconventional gas as a key feedstock is that CBM has never been liquefied into LNG on a scale as large as the one proposed. Issues with production such as cost, application, or practicality may

Australian Projects by Date Onstream (2012-2020)

Name	Operator	Type	Capacity (mmtpa)
Pluto LNG	Woodside	Offshore to Shore	4.3
Greater Gorgon LNG	Chevron	Offshore to Shore	15
Queensland Curtis LNG	BG Group	CBM	8.5
GLNG	Santos	CBM	7.8
APLNG	APLNG	CBM	9
Wheatstone LNG	Chevron	Offshore to Shore	8.9
Ichthys	INPEX	Offshore to Shore	8.4
Prelude FLNG	Shell	FLNG	3.6
Browse LNG	Woodside	Offshore to Shore	12
Bonaparte FLNG	GDF Suez	FLNG	2.5
Cash Maple FLNG	PTT LNG	FLNG	2
Arrow LNG	Arrow Energy	CBM	8
Gladstone LNG	LNG Limited	CBM	1.5

reduce the level of anticipated supply.

Source: Douglas-Westwood, World LNG Market Forecast 2012-2016.

FLNG sector

The key drivers of the floating liquefaction sector are the desire to monetise stranded offshore gas fields and the relative high costs of an onshore liquefaction terminal. A modular design allows the FLNG vessel to be built in lower cost environments then towed to location. Positioning the liquefaction facility on field reduces the requirements for costly upstream facilities and long pipelines to shore, which would be required for an onshore development.

Australasia was the first region in the world with an approved FLNG liquefaction project—Shell's 3.6 mmtpa prelude floater, which is expected to be onstream in 2017. Offshore gas fields and deep subsea trenches such as the Timor Sea Trench, which render pipelines impractical, make this region a key focus area for FLNG project devel-

opers. Other FLNG prospects in this region include GDF Suez/Santos' Bonaparte development; PTT's plans to monetise its Cash and Maple fields and Woodside's Sunrise project.

Papua New Guinea

ExxonMobil will invest \$4.5 billion to bring the country's first liquefaction plant onstream within the 2012-2016 period. This facility has generated discussion around a number of other projects among Operators; however, topographical and security-related factors may potentially limit their progression due to the associated difficulties and costs. Offshore liquefaction has been suggested as a possible alternative solution to this.

China

China is looking to increase gas imports to sustain growing energy demand as well as, as an alternative to coal in response to global pressure to reduce emissions and concerns over coal dependence and supply. Furthermore, the continued rise in the price of crude has significantly increased demand for LNG as a suitable substitute for meeting the country's energy needs. China currently has six projects under construction, including the first phase of the Zhuhai and Tangshan projects. China's reward of LNG expansion projects and new developments will provide an additional 18 mmtpa in import capacity.

Japan

Japan will see eight new LNG import terminals come onstream between 2012 and 2016 as the country seeks to cover the energy deficit following the shutdown of its nuclear power stations, the last of which was powered down in May 2012. As a result, the country has imported 27% more LNG when compared to May 2011. There are currently five new developments and a storage tank project due onstream between 2012 and 2016. This, coupled with the Yoshinoura terminal that came onstream earlier this year, will give Japan an additional import capacity of 13 mmtpa. This excludes Tokyo Gas's Hitachi project, which may come onstream at the end of the 5-year forecast, adding approximately 3 mmtpa in import capacity.

Indonesia and Malaysia

Indonesia is one of the world's largest LNG exporters and has three operational liquefaction plants: Arun, Bontang, and Tangguh. The biggest challenge that the country faces is whether it is able to balance long-term decline of natural gas production with a growing consumption in its major cities.

Since becoming an exporter in 1983, Malaysia has increased production to become the largest LNG exporter in the Pacific region. However, similar to demand trends in Indonesia, Malaysia has experienced rising gas consumption in its urban areas, leading it to seek LNG imports.

Russia

Russia is currently the only LNG exporter in Eastern Europe and the FSU, exporting from the Sakhalin II facility. It is currently looking to exploit LNG as a means of supply-

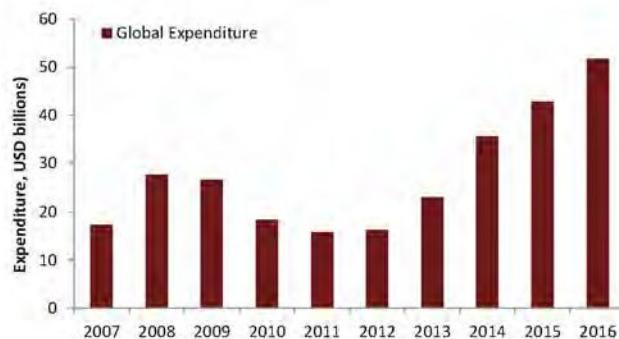
ing gas to Asia and to reduce its dependency on European gas demand. However, LNG transport from terminals slated for the north and northwest areas of the country would be hampered by ice conditions, requiring the use of specialized vessels similar to those employed on the Sakhalin II facility.

North America – United States

Recent developments in unconventional production, such as shale gas, will see a significant shift in the U.S. as the country moves from an importer to an emergent player in the LNG export market. Gas prices in the U.S. are currently less than \$3 per million BTU; arguably, these prices are unsustainable, falling below the cost of production. Furthermore, exposure to global markets will reduce excess supply and could drive up domestic prices.

The U.S. is currently set to bring the Sabine Pass project in the Gulf Coast onstream at the end of 2016. The development involves the construction of production trains in existing import facilities and will have a total export capacity of 8 mmtpa. The complete project will cost \$3.9 billion and is designed for further expansion with Trains 3 & 4 due online between 2017 and 2018.

One potentially limiting factor for U.S. exports is the stage of unconventional production. At present, the U.S. is exploiting "sweet spots." However, as these diminish and the production moves into the next phase, there could be a significant rise in costs and a decline in the rates of wells. This could potentially limit the long-term exporting aims of the U.S. and Canada.



Global LNG capital expenditure, 2007-2016

Source: Douglas-Westwood, *World LNG Market Forecast 2012-2016*.

Overall, capital expenditure in the global LNG market is expected to grow to \$169 billion between 2012 and 2016. Asia will be the main driver in import terminal developments and is forecast to invest \$31 billion during this period.

The global LNG business will see growth and recovery in a number of sectors. Expenditure on liquefaction facilities will exhibit the highest level growth in global expenditure over the forecast period, a large proportion of which will come from Australian developments. Furthermore, growing demand for import terminals will see regasification Capex increase to represent 20% of global expenditure. Following a sharp decline through 2010-2011, the LNG carrier market will begin to recover from 2012 onwards with Capex expected to be over \$30 billion.

Leading the Way to Developing Innovative Solutions and Setting New Industry Records

Devoted to delivering cost-effective, cutting-edge shelf and deepwater solutions either as single service or a comprehensive package, Wright's Well Control Services (WWCS) provides a "Can-Do" attitude with new-school training and technology locally and globally—leading the way to developing innovative solutions and setting new industry records.

Cutting-edge remediation system

WWCS introduced the world's first autonomous hydrate remediation system that did not rely on ROVs or attachable skids to supply power and energy; instead, coiled tubing units were employed to provide energy and horsepower to its system that allowed for the displacement of pipeline internals at a rate in excess of a barrel per minute—a feat that was previously unheard of. The system also facilitated the removal of hydrates, asphaltenes, paraffin, and condensate by introducing gas separation into the pipeline intervention.

New industry record for rigless intervention

Wright's has contributed to setting a new industry record for rigless intervention without a riser—by working over two gas wells in 2,950 ft of water at a downhole depth of 9,000 ft. WWCS provided personnel, deployment and use of wireline tractors, gauges, milling tools, perforating guns, and logging tools to execute the project.

New facilities for 2013 state-of-the-art solutions

With a new Houston facility opening in 2013, WWCS will continue to offer state-of-the-art solutions in the Gulf of Mexico (GoM) and is committed to focusing on its core offerings: decommissioning, P&A, well control, wireline, and downhole services. "This facility is specifically being built for our subsea



Lake Charles Facility

equipment and associated product lines," says David Wright, president and founder of WWCS. The new facility will support WWCS's expansion in overall shelf and deepwater offerings and will help facilitate their rapid response for the following project-related services: RLWI, ROV tooling/support, subsea intervention, hydrate remediation, and rigless/riserless abandonments.

The new location will further enable Wright's to develop, manufacture and test new equipment designed to minimize NPT and contingent scenarios in the field—from specialty hot stabs to hybrid emergency disconnects and nitrogen-filled canisters—to allow for unplanned and contingent operations. WWCS will continue to have a presence in Louisiana via its operational and staging facilities, respectively located in Lake Charles and Cameron.



Equipment Load Out for P&A Projects

viding subsea intervention, topside support, service crews, and project management support while also allocating resources to enable WWCS to make inroads via a focalized expansion into Africa.



Coiled Layout for Rigless Intervention

Global expansion in 2013

Facilitating our goal of global expansion, WWCS received a contract to build a one-of-a-kind piece of equipment for a major oil company in Nigeria. The award includes the provision of specialized and proprietary coiled tubing units for rigless activities to facilitate well stimulation and intervention. The project is scheduled to commence this year, with WWCS beginning to deliver the equipment in this fiscal quarter. WWCS will be pro-

Wright's Well Control Services engineers and executes numerous first-to-market services for clients. Ask the expert team at Wright's about customized solutions for the most challenging offshore environments in the Gulf of Mexico (GoM) and beyond. Whether your focus is shelf, deepwater, or platform-oriented, WWCS is the right answer.

For more information, contact Wright's Well Control Services at 281-446-0273 or visit www.wwcs911.com.

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The Deep Trekker DTG2 splashes down

Deep Trekker announced that their premiere product, the DTG2 micro ROV has shipped to 16 countries in 2012.

The aquaculture and fisheries market, the first users of the Deep Trekker DTG2, continues to be strong. Deep Trekker units have also been deployed for pipe and infrastructure inspection, academic and scientific sea flora and fauna research, shipwreck investigation, and salvage dive operations, and more.

When the St. Lucie Nuclear Power Plant in south Florida needed to do an in-reactor inspection, they reached out to Deep Trekker for help. St. Lucie project manager Rusty Hurt said, "The submarine vendor that we decided to use for the project, Deep Trekker, saved a large percentage of money compared to other vendor proposals. Deep Trekker also generously offered hands-on technical assistance. They even agreed to provide a spare backup sub for the inspection and shipped a prototype sub that came equipped with a gripper attachment that could be used to retrieve the [the anomaly of concern], should it become dislodged. All of this was at no additional cost. We are very grateful for their generosity."

Deep Trekker Inc. added seven new dealers to their



roster in 2012 and will continue to expand their reach into 2013. With a strong focus on innovative engineering combined with a steadfast commitment to customer service, Deep Trekker has been able to penetrate new markets rapidly.

The latest shipments include a DTG2 unit to NASA, marking their first unit into the aerospace industry.

The ROV can be used for hull inspections, salvage investigations, trouble shooting, search and rescue, training, conditions checks, safety monitoring, wreck and reef exploration, and more. With its high-resolution camera feed, divers, enthusiasts, and ROV pilots can plug it into any viewing source and check out reefs, shipwrecks, and ocean flora and fauna. To go fully portable, the DTG2 can be used with the portable screen or digital glasses offered by Deep Trekker for exploring from the dock or boat.

The completely unique design puts the capability of larger, more expensive ROVs in a small, portable, and affordable package. With onboard batteries, the DTG2 is fully self-contained, with no need for external power, topside box, or other installations. Deploying in less than 30 secs, the Deep Trekker DTG2 goes from its case to the water in no time at all, simply remove from the case, turn it on, and start exploring!

For more information, visit www.deptrekker.com.

Divex to provide Russian Navy with saturation diving system

International diving equipment technology company Divex is pleased to announce the award of a multi-million pound contract to supply the Russian Admiralty with a saturation diving system.

Divex are to design, manufacture, and supply a 450-m rated deep saturation diving system for Divex Russian partners Tetis Pro, ultimately for the Russian Admiralty. The system, worth in excess of £10 million, is to be installed in partnership between Divex and Tetis Pro on the Rescue Ship Igor Belousov.

The system is a unique design that accommodates 12 divers in saturation, allowing three-man bell excursions to depths of 450 msw to gain access to a stricken submarine. It also accommodates

up to 60 rescued submariners in the chamber complex in the event that they require decompression following rescue.

The system comprises four accommodation chambers arranged around a central "transfer-under-pressure" chamber where the divers don their diving equipment and access the diving bell. These four chambers accommodate the divers at their equivalent working pressure and provide decompression facilities for the rescued submariners.

Divex, who has built 100 major saturation diving systems since 1974, is to split manufacturing of the facility between two of its global locations. The system decompression chambers, diving bell, and control system will be built in Divex facilities in Perth, Western Australia while the bell deployment, life support, and gas management systems will be manufactured and supplied from Divex headquarters in Aberdeen, Scotland, making the system a truly international project.

The Igor Belousov is planned to be commissioned into the Russian Navy in 2014. The need for such a vessel was emphasised by the Kursk tragedy in 2000.

For more information, visit www.divexglobal.com.

Bluefin offers Seebyte's SeeTrack AutoTracker software for enhanced AUV pipeline inspections



Bluefin Robotics, the leading provider of Autonomous Underwater Vehicle (AUV) solutions, and SeeByte, the global leader in creating smart software for unmanned maritime systems, have announced their collaboration to provide enhanced software solutions for deepwater export pipeline inspections. The collaboration is aimed at equipping Bluefin's 21-in. AUV platforms with SeeTrack AutoTracker. SeeTrack AutoTracker was developed to enable AUVs to perform export pipeline inspections using on-board payload sensors to detect pipelines and automatically adjust the vehicle's trajectory to optimally track the pipeline.

The combination of Bluefin's vehicle stability and navigation capabilities, along with SeeTrack AutoTracker's ability to accurately guide the AUV at a pre-defined offset from the pipeline stands to provide an excellent data product for rapid and efficient pipeline inspection. Using SeeByte's SeeTrack AutoTracker software package on the Bluefin-21 AUV will further expand subsea inspection capabilities and provide valuable information to decision-makers.

For more information, visit www.bluefinrobotics.com.

Singapore-based Kreuz takes delivery of SAAB Seaeye ROV

Operations manager Robert Black sees it as a "formidable vehicle."

"It has incredible strength and an unrivalled speed and agility, which means it can swim around divers safely whilst undertaking light construction and work tasks."

For that reason, he plans to deploy it from Kreuz Subsea's DSVs in support of

diving operations throughout the region.

His first planned mission is in Myanmar, where his client is seeking a competitive work-class package, which Robert feels ideally suits the Panther XT Plus.

"It has the capabilities of a small hydraulic work ROV, yet needs a quarter of the deck space and fewer crew," he says.

The technological breakthrough in design that attracted him is an increase in power management that offers 50% more power and 10 powerful thrusters that drive the ROV at speeds 30% faster than any other electric work ROV in its class.

This unrivalled thruster power means the ROV can stay on task in currents greater than 4 kts — a velocity at which other ROVs must be withdrawn from active service.

For an operator, this exceptional number of thrusters also delivers a reassuringly high level of redundancy.

Robert Black also sees the greater payload and cleverly increased space as an opportunity to add a wide range of



tools and sensors, both now and when needed, including the chance to fit torque tools.

His delivered Panther XT Plus comes with two Schilling Orion manipulators, a Tritech Super Seaking sonar, a variety of cameras, and a tether management system with A-frame LARS and control cabin.

Kreuz Subsea is a subsea service provider offering solutions for developing fields and IRM for existing fields. Its resources include a fleet of offshore vessels and ROVs, as well as a range of diving systems.

For more information, visit www.seaeye.com.





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SeaRobotics Delivers 11-m USV

SeaRobotics Corporation has delivered the first Unmanned Surface Vehicle (USV) in their 11-m hull series to the University of Rhode Island, through funding from the National Science Foundation (NSF). The long endurance, robust hull design is designed to operate through Sea State 5 for up to 30 days. The USV—dubbed SCOAP, “Surveying Coastal Ocean Autonomous Profiler”—will perform a variety of data acquisition tasks to support material transport investigations as well as multidisciplinary studies for coastal oceanographers.

“We are pleased to be involved in this aggressive NSF project, which will push the envelope of unattended operations in navigable waters, while acquiring valuable data. Improvements in affordable situation awareness will open the door to a variety of long duration coastal surveys,” stated Don Darling, President of SeaRobotics.

The company has recently extended its standard product line of USVs to include both 5.7-m and 11-m systems in addition to adding arctic operations to their USV experience base.



SeaRobotics specializes in small, smart vessels that are remotely or autonomously operated. Its clients include major military and commercial organizations, both U.S. and foreign. SeaRobotics’ marine survey software interfaces with most data acquisition hardware, software, and sensing systems to produce multi-spectral, DGPS-stamped data for survey, research, or surveillance efforts. Applications for SeaRobotics vessels range from bathymetric and hydrographic surveys to coastal, harbor, and riverine surveillance. Many SeaRobotics vessels are small, modular, and man-portable, allowing for rapid deployment in remote areas or deployment by larger vessels, and its command and control systems are user-friendly and compact, allowing for backpack mobilization.

For more information, visit www.searobotics.com.

Global submersible solutions provider acquires another deep-sea submersible

OceanGate Inc., a global provider of deep-sea manned submersible solutions, announced the acquisition of the three-person, diesel-electric submersible Lula from Portugal’s Rebikoff-Niggeler Foundation. The submarine, which can operate at a depth of 500 m (1,640 ft), was purchased to meet the increased demand for manned submersibles in commercial applications focused on biological and environmental surveys, monitoring, and inspection.

Having conducted hundreds of dives during her 10-year operating history, Lula will expand OceanGate’s ability to meet growing industry client demands, helping fulfill contracts for the University of Washington on behalf of the Defense Advanced Research Projects Agency (DARPA) and Office of Naval Research. Lula will also supplement OceanGate’s Antipodes submersible in performing survey, inspection, and monitoring work in the Gulf of Mexico.

For more information, visit www.opentheoceans.com.

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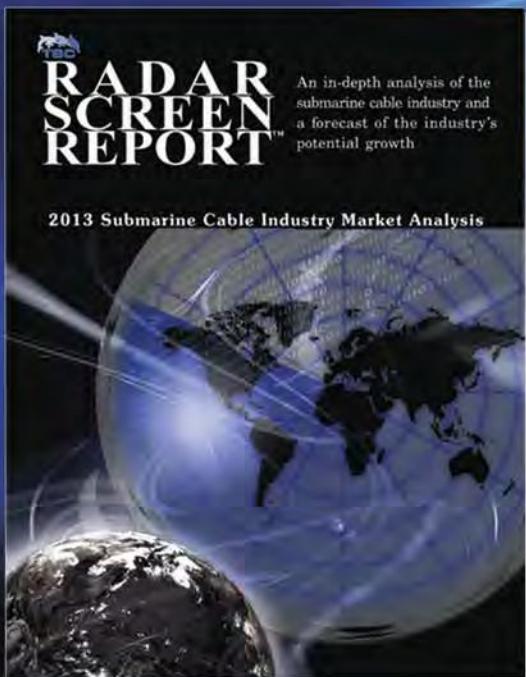
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- Forecast of demand for new systems from 2013-2018
- Analysis of the major factors impacting the submarine cable market, including Internet demand, availability of financing and implications of the financial crisis
- A listing of 250 submarine cable projects under contract during 2012 or planned for the future



Published and distributed by TSC



CWC installs maritime safety system for St. Vincent and the Grenadines

Cable & Wireless Communications' Caribbean business, LIME, has introduced a Global Maritime Distress and Safety System (GMDSS) in St. Vincent and the Grenadines to improve coast guard services. There are an estimated 2,500 fishermen working in St. Vincent and the Grenadine Islands, operating with small-scale and artisanal boats and equipment. There are also many privately owned boats. Boats in distress previously had to tune between radio channels to try to find the coast guard or another vessel. LIME has installed a new system whereby local boat owners can purchase a low-cost handheld mobile radio that will put them directly in touch with the coast guard at the touch of a button. The coast guard's call center is connected using LIME's broadband network to a VHF radio antenna. The new antenna has increased the distance around the country that the coast guard can monitor. The project was funded by St. Vincent and the Grenadines' Universal Services Fund (USF), which was launched in October 2010. The Fund is used by the country's National Telecommunications Regulatory Commission (NTRC) to fund universal access to telecommunications services.

Norsat launches Global-VSAT™ maritime service

Norsat International Inc. announced the launch of Global-VSAT™, an equipment and global airtime services package that leverages the Norsat MarineLink™ line of maritime VSAT terminals. The package is available via flexible lease and purchase options and will provide Norsat's maritime customers with a complete end-to-end communications solution including terminals, modems, air time, installation, and technical support. Global-VSAT™ provides complete coverage through a global satellite network, that features automatic bandwidth leveling for the highest network performance, remote management capabilities for worldwide monitoring and control, and automatic signal switching to prevent signal blockages. The flexible service package is available at competitive monthly rates and is compatible with all of Norsat's COM and TVRO series antennas, including options for Ka-band, Ku-Band, X-band, and C-band.

MTN extends strategic partnership with Norwegian Cruise Line

MTN Satellite Communications (MTN) has extended its contract with Norwegian Cruise Line (Norwegian) for an additional 5 years for VSAT communications, crew calling, Internet services, access to MTN Worldwide TV™, and related services around the globe. MTN will continue to provide its communications solutions to the entire Norwegian fleet, including its newest ships, Norwegian Breakaway and Norwegian Getaway, launching in 2013 and 2014, respectively. MTN's partnership with Norwegian started with the Seaward in 1991, where MTN provided bandwidth to the 709-foot cruise ship carrying 1,480 guests and 740 crew members.

Over the years, the two companies shared many firsts, including pioneering crew calling and launching the first Internet access and Internet cafés at sea. With the extension of the contract, MTN will continue providing Norwegian with a full range of communications services, including Internet cafés and Wi-Fi so users can have Internet access via smart phones, tablets, computers, and laptops. Additional services will include MTN OceanPhone®, which enables reliable connectivity to friends and family for crew as well as extensive MTN Worldwide TV™ programming, including E! Entertainment Television, BBC World News, CNBC, MSNBC, Fox News, Sky News, Sky Sports News and Sport 24.

**Astrium and SES extend coverage for global maritime customers**

SES and Astrium Services have signed capacity deals to deliver connectivity to vessels around Latin America as well as in the North Sea, Mediterranean Sea, Red Sea, and Gulf of Aden.

Astrium Services will renew capacity on the SES-4 satellite to provide its customers with managed services for maritime business communications, tracking equipment and engine performance as well as ensuring crew at sea stay connected. Located at 338°E, SES-4 is among several SES satellites providing capacity to Astrium Services enabling the company to customize services to satisfy specific needs of the maritime industry.

Under the new agreement, Astrium Services is able to meet several specific communication needs, including reliable VSAT coverage for oil and gas activities offshore Brazil and East Africa. Additionally, the wider footprint of SES-4 extends coverage over the Gulf of Aden to support vital connectivity to customers in piracy risk zones, for instance off the coast of Somalia. The coverage also supports fisheries, transportation, and recreational maritime customers in Europe.

For more information, visit www.ses.com or www.astrium.eads.net.

KVH provides 60% more capacity for EMEA region

KVH Industries, Inc. has just completed a major upgrade to the mini-VSAT Broadband™ network that will provide customers in Europe, the Middle East, and northern Africa (EMEA) with a 60% increase in satellite capacity. The added capacity was provided by consolidating bandwidth covering two separate regions into one powerful unified beam and by implementing Variable Coding, Spreading, and Modulation (VCMS) technology provided by ViaSat, Inc., KVH's partner in the mini-VSAT Broadband™ network.

VCMS will be introduced throughout the remainder of the mini-VSAT Broadband™ network in the coming months. For the new regions upgraded with VCMS, the mini-VSAT Broadband™ network capacity is anticipated to



provide a 60% increase over what is currently delivered with the existing transmission technology.

The KVH mini-VSAT BroadbandSM network uses both C-band and Ku-band satellite capacity provided by leading commercial satellite operators, including Intelsat, Eutelsat, SES, and SKY Perfect JSAT. Several of these companies have significant initiatives underway to provide additional satellite capacity over the world's oceans. Currently, 14 powerful satellite transponders deliver KVH's Ku-band capacity, which provides one of the broadest coverage areas of any Ku-band network. This year, KVH added three global C-band beams to the mini-VSAT Broadband network, making it the first and currently the only modern maritime VSAT service using a 1-m antenna to provide full global coverage outside of the polar regions.

KVH manufactures three onboard antennas for the mini-VSAT BroadbandSM network: the new enter-

prise-grade TracPhone® V7-IP; the compact TracPhone V3, which is the world's smallest maritime VSAT antenna measuring only 37 cm diameter; and the new dual-mode TracPhone V11, which provides coverage of 95% of the Earth thanks to its ability to receive both C- and Ku-band satellite signals.

The mini-VSAT BroadbandSM service equips vessels with the highest data rates available today, with downloads as fast as 4 Mbps and uploads as fast as 1 Mbps, as well as Voice over IP (VoIP) telephone lines with optimized service and prioritization of applications.

For more information, visit www.kvh.com.

MTN Nexus™ transforms at-sea communications

Connectivity and content demands on cruise operators increase significantly as cruise passenger and crew communications requirements grow. To address these passenger and crew connectivity

needs and to ensure that cruise operators stay ahead of connectivity demands, MTN Satellite Communications (MTN) announces the launch of MTN Nexus™.

MTN Nexus™ is the company's next-generation communications network—a hybrid network that builds on a 30-year legacy of satellite connectivity leadership and innovation. This new network will deliver sophisticated computing, caching, and security infrastructure to deliver connectivity and communications to a degree never realized before at sea and in port.

According to a recent Business Insider report, consumers expect to be connected everywhere, as evidenced by the more than 2 billion people online today via Internet devices. Smartphone sales overtook PC sales in 2011, and Business Insider also cites social networking as the second most popular mobile application in terms of consumption per minute. Today, these trends reflect vacationers' expectations—to keep their devices with them, to keep them on, and to keep them connected.

MTN Nexus™ seamlessly integrates three critical components that, until now, have never been combined into one maritime communications solution:



Worldwide leader of commercial AUV surveys for 13 years!

C & C Technologies, Inc. leads the market with its four proprietary C-Surveyor™ AUVs. C & C's surveying experience spans the world seven times over; it sets the standard in deepwater AUV capability with more than 290,000 kilometers of survey experience on over 385 projects to date.

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- A hybrid satellite and terrestrial wireless network;
- A cloud computing-based optimization platform; and
- New products and services enabled only through this hybrid solution.

MTN recently made a significant investment in a cruise-specific, purpose-built payload through the launch of Intelsat's EpicNG satellite constellation. MTN partnered with Intelsat to carefully engineer the delivery of maximum bit-to-hertz efficiency, which has resulted in unmatched throughput and global interoperability to key cruising areas around the world. The partnership has enabled the delivery of a High Throughput Multi-Spot Beam (HTMS) solution delivering up to 500 Mbps per beam in the Caribbean.

MTN HTMST™ will enable vessels to seamlessly roam between MTN HTMST™ beams and conventional Ku-beams. This collaboration will ensure global coverage and redundancy while reducing cost and antenna complexities. MTN service will remain backward compatible with existing Ku-band satellite systems, current network infrastructure,

and customer-preferred network topology, making it the most interoperable network available.

That network design was the first step in developing MTN Nexus™. The second was combining MTN's global satellite capabilities with a terrestrial network, building a Near-Port/In-Port network using Wi-Fi, 3G, 4G, WiMAX, and/or LTE. As vessels move into port, they will switch to Wi-Fi infrastructure using a sophisticated smart switching technology. As a Wi-Fi connection is established, MTN will seamlessly reallocate unneeded satellite capacity back to ships at sea, maximizing capacity and affordability for cruise lines. The results are maximized efficiencies of unused bandwidth when ships are in port and a better end-user experience as crew and passengers move from ship to shore and back on port days without service interruption.

MTN ShipCloud™ is an integrated shoreside and shipboard platform that will build on the MTN Nexus™ hybrid network. Leveraging cloud computing technology, MTN ShipCloud™ will deliver powerful infrastructure for faster processing and caching of data



and content. Content enhancements and processing advancements on the vessel are geared to improve the end-user experience.

The powerful combination of the MTN Nexus™ hybrid network, coupled with the MTN ShipCloud™ platform, will enable the delivery of a communication and content products suite specifically optimized for maritime use to deliver social media solutions, content, and calling apps for a more enjoyable at-sea experience. In addition, because MTN Nexus™ is an open platform, MTN products as well as cruise-specific

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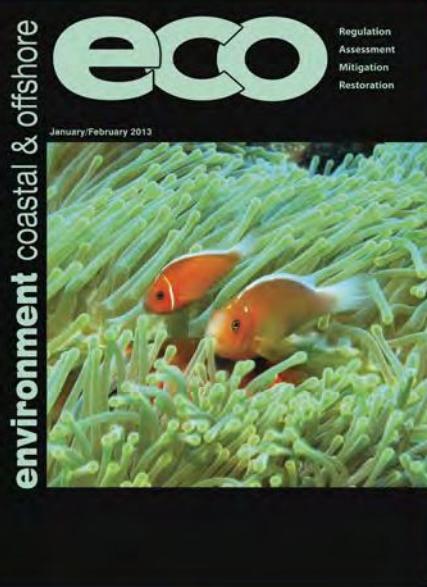
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products and products from third parties can be integrated for complete optimization and delivery.

MTN is launching its next-generation network to the cruise market, but it will ultimately expand these capabilities to other key markets that demand the same connection, content, and user experience as on land.

For more information, visit www.mtnsat.com.

Marlink commits to 24-hr VSAT installation

Twenty-four hrs is all it takes to get a VSAT up and running, according to the new commitment that Marlink, an Astrium Services company, is making. The established satcom provider has developed a concise antenna installation and commissioning system that will support engineers and crews to have vessels fully connected to Marlink's WaveCall standardized VSAT service in just 24 hrs.

The perceived complexity of VSAT procurement and installation may have been a barrier to some customers in the past, so Marlink has optimized its processes to ensure installation to high standards in a very short timeframe.

Marlink's VSAT installation program means that its WaveCall standardized VSAT services can be installed during scheduled port-calls anywhere in the world, without affecting a vessel's operational schedule. With field engineers all over the world, Marlink is able to board a vessel in port and have the VSAT connectivity up and running in 24 hrs, as long as the operator and owner agree to support the process by preparing certain aspects in advance. A customer installation document is used to provide confirmation that all equipment has been delivered, in addition to checking off that preparation of the antenna pedestal, rack mounting, cabling, power, and gyro connections has been completed. All Marlink deliveries and installations are completely transparent; over the online portal, customers can track the installation status at all stages.

For more information, visit www.marlink.com.

Navarino, Inmarsat sign reseller agreement

Navarino, a maritime communications provider based in Piraeus, Greece, has signed an agreement with Inmarsat to become a Value Added Reseller of Global Xpress® for the maritime market. Global Xpress® will be launched in 2013, with full global coverage available by late 2014. It will offer downlink

speeds of up to 50 Mbps and up to 5 Mbps over the uplink from compact user terminals. With superior engineering and quality, and backed by the L-band resilience of FleetBroadband, the Global Xpress® solution will exceed the levels of service offered by existing broadband VSAT services. Global Xpress® will offer significantly better throughput at prices comparable with today's slower VSAT services. Global Xpress® will be available globally through smaller anten-

nas than standard VSAT Ku antennas. This will enable many more ships to take advantage of the superior speeds and service. As the need for better crew benefits grows, Global Xpress® will be ideally placed to provide a high-quality user experience for browsing, voice, and media services. In addition, integrating the ship into the corporate office as a part of the enterprise will become reality.

For more information, visit www.navarino.gr.

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CWC joins PCCS consortium

Cable & Wireless Communications has announced that it has become one of the founder members of a consortium to build a new submarine cable system that will increase access to fast broadband and pay TV in the Caribbean and Central and South America. The Pacific Caribbean Cable System (PCCS) will span 6,000 km from Jacksonville, Florida to Manta, Ecuador. The cable will have landing stations in the islands of Tortola in the British Virgin Islands, Puerto Rico, Aruba, and Curacao as well as Cartagena in Colombia and Maria Chiquita and Balboa in Panama. Demand is growing rapidly across the pan-America region for online content such as tourism-related services, sports coverage, and digital TV. The 100-Gbps cable system will substantially increase the capacity for broadband services and international connectivity in the region as well as improving the reliability of telecommunications services. The other consortium members are Setar, Telconet, Telefonica Global Solutions, and United Telecommunication Services (UTS). With PCCS, CWC Wholesale Solutions will own or have capacity on 20 submarine cable systems in the region, including CBUS, the East-West cable, PanAm, Maya, and ECFS as well as four diverse landings in the USA.

Alcatel-Lucent, Main One extend maintenance contract

Alcatel-Lucent and Main One Cable Company Limited have renewed their marine maintenance contract for Main One's submarine cable system connecting Portugal to Nigeria over 7,000 km and contributing to enhancing overall African and international connectivity. Delivering high-speed bandwidth of 1.92 Tbps, the Main One cable enables cost-effective access to global information, data, and markets in Western Africa. As a member of the Atlantic Private Maintenance Agreement (APMA), Main One will continue to manage and maintain its network at the highest level of performance. Under the service level agreement, Alcatel-Lucent will make available its maintenance vessels as well as experienced, fully trained, and certified specialist personnel for cable repairs. Alcatel-Lucent capitalizes on its unique experience as a turnkey provider delivering a wide range of installation, maintenance, and related services, which includes the APMA. Alcatel-Lucent private maintenance agreements offer a unique solution adapting to the particular maintenance philosophies of individual cable owners and their needs. Alcatel-Lucent currently maintains over 300,000 km of critical submarine cable infrastructure worldwide.

ESB Telecoms completes UK-Ireland cable

Ireland's ESB Telecoms Limited (ESBT), in partnership with Geo Networks Limited, announced the completion of a new submarine fiber optic cable that directly links Irish businesses with major UK cities for the first time. The new cable connects ESBT's existing 1,300-km fiber network in Ireland with Geo's extensive UK fiber network and forms a critical link in Geo's new East-West Ring, the newest diverse optical ring between Ireland and the UK. The new subsea cable, known as the Emerald Bridge Fibres Cable, will provide customers with an end-to-end fiber solution, allowing businesses in Ireland and the UK to connect directly through a single supplier. Using the shortest subsea route and most modern fiber technology, it provides virtually limitless capacity and best-in-class, low-latency bandwidth, future-proofed and 100-Gbps capable for even the most demanding of requirements. Responding to growing demand for high capacity, scalable bandwidth between the UK and Ireland, the new fiber link is specifically optimized for heavy data users such as data center operators, mobile and fixed line carriers; cloud providers; and the digital, financial, and high tech sectors. A number of multinational customers have already signed up to use the service.

**Sea Fibre Networks takes the reins of ACMA website**

Sea Fibre Networks (SFN), owner and operator of the CeltixConnect submarine fiber optic cable system, announced its selection to oversee the newly developed and upgraded Atlantic Cable Maintenance Agreement (ACMA) website. ACMA operates one of the largest dedicated marine fleets in the world and is responsible for the maintenance and repair for over 60 of the largest submarine telecom, power, and oil and gas organizations in the world.

Following a long honored tradition among the ACMA members, SFN is delighted to be selected from a group of prestigious sub-sea providers to spearhead the development and new direction of this vital resource. The ACMA website is an essential communications tool for members such as Cable&Wireless, Hibernia Atlantic, Verizon, and SFN who depend on real-time access to information regarding vessel locations and maintenance agreements. ACMA selected SFN from amongst its 60+ specialized sub-sea operators, following in the footsteps of previous members who managed the site. SFN joined ACMA at the start of 2012 as part of their pro-active cable operations and maintenance program for CeltixConnect, the most modern cable system connecting Ireland to the UK.

ACMA is a non-profit cooperative subsea maintenance agreement consisting of 60+ members. ACMA members are companies responsible for the operations and maintenance of submarine communications and power cables as well as oil and gas platform operators in the Atlantic, North Sea, and Southeastern Pacific Ocean.

As the entire ACMA maintenance (operation ships, ROVs, technical specialists) is under independent contract to dedicated third-party service providers, with formal key performance indicators, such as cable ship mobilization, spares loading and operational timings, ACMA members also benefit from a quality and efficient service provided by an independent fleet with its facilities dedicated to the sole use of the ACMA members.

For more information, visit www.seafibre.com or www.acmarepair.com.

ADB to help Solomon Islands fund cable system

A financing agreement and a project agreement were signed on 14 November by the Asia Development Bank

Subsea Telecom

(ADB) to support the Government of Solomon Islands finance the building of a submarine cable system that will deliver good quality high-speed Internet services at affordable prices to the people of Solomon Islands.

Rick Houenipwela, Minister of Finance and Treasury, the Government of Solomon Islands; Andrea Iffland, regional director of ADB's Pacific Liaison and Coordination Office in Australia; and Austin Holmes, chairman of the board of the Solomons Oceanic Cable Company participated in the signing ceremony.

The project will build a submarine cable system that will connect Solomon Islands to an existing international submarine cable network that runs between Guam and Sydney, Australia. The cable system is expected to be in place by December 2013.

Many areas of Solomon Islands remain geographically isolated with poor access to markets and services. The cable project will improve the country's connectivity to the rest of the world, offer new domestic and regional economic opportunities, reduce communication costs, and assist with service delivery.

The project will be financed by Asian Development Fund (ADF) loan and grant funds, commercial financing from ADB, and equity brought in by the Solomons Oceanic Cable Company.

Supporting investment in ICT and inclusive growth are key focus areas of ADB's Pacific Approach, which guides ADB's operational focus for ADB in the region.

For more information, visit www.adb.org.

ACE cable launched in first phase to link 13 countries

France Telecom-Orange and the other members of the Africa Coast to Europe (ACE) consortium announced in a ceremony held in Banjul, The Gambia, that the ACE submarine cable is now operational for the first phase linking France and São Tomé & Príncipe. The cable, which will extend as far as South Africa for the second phase, provides connectivity to broadband Internet in Africa and will add extra capacity to existing international networks.

Nearly 12,000 km of submarine optical fiber cable running along the west coast of Africa have been deployed to connect 13 countries—France, Portugal, Mauritania, Senegal, The Gambia, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Equatorial Guinea, Gabon, and São Tomé & Príncipe. Two landlocked countries, Mali and Niger, will also be connected through extensions to the terrestrial network. Finally, Nigeria will also be connected to the cable in 2013.

Seven of these countries—The Gambia, Guinea, Equatorial Guinea, Liberia, Mauritania, São Tomé & Príncipe, and Sierra Leone—will benefit for the first time from a direct connection to a submarine cable, enabling them to enjoy optimal access to the international broadband network. By using this new network, the telecoms operators in these countries will now be able to develop innovative broadband services that are essential to their economic and social development.

The ACE cable will also contribute to the development of multinational companies present in Africa by improving connectivity between the local subsidiaries and their global networks. This will allow them to develop added-value services in areas such as Unified Communications, IT, and customer relations.

The commissioning of this first phase marks the beginning of the deployment plan for the ACE submarine cable, which will ultimately run for a total of approximately 17,000 km. Seven additional countries—Canary Islands (Spain), Benin, Cameroon, Democratic Republic of Congo, Angola, Namibia, and South Africa—will be connected in the second phase.



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To carry out this ambitious project, France Telecom-Orange, together with its subsidiaries Côte d'Ivoire Telecom, Orange Cameroon, Orange Mali, Orange Niger, and Sonatel, have combined forces with other major partners to form an international consortium.

Through links to other submarine cables, ACE also provides an additional western route for traffic between Europe and Asia via Africa. ACE, for example, offers an alternative and secure route for communications to countries already connected to the SAT3-WASC-SAFE cable linking Portugal and Malaysia. Finally, the cable also diversifies transmission arteries between Portugal and France.

ACE relies on what is currently the most advanced technology used for submarine cables: wavelength division multiplexing (WDM). With WDM, cable capacity can be increased without additional submarine work. Overall capacity will be boosted to 5.12 Tbps using the new 40-Gbps technology that supports ultra high-speed broadband networks.

The cable's construction amounts to a total investment of around US\$700 mil-

lion for the consortium, with around US\$250 million financed by the Group and its subsidiaries. This major investment furthers two strategic objectives of France Telecom-Orange: (1) to provide widespread access to the Internet in the more than 20 African countries where the Group is present and (2) to continue to improve the quality of service provided by the network in all of its subsidiaries.

Through the development of its submarine networks, France Telecom-Orange is contributing to the development of a high-quality worldwide network. These cables constitute the essential arteries to provide the Group with access to high-performance systems at a reasonable cost in order to help service the ever-increasing volumes of data being exchanged.

For more information, visit www.orange.com.

Alcatel-Lucent to upgrade MAYA-1

Alcatel-Lucent is to upgrade the MAYA-1 submarine cable system – which spans 4,400 kilometers in distance in a collapsed ring from

Hollywood, Florida, US, to Tolu, Colombia – quadrupling the activated data capacity to address growing demand for bandwidth-intensive services, as well as position the Caribbean as a critical hub for communications between North and South America. The 40 Gigabits per second (40G) subsea system will use the high scalability of Alcatel-Lucent's market-leading single carrier coherent technology to lay the foundation for potential upgrade to 100G capabilities in the future. The solution that will be provided to MAYA-1 is based on the 1620 Light Manager submarine line terminal equipment, which uses single-carrier coherent technology to provide the most efficient use of the available optical spectrum. Designed to operate on different channel spacing grids, with various modulation formats and channel bit rates co-existing on the same platform, the flexibility of the 1620 LM ensures the highest achievable capacity in the most cost-effective manner. It will also feature built-in supervision function, allowing for managing the wet plant along with the man-

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agement system. MAYA-1 is a submarine telecommunications cable system owned by a consortium of telecoms companies that was originally constructed in the year 2000. The system connects seven strategic landing points in the Caribbean, including Hollywood (USA), Cancun (Mexico), Puerto Cortes (Honduras), Puerto Limon (Costa Rica) Half Moon Bay (Cayman Islands), Maria Chiquita (Panama) and Tolu (Colombia) in a collapsed ring configuration. The system has historically been operated as an SDH Ring, however it is now also configured to provide Direct Wavelength Access with various interface types available in addition to the original SDH Ring.

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

Reliance Globalcom partners with Ciena for 100-G upgrade

Ciena® Corporation announced that Reliance Globalcom has selected Ciena®'s market-leading WaveLogic™ coherent optical 100-G networking solutions to upgrade its FLAG Europe-Asia (FEA) submarine network. Based on Ciena®'s OPn architecture, the 100-G network will bring massive capacity increases to a route that connects Egypt and Jordan to satisfy customer demand for high-bandwidth services, while using its existing fiber infrastructure to support growing bandwidth requirements.

As part of the network upgrade, Reliance Globalcom will deploy a 100-G DWDM system with Ciena®'s 6500 Packet-Optical Platform equipped with WaveLogic™ coherent optical line interfaces. Using principles of Ciena®'s OPn network architecture, the upgrade will allow Reliance Globalcom to support the surge of high-bandwidth applications such as cloud computing, video conferencing, business continuity/disaster recovery, data center connectivity, and storage area networking in addition to ever-increasing Internet traffic.

The network upgrade with 100-G technology allows Reliance Globalcom to increase submarine bandwidth on this segment by 10 times and enables the launch of 10GE and OTU-2 services. The upgrade also enables Reliance Globalcom to provide 100-GbE for their end customers as required.

Ciena® is also providing Reliance Globalcom with its advanced network management solution for streamlined service activation, robust fault management, and comprehensive performance

monitoring. Additionally, the deployment includes a wide range of professional services for this deployment via Ciena®'s Specialist Services portfolio, including engineering, furnishing, and installation (EF&I).

This deployment builds on a long-standing relationship between Ciena® and Reliance Globalcom and its parent company Reliance Communications. Earlier this year, Reliance announced it is using Ciena®'s 100-G solutions to

power its European network. In 2011, the companies announced two 40-G deployments on the Reliance Globalcom network—one to support a 5,000-km submarine link along two key routes connecting Japan, Taiwan, South Korea, and Hong Kong, and the other to support a 6,400-km ultra-long haul submarine link connecting the UK, Spain, Italy, and Egypt.

For more information, visit www.ciena.com.

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LS Cable wins order from Qatar Petroleum

LS Cable & System announced that the Letter of Award (LOA) has been received for the contract of submarine power cable project worth over US\$440 million ordered by Qatar Petroleum.

This project is to install two 100-km, 132-kV cables for efficient electric power supply from Ras Laffan Industrial City to Halul Island. The 132-kV cable comprises 3-core power cables with embedded fiber optic cables to transmit 100 MW power in total.

LS Cable & System secured the turnkey contract, including engineering, procurement, installation, and commissioning of onshore construction in Ras Laffan, as well as the laying of submarine cables, construction of new substation and tie-in with existing substation in Halul Island. This project is of significance in that the company's pro-



duction know-how and capabilities as a submarine power cable manufacturer were recognized.

LS Cable & System won the contract through competition against leading European and Japanese manufacturers with long-standing know-how of submarine power cables.

The global submarine cable market has grown significantly from KRW1.5 trillion in 2008 to KRW3 trillion in 2011. LS Cable & System won several overseas submarine cable projects consecutively, including the installation of 20-kV submarine power cables in the 10-km section from Tidore Island to Ternate in the archipelago north of Indonesia and 33-kV Malaysian Sarawak islands electrification project. In addition, LS Cable & System became the first Korean company to win the submarine cable project for power supply between Long Island and Captree Island in the east of New York and completed the project at the end of last year. Domestically, the company has completed projects, including HVDC 250-kV interconnection project to in the 105-km span between Jindo to Jeju island, 154-kV AC interconnection project between

Hwawon and Anjwa, the Jeju-do Woljeong-ri wind power project, and the Jeolla-namdo Jangjuk-Sudo tidal current power plant project.

For more information, visit www.lscns.com.

SOC, JPS win offshore wind farm contract

Siem Offshore Contractors GmbH (SOC) and J-Power Systems Corporation (JPS) have been awarded a contract with TenneT TSO GmbH.

The contract is for the supply, installation, and commissioning of the 155-kV grid connection system for the Innogy Nordsee 1 Offshore Wind Farm cable system project. The contract award marks a further key milestone as part of the Offshore Renewable Energy Market activities within the Siem Offshore group. SOC is a wholly owned subsidiary of Siem Offshore Inc.

The cable system will consist of two 155-kV high-voltage alternating current (HVAC) 3-core submarine composite cables, which will be installed in between the offshore substation (OSS) of the Innogy Nordsee 1 Offshore Wind Farm

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and the offshore converter platform (OCP) DolWin beta as part of the DolWin2 cluster within the German exclusive economic zone (EEZ).

The HVAC submarine composite cables will be manufactured and supplied by JPS and subsequently installed by SOC utilizing dedicated resources out of the Siem Offshore group.

In addition to the submarine cable installation works, SOC and JPS will provide associated services, including burial assessment studies, route clearance operations, and post-installation termination and testing works, whereby the offshore submarine cable installation works are scheduled for third and fourth quarter 2014.

For more information, visit www.siemoffshore.com.

Guard vessel contracts for OMM

Offshore Marine Management has signed several contracts with cable suppliers and installers for upcoming Offshore Wind Interconnector installations (BorWin2, HelWin1, Dolwin1, SylWin1, Helwin2) for auxiliary works and supply and management of Guard Vessels.

OMM currently has 21 Guard vessels under management on exposed cable sections, cable crossings, and joint locations. OMM is using its German subsidiary company, based in Hamburg, for project management and active control (with the in-house Marine Management System "EPOCH") of these contracts.

Since the first Offshore Wind Interconnector cable was installed in German Waters (Alpha Ventus/BorWin1) in 2009, OMM has been actively involved in the supply and management of Guard vessel operations in the German part of the North Sea, protecting the cable installation operations in harsh conditions. OMM provides a full management solution to our clients.

For more information, visit www.offshoremm.com.

NSW to supply and install Gode Wind I export cable

Norddeutsche Seekabelwerke GmbH (NSW) has been awarded the order by TenneT TSO GmbH, a German-based transmission network operator, for the

Power Cables

supply and installation of 2 x 8.5 km of 155-kV AC submarine transmission cable system.

The cable will provide the connection of the transformer platform of the future offshore wind park Gode Wind I to the converter station DolWin beta. DolWin beta is currently being constructed and will be located approximately 45 km from the German coast in the North Sea. The offshore converter station DolWin beta, which will be operated by TenneT, is transforming the wind energy generated offshore from AC into DC current. It prepares the transport of the current via a 135-km high-voltage DC submarine cable system to the onshore converter station Dörpen West. Production is scheduled to start in 2015.

For more information, visit www.nsw.com.

Emera approves sanction of Maritime Link Project

Emera Inc. has announced sanction of the Maritime Link, submarine power cable project that will link the provinces of Newfoundland and Labrador and Nova Scotia for the first time. When completed, The Maritime Link will supply affordable, reliable and renewable energy to Nova Scotians.

The Sanction Agreement entered into will enable Emera and Nalcor to move forward with the project on terms that are consistent with the Federal Loan Guarantee announced on November 30, 2012. The Federal Loan Guarantee provides a direct benefit to Nova Scotia electricity customers by lowering Emera's borrowing costs for the project. This will save more than one hundred million dollars in financing costs over the 35-year period, all of which will be passed on directly to customers.

Recovery of costs on the Maritime Link project from Nova Scotia customers remains subject to regulatory approval in Nova Scotia. The project partners have committed to ensure that the Maritime Link is built under the terms of The Sanction Agreement. These terms include:

- Agreement on a mechanism for dealing with adjustments to rate of ROE
- Settlement mechanism for payment on the 80/20 true up
- Agreement on the conditions under which Emera's investment in the Labrador Island Transmission Link is assured
- Agreement on cost sharing of the Federal guarantee payment

For more information, visit www.emera.com.



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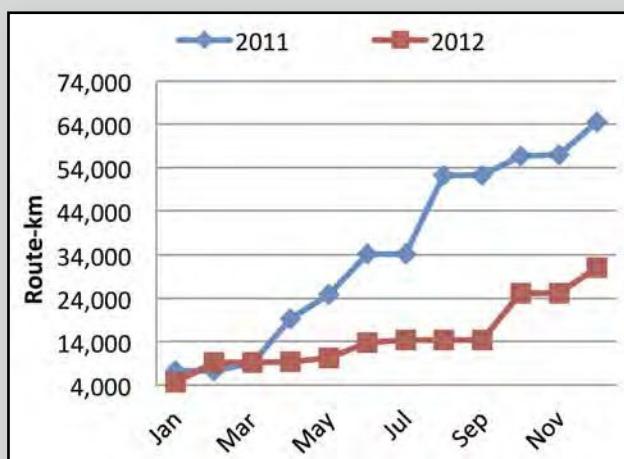


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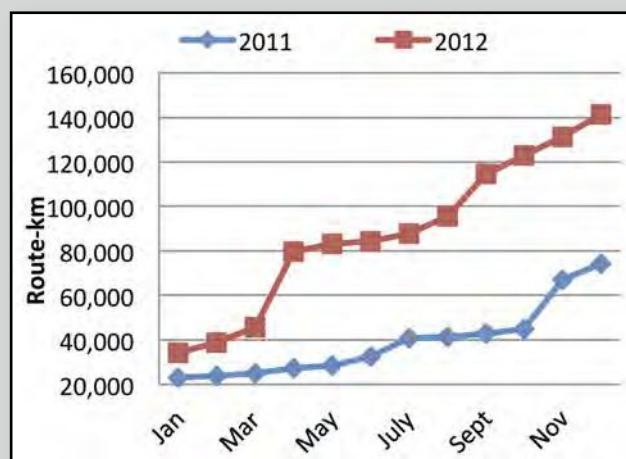
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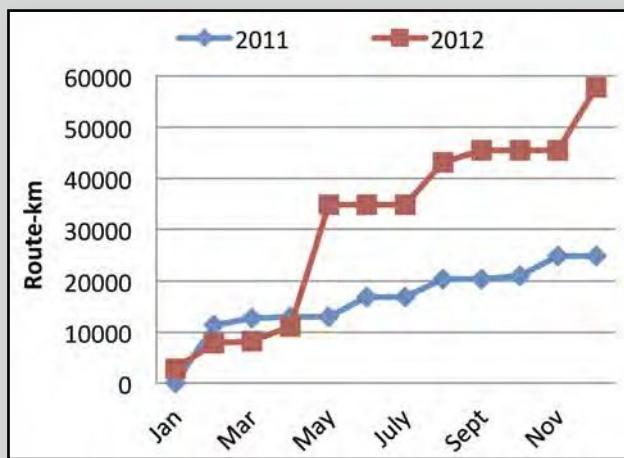
FO Cable Awards by Month



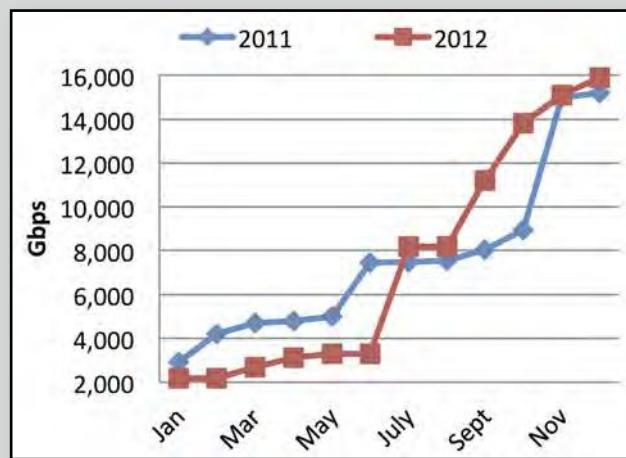
FO Cable Announcements 2012



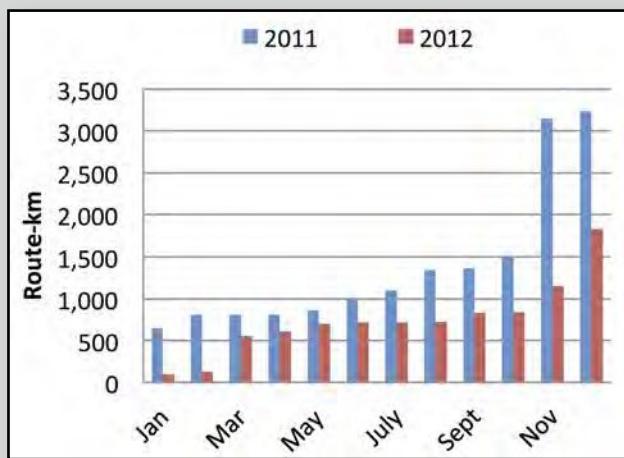
Submarine FO Cables Entering Service 2012 in Route-km



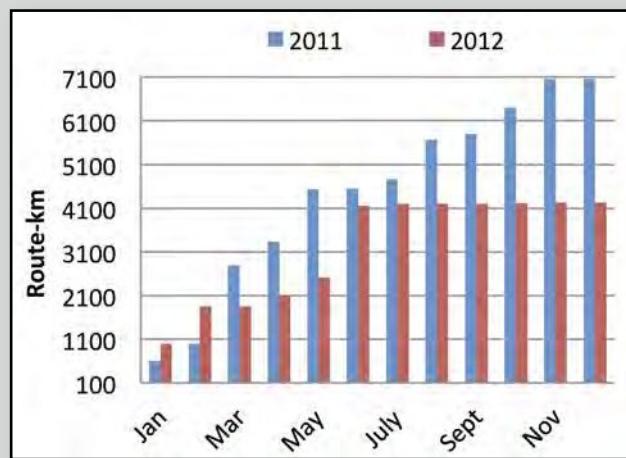
Upgrades of Existing Cable Systems in Gbps



Submarine Power Cable Awards 2012 in Route-km



Submarine Power Cable Announcements 2012 in Route-km



2013 EDITORIAL CALENDAR

January/February 2013

Editorial: Decommissioning & Abandonment, Subsea Fiber Optic Networks
Distribution: Decommissioning & Abandonment Summit, NACE, Offshore Mediterranean, U.S. Hydro
Product Focus: Navigation, Mapping & Signal Processing

March

Editorial: Oceanology & Meteorology, Maritime Security
Distribution: Ocean Business, SubOptic 2013
Product Focus: Ocean Instrumentation, Diver Detection Systems

April

Editorial: Offshore Technology, Ocean Mapping & Survey
Distribution: GMREC, IDGA Maritime Homeland Security, OTC
Product Focus: Connectors, Cables & Umbilicals

May

Editorial: UW Imaging & Processing, Marine Salvage
Distribution: EnergyOcean, Oceans '13 Bergen, Sea Work Intl, UDT
Product Focus: Cameras, Lights & Imaging Sonars

June

Editorial: Workclass ROVs, Deepwater Pipeline & Repair & Maintenance
Distribution: TBA
Product Focus: Subsea Tools & Manipulators

July

Editorial: AUVs & Gliders, Marine Construction
Distribution: AUVSI
Product Focus: Tracking & Positioning Systems, Seismic Monitoring

August

Editorial: Defense & Naval Systems, Corporate Showcase
Distribution: TBA
Product Focus: Multibeam & Side Scan Sonars

September

Editorial: Ocean Observing Systems, Ocean Renewables
Distribution: Oceans MTS IEEE, SPE ATCE, MREC, MTS Dynamic Positioning,
Product Focus: Buoys & Monitoring Instrumentation

October

Editorial: Offshore Vessels, Offshore Communications
Distribution: International Workboat, LAGCOE, Oil Comm, OTC Brazil, North Sea Decommissioning, AWEA/Offshore Windpower
Product Focus: Acoustic Modems, Releases & Transponders, Marine Communications

November

Editorial: Subsea Inspection, Monitoring, Maintenance, Repair; Subsea Telecom
Distribution: SUBSEA Survey IMMR, Clean Gulf
Product Focus: Handling Equipment, Winches & Control Systems, Battery Technology

December

Editorial: Light Workclass ROVs, Commercial Diving
Distribution: Subsea UK, Underwater Intervention
Product Focus: Diving Equipment & Buoyancy Materials

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SBG Systems introduces Ekinox Series

SBG Systems presents Ekinox Series, a brand new product range of tactical-grade inertial systems that brings robust and cost-effective MEMS to the Fiber Optic Gyro (FOG) level. This series consists of two ITAR Free models: the Ekinox AHRS, which provides 0.05° 3D attitude and 5 cm heave, and the Ekinox INS, which delivers additional 2-cm position. Marine, ground, aerospace—Ekinox Series precisely fits every demanding application.

R&D specialists usually compromise between high accuracy and price. Ekinox Series brings robust, maintenance-free, and cost-effective MEMS to the FOG accuracy and opens up to a new world of opportunities for professionals. Thanks to a drastic selection of high-end MEMS sensors, an advanced calibration procedure, and powerful algorithm design, Ekinox Series achieves 0.05° in a compact and affordable package. Compromise is no longer required between high performance and cost.

The Ekinox series has been designed for harsh environments and high demanding applications. Its IP68 enclosure is constructed of aluminum, and every system has been intensively calibrated and tested. More than offering a high attitude accuracy, Ekinox hardware outputs data at 200 Hz with a 3 milliseconds latency and very low noise on Euler Angles (< 0.03°). All data can be recorded into the 4-GB internal data logger, displayed in real-time throughout an intuitive embedded interface, and analyzed in the sbgCenter software.

Ekinox accepts aiding data from various marine external equipment, including DVL, Dual Antenna GPS, USBL, and EM Log. By offering real-time surge, sway, and auto adjusting heave on four monitoring points NMEA protocol; and Ethernet communication, Ekinox is ideal for demanding marine applications such as vessel motion monitoring, ROV and AUV control, or buoy positioning. As a cost-effective alternative to FOG technology, Ekinox is also highly efficient in geo-referencing data from sonar, LIDAR, and camera.

For more information, visit www.sbg-systems.com.



New 200m rated DS5X sondes now available

OSIL are delighted to announce the addition of a 200m rated Hydrolab DS5X to their rental pool and they are now available for hire.

The DS5X is a multiparameter water quality sonde, capable of measuring up to 15 water quality parameters simultaneously. The memory capacity of up to 120,000 measurements allows users to deploy the sonde in situ for long periods of time. Thanks to its innovative central brush motors, the DS5X is also ideal for extended deployments where biofouling may otherwise become an issue.

As with the other Series 5 multiparameter sondes, the DS5X allows optimised combinations of sensors and

accessories to suit water quality monitoring applications in all environmental water sources such as rivers, streams, lakes, reservoirs, oceans, bays, estuaries and groundwater aquifers. The DS5X can be used in a broad range of applications including dredge monitoring, long term in-situ environment monitoring and buoy based applications.

Sensors are available to measure temperature, depth, conductivity, salinity, specific conductance, TDS, pH/ORP, dissolved oxygen, turbidity and chlorophyll a.

This is a great opportunity to have an advanced Series 5 Sonde available for both short and long-term rental use without the outlay of purchasing a unit.

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



MacArtney adds 4-pin option to the Mac API connector range

To further support the ascending demand for API connectors—the MacArtney Underwater Technology Group now has a 4-pin addition to the Mac API Power and Signal Connector range.

The 4-pin connector features a compact, rugged design that is ideal for securing critical connectivity and optimal design for underwater equipment solutions. The new connector is especially applicable for riser monitoring, drilling control, and BOP (blow out preventer) systems.

From draft to delivery, the Mac API 4-pin connector is designed to comply with American Petroleum Institute (API) standards 16D and 17E and for use in critical and strictly regulated environments.

Within an API context, the PBOF (pressure balanced oil filled) cable is as important as the connector. Every element of the cable is tested to ensure its integrity so that it can function even if water ingresses the hose. A boot fitted behind the connector ensures that any water entering the hose cannot penetrate it so that the connector will continue to work for its intended lifespan—even if fully flooded. Double test ports on the API connector itself allow pressure testing of both sections.



The connector is tested to full ocean depth and has an operational depth rating of 4,000 m. In addition, the connector has an operational voltage of 600 V and can take 10 A per pin. The Mac API 4-pin connector will work at temperatures ranging from -15°C to +60°C.

Besides complying with the strict API standards for use in challenging environments, the Mac API 4-pin connector, like the larger 12-pin and 24-pin options of the same series, is certified to accommodate DNV standards of quality and performance.

MacArtney is currently the only supplier of third-party certified API connectors in the world.

For more information, visit www.macartney.com.

DeepSea Power & Light® announces the new 220Vac SeaLite® Sphere



DeepSea Power & Light® proudly announces the release of the 220Vac version of the SeaLite® Sphere, taking this already popular LED light to the next level by extending the range of input voltages available for the subsea market.

SeaLite® Sphere, the perfect LED replacement for Halogen lights, previously covered both low (10-36 Vdc) and high (120 V) voltages in AC and DC. This powerful, dimmable, and compact LED light is now available for 220-275 Vac (50/60 Hz) and 275-385 Vdc input as well.

The SeaLite® Sphere family of lights continues to combine the latest LED technologies with cutting edge engineering innovations. John Sanderson, director of product development at DeepSea Power & Light®, states, "The SeaLite® Sphere light is five times as bright as a comparable Halogen light, while consuming 80% less power and lasting about 60 times longer."

The SeaLite® Sphere uses the same connector choices, mounting bracket, input voltages, and easy dimming options that have been used with the Halogen Multi SeaLite® family of lights for many years. The LED SeaLite® Sphere successfully operates around the world, from splash zones to depths of 6,000 m and beyond.

For more information, visit www.deepsea.com.

RESON SeaBat 7125-ROV2 gets enhanced performance

RESON A/S announced that it is now adding the extra features contained in its Feature Pack 3 (FP3) to the SeaBat 7125-ROV2 multibeam system. FP3 contains RESON's latest SeaBat technology for enhancing performance and efficiency, based on four state-of-the-art features: RESON's new SeaBat User Interface, Tracker (Autopilot), X-Range (400 kHz), and Full Rate Dual Head (400 kHz).

Ekinox INS

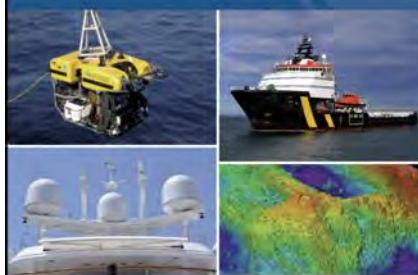
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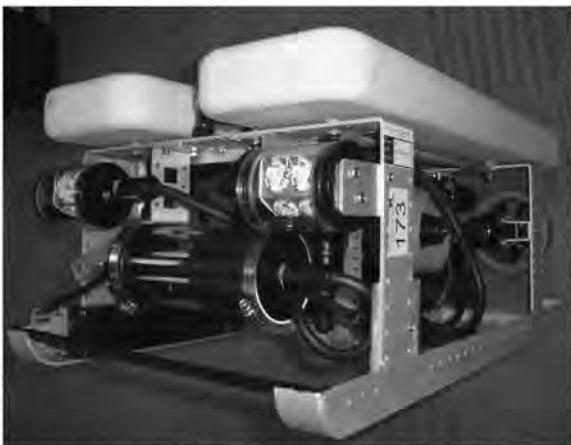
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Product News



"With this launch, the SeaBat 7125-ROV2 reaches a new performance level. Feature Pack 3 improves the efficiency and capability of the sonar, and we are confident that our worldwide users will benefit greatly from these additional features," says executive vice president of product management at RESON A/S, Tim Lysholt Jensen.

FP3 was introduced earlier this year on the SeaBat 7125-SV2 hardware platform and has proven to be a very successful addition to the RESON family, providing customers with significant added value by maximizing data density and enhancing data quality through increased noise immunity.

The unique X-Range and Full Rate Dual Head features form the core of the FP3 and are what make this feature pack such a useful addition to the SeaBat family. RESON's X-Range is a software and hardware package that provides extended range performance for the SeaBat 7125 as well as significantly increasing the system's protection to external noise. X-Range combines frequency modulated transmission with advanced signal processing techniques to extract maximum possible performance from the system.

Incorporating RESON's X-Range technology into a dual-head system (Full Rate Dual Head) not only gives both systems greater effective range, but also enables both to transmit simultaneously—effectively doubling the ping rate of earlier dual-head implementations.

For more information, visit www.reson.com.

Novacavi's customized underwater hybrid FO cables

Following considerable adaptation to the production equipment and months of research and development in collaboration with end users, Italy-based special cable manufacturer Novacavi reports the availability of its customized underwater hybrid fiber optic (FO) cables.

The first delivery in the specialist range is a bespoke single 7-km long neutrally buoyant ROV hybrid cable. The challenge in this specific case was to be able to supply a 7-km single length of such a cable to be connected and used in a unique underwater inspection system. This tether cable has to be connected to a long range, work-class ROV to inspect an underground gallery in shallow water. Moreover, this custom, neutrally buoyant cable, made by combining special electric cables with fiber optics, has to be a load-bearing cable with 7,000-kg breaking strength.

Established in 1975 as a privately owned company, Novacavi provides expertise in designing and manufacturing inside unique cables suiting customers' requirements, even when small quantities are needed in a variety of special applications.

For more information, visit www.novacavi.it.

HYPACK 2013 software introduced in the UAE

Unique System FZE, a Unique Maritime Group Company, one of the world's leading integrated turnkey subsea and offshore solution providers, announced the launch of HYPACK 2013 software in the HYPACK Training Workshop 2012.

Some of the highlights of HYPACK 2013 are as follows:

- 64-BIT HYSWEEP® EDITOR, which enables much faster processing.
- HYSWEEP® SURVEY: Dual-logging for multibeam and topographic data and Support for Tritech Gemini Profiler and Odom MB1.
- HYPACK® CUBE: New options in the Grid View, such as exporting georeferenced TIF files for use as a background chart and printing of the Grid View Display with the system printer.
- Single Beam Editor that supports up to 100 template points and various other options.
- SORT using four sorting algorithms: 32-BIT AND 64-BIT VERSIONS.
- Side Scan Targeting and Mosaicking.
- Barge-Tug Management Module.
- Barge Management Module.

For more information, visit www.uniquegroup.com.

New subsea-ready battery

Two subsea ready Li Ion battery products announced by battery solutions innovator Southwest Electronic Energy Group (SWE) break new ground with 4x longer deployments and 8x more charge cycles than lead acid batteries while delivering uncompromising safety.

SWE SeaSafe™ products will power the entire range of modern subsea vehicles from MUVs (manned underwater vehicles) to ROVs (remote operated vehicles) to AUVs (autonomous underwater vehicles) and offshore Oil and Gas infrastructure electronics and actuators. SeaSafe™ battery products are available commercial-off-the-shelf for fast time to market with configure-to-order flexibility that scales to customers' individual voltage and amp-hour capacity needs in modular increments. Popular configurations will be pre-certified for UN/DOT transportation and other industry standards, as appropriate, further speeding customer's time to market while reducing cost and risk.

For more information, visit www.swe.com.

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New Survivor wearable life vest and raft

The Survivor™ wearable life vest and raft is a compact survival and rescue system designed for offshore operations. The unique, vacuum-packed, lightweight, compact design allows workers comfort and freedom of movement, while providing both an emergency inflatable life vest and life raft. Both devices inflate automatically with salt water immersion or can be manually activated. With its protective canopy and sea-anchor stabilization, the man overboard is ensured survival until rescued.

The vest only weighs 4.4 kg (9 lbs) and due to special, patented, vacuum packaging is guaranteed to be inspection and maintenance free for 5 years.

Other features include an LED flashlight operated with 5-year lithium batteries, zero leak CO₂ inflation system, and optional GPS tracking system. In addition, the canopy can be closed for optimal protection from the environment or opened and used as signaling device.

For more information, visit www.searescuegear.com.

New cost-effective geo-referencing and orientation system

ATLANS, a new cost-effective geo-referencing and orientation system from iXBlue, has been designed specifically for land and airborne mapping applications being conducted within a limited budget. Significantly, the unit is ITAR-free.

The user gets a compact, lightweight gyrocompass and motion sensor that consumes very little power and yet provides all of the required data for demanding navigation, stabilization, and control applications.

ATLANS can be easily integrated with standard GNSS and DMI systems and is easily combined with most commonly used flight management, satellite tracking, and mobile imaging systems. All of the interface and computing electronics are contained within a single housing that also features an embedded RTK GPS board for centimeter accuracy performance.

ATLANS is based on fiber optic gyroscope (FOG) technology, heavily

developed by iXBlue over a period of 25 years and now incorporated into a range of high-performance positioning and navigational aids for use in civil, defense, and space applications. Being solid state and having no moving parts, FOGs have become renowned for their ruggedness and stability as well as for their extended and maintenance-free service lives.

Benoit Kerouanton, product manager, said, "We have spent a great deal of effort over the years developing FOG technology, not just to improve its performance and reliability but to get us to a position where we can provide simple to use, highly practical systems at very competitive prices. ATLANS capitalizes strongly on this work. It is a small, high-performance unit which comes at a price that will make it a very attractive option for users pursuing a range of UAV and LIDAR mapping, digital imaging, and hyperspectral sensing applications."

For more information, visit www.ixblue.com.

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AXYS to produce next generation laser wind sensor

AXYS Technologies Inc. has partnered with Optical Air Data Systems, LLC (OADS) to develop and manufacture the Vindicator® Generation 3 Laser Wind Sensor for the AXYS WindSentinel™ floating wind resource assessment system.

Combining the current Vindicator® technology with lessons learned from the world's first commercially deployed floating LIDAR systems, the Vindicator® Generation 3 Laser Wind Sensor will feature enhanced wind resource data collection combined with an innovative lens cleaning solution specifically designed to deliver reliable, accurate results in the challenging marine environment.

AXYS is an ISO 9001-2008 registered Canadian company with over 35 years experience in the development, deployment, and maintenance of offshore remote sensing systems. The WindSentinel™ is the world's first floating buoy system that uses a simultaneously pulsing laser wind sensor to

accurately measure wind speed, wind direction, and turbulence offshore at turbine hub-height and across the blade span. Deployed on the NOMAD buoy platform, this fully motion-compensated solution significantly reduces the costs and risks associated with offshore wind resource assessment.

OADS, a high technology, award-winning Small Business, is a rapid developer of lightweight, rugged Light Detection and Ranging (LIDAR) remote sensing solutions for real-world precision measurement applications. OADS has a state-of-the-art design, engineering, manufacturing, and field and flight test facility located in Manassas, Virginia. Born out of the aerospace industry, OADS has established itself as a world leader in the development of customized all-fiber motion-compensated LIDAR solutions that meet the reliability, maintainability, and survivability requirements essential for platform based sensors.

Over its 22-year history, OADS' experienced management and engineering team has launched numerous prod-

ucts, including the world's first laser-based air data system for rotary and fixed wing aircraft, LIDAR for wind turbine control, hand-held laser wind sensors, and laser range finders.

For more information, visit www.axystechnologies.com.

Morgan Technical Ceramics launches new wideband transducer

Morgan Technical Ceramics has introduced a new dual wideband piezo composite frequency transducer for a range of marine applications, including depth sounding, fish finding or guidance, and Doppler speed metering. A key advantage of the new 09222/000 transducer is that it offers wideband dual-frequency operation through the same slot.

Compared with conventional designs, which have a single bandwidth of 195 to 205 kHz, the new 09222/000 transducer has dual ranges of 55 to 89 kHz and 150 to 220 kHz, with a side lobe level of less than -25 dB, compared to -20 dB. The transducer uses piezo composite technology that



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extends bandwidth, suppresses side lobes, improves beam uniformity, and increases figure of merit operation. The wide bandwidth it delivers has a short ring-down time, which enables the user to distinguish between objects close together within the transducer's field of view, typically between fish close to the seabed.

Using wide bandwidth also means that it is possible to use more advanced imaging algorithms such as Chirp, which requires driving with a frequency sweep or Synthetic Aperture Focusing Techniques (SAFT). Users also have the options of using the higher frequency for increased target resolution, while the low-frequency mode remains available for better deepwater performance.

From the installation point of view, having a wide-bandwidth dual-frequency transducer avoids having to drill two separate slots in the hull and reduces the need for fairings protruding beneath the boat. Fitted into a stainless-steel housing, with alternative materials available, the transducer is RoHS (Restriction of Hazardous Substance) compliant.

In addition to its standard specification, Morgan Technical Ceramics can also offer customized geometry, center frequency, and bandwidth. Composite technology is available with a center frequency of 50 kHz to 5 MHz and a bandwidth up to 70%. The emitting face can be up to 200 mm square or 150 mm diameter to allow for a tight beam width and high power. With appropriate encapsulation and cabling, transducers can also be designed to withstand deep-sea environmental conditions and downhole applications.

For more information, visit www.morgantechceramics.com.



3SAE Technologies introduces Linear Tensile Tester for optical fiber

3SAE Technologies' new Linear Tensile Tester is an automated proof tester designed for optical fibers with cladding diameters ranging from 80 to 400 µm. In addition, the unit's fiber clamps accommodate coatings up to 1,000 µm in diameter. This proof tester enhances 3SAE Technologies' extensive line of fiber optic processing equipment.

This compact, linear-style proof tester incorporates easy, single-button fiber-loading and an automated tension test process to deliver testing speed and accuracy, both in laboratory and production environments. Its built-in LCD reports the "pass" result and the maximum tension (in Newtons or Kpsi) applied to the fiber during the tension test. The 3SAE Linear Tensile Tester can also perform destructive testing by pulling up to 50 N and displaying the maximum achieved tension.

3SAE's Linear Tensile Tester features a built-in LCD and keypad to

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enable convenient, stand-alone operation and provides the operator with up to 10 user-selectable and customizable tension programs, each with discreet settings to control key process variables, including clamp pressure, maximum tension, tension rate, and proof test hold times. These features, in combination with the compact design, allow for extreme portability and flexibility in application.

The 3SAE Linear Tensile Tester includes a universal AC-12V DC power supply and requires no additional external connections, such as air for operation or a PC for configuration. An avail-

able RS-232 port provides the ability to update the firmware and supports data collection from any appropriately configured computer.

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

Unique System FZE announces new on-site machine rental division in UAE

Unique System FZE, a Unique Maritime Group (UMG), has invested in an extensive inventory of all the latest designs of equipment and tooling, assuring faster responses and quick delivery of equipment to the job site.

"Our ever expanding product line included a whole range of portable machines like split frame clamshells, flange facing machines, boring bards, milling machines, hot tapping equipment, end prepping tools, and many more," said Ian Huggins, general manager of Unique System FZE. "We strive to meet and exceed our customer's expectations with the finest equipment in the business. We offer the best and timely solutions for any on-site machin-

ing requirements with our rentals or sales or technical support team. Our team provides professional, environment friendly and economical solutions for all kinds of machining problems," he added.

24/7 support service is provided to manage customer requirements as every customer is vital at UMG.

The Group's operations are spread across eight global regions in the Middle East, USA, UK, South Africa, Nigeria, India, Russia, and Singapore—all well positioned to manage all project requirements and a fast growing international customer base.

For more information, visit www.uniquegroup.com.



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A Storm Too Soon A True Story of Disaster, Survival and an Incredible Rescue

Michael J. Tougias



Seventy-foot waves batter a torn life raft 250 mi out to sea in one of the world's most dangerous places, the Gulf Stream. Hanging on to the raft are three men: a Canadian, a Brit, and their captain, JP de Lutz, a dual citizen of America and France. Their capsized 47-ft sailboat has filled with water and disappeared below the tempestuous sea. The giant waves repeatedly toss the men out of their tiny vessel, and JP, with nine broken ribs, is hypothermic and on the verge of death. The captain, however, is a remarkably tough character, having survived a brutal boyhood, and now he must rely on the same inner strength to outlast the storm.

Trying to reach these survivors before it's too late are four brave Coast Guardsmen battling hurricane-force winds in their Jayhawk helicopter. They know the waves will be extreme, but when they arrive they are astounded to find that the monstrous seas have waves reaching 80 ft. Lowering the wind-whipped helicopter to drop a rescue swimmer into such chaos will be extremely dangerous. The pilots wonder if they have a realistic chance of saving the sailors clinging to the broken life raft, and if they will be able to even retrieve their own rescue swimmer from the towering seas. Once they commit to the rescue, they find themselves in almost as much trouble as the survivors, facing one life-and-death moment after the next.

Also caught in the storm are three other boats, each one in a Mayday situation. Of the 10 people on these boats, only 6 will ever see land again.

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People & Company News

BP plc appointed **Lamar McKay** as head of oil and gas production and development. The move frees up BP chief executive Bob Dudley, who has been acting as head of upstream since the company's major reorganization of the segment into three divisions—exploration, development, and production—in 2010. The three divisions will now report to McKay, 53, who will report to Dudley. The current structure and management teams will remain unaffected by McKay's appointment, BP said in a statement. McKay, who has a background in petroleum engineering, has served in a variety of operational and commercial roles globally during his 32 years with BP. He has overseen BP's Gulf Coast restoration work in his current role as chairman and president of BP America, which he has held since 2009.

Aquatic Engineering & Construction Ltd., an Acteon company, appointed **Bill Smart** business development manager, North America. Prior to joining Aquatic, Smart served as the vice president of sales and service for Prime Source Packaging, Ltd. He has significant industry experience and has held engineering and project management positions with

Oceaneering Intervention Engineering, Oil States, Unigraphics Solutions, and Global Compression Services. "His location at InterMoor's headquarters will deliver new scope for partnering, whereby our complementary capabilities will bring optimum benefit for our clients," said Chris Brooks, president of Aquatic. Smart holds a bachelor of science degree in mechanical engineering from Texas A&M University. He is engineer-in-training (EIT) certified and has completed Dale Carnegie sales training.

Hess Corp. said that **Drew Maloney** was appointed vice president, government affairs and public policy. Maloney, 43, will lead the company's international, Federal, and State relations and be based in Washington, D.C. He was previously chief executive officer of Ogilvy Government Relations, a bipartisan government affairs organization. He also served as a senior advisor to the Republican National Committee and head of legislative affairs for the Romney



Smart

Readiness Project. "We have worked with Drew over the years in his role at Ogilvy and are pleased to have an executive with such extensive experience lead our government relations and public policy group," said John B. Hess, chairman and chief executive officer of Hess.

Superior Energy Services named **Carlos Martín** regional director of health, safety, environment and quality (HSEQ) for Latin America. Based in Neuquén, Argentina, Martín will be responsible for facilitating the implementation of Superior Energy Services' HSEQ strategies, policies, practices, and programs across all Latin American corporate and subsidiary operations. He will also be responsible for facilitating the development and implementation of region-specific HSEQ requirements. Martín has more than 25 years of HSEQ-related experience and holds a degree in industrial engineering from Universidad Católica Argentina. He has also completed post-graduate work in safety and industrial hygiene at the Universidad de Buenos Aires and in environmental management at the Universidad Católica Argentina. He is a published author and has presented work at conferences.



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Esbjerg Business Development Centre (EBDC) is continuing its ambitious growth strategy for the Municipality of Esbjerg, Denmark as a focal point for the energy sector through the appointment of **Lone Aaboe Jessen** as its new marketing manager. Jessen has considerable international and regional business experience and offers particular insight in the offshore sector, one of Esbjerg's key growth areas. She joins EBDC with a track record that includes the marketing manager role at marine and offshore equipment specialist Viking Life Saving Equipment, one of the region's foremost employers. She can also call on 7 years overseas experience as part of the Royal Danish Consulate General in Los Angeles. Esbjerg's role in energy technology takes in offshore oil and gas, offshore wind, and energy-efficient combustion technology. Accounting for more than two-thirds of the country's jobs in the offshore industry, the municipality's business cluster employs around 10,000 persons, either directly or in associated activities.



Jessen

Variable Bore Rams, Inc. (VBR) named **Brandon Leger** operations coordinator, quality control. Leger will be responsible for VBR's quality program, a management system used to document the company's best business practices, better satisfy the requirements and expectations of its customers, and improve the overall management of the company. Additionally, he will oversee the quality assurance of all OEM equipment and operations within VBR. Leger graduated from the University of Louisiana at Lafayette in 2011 with a bachelor of science degree in industrial technology and a minor in business. He has completed coursework approved by the standardized emergency management system in compliance and implementation.



Leger

TAM International, Inc., an independent oilfield services company providing inflatable and swellable packers, appointed **Jim McGowin** to general manager of TAM Completion Systems, a subsidiary of TAM International, and **Ray Frisby** to technical director for TAM International. As general manager, McGowin will be charged with establishing, managing, and growing operations and sales for the

recently created TAM Completion Systems, while Frisby will lead the development of new technologies for TAM International. Both McGowin and Frisby are veterans of the oil and gas industry, with more than 50 years of combined experience. McGowin and Frisby both hail from major service company backgrounds. McGowin most recently held positions as sales director and global account director, while Frisby served as engineering director.

KPMG was named "Global Firm of the Year" at the recent British Accountancy Awards, the prestigious event for the accountancy industry. Meanwhile, the firm's **Raylene Whitford** was named "New Accountant of the Year," in recognition for her work in the oil and gas sector. The judges praised KPMG for its "diversity of client base" and "commitment to corporate responsibility," adding that the firm really "walks the walk." The 26-year-old Whitford, originally from Alberta, Canada, is currently

studying an MBA at Robert Gordon University in Aberdeen. She splits her time between Aberdeen and London working on a NE client list for the oil and gas sector. Whitford qualified as a chartered accountant in November 2011, but has already become a key member of KPMG's energy and natural resources group. The judges commented that she is "exceptional in her industry focus."

National Oilwell Varco, Inc. announced that **Clay Williams** has been named president and chief operating officer of the company. Williams has served as the company's executive vice president and chief financial officer since March 2005. He served as Varco International, Inc.'s vice president and chief financial officer from January 2003 until its merger with the company in March 2005. **Jeremy Thigpen** will assume the role of senior vice president and chief financial officer. Thigpen has served as the company's president of downhole pumping and solutions since 2007. Prior to that, Thigpen was the president of the company's downhole tools group from 2003 until 2007. Thigpen has been with National Oilwell Varco for 15 years, holding various positions during his career.



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Website: www.falmat.com
Contact: Shawn Amirchansani

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Tel: +44(0)1923 216020, Fax: +44(0)1923 216061
E-mail: tsssales@teledyne.com
Website: <http://www.teledyne-tss.com>
Contact: Carolyn Jones

USA Office: 10801 Hammerly Blvd, Suite 128,

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Website: www.pmiind.com

Specializing in the design, manufacture & testing of highly reliable **Cable Systems & Hardware** for harsh marine environments since 1969; PMI Industries, Inc. is committed to providing Engineered & Custom Designed Cable Systems for all types of applications in the marine industry including Cable Installation, Terminations & Protection Products, Defense & Surveillance, Monitoring & Fisheries, ROVs & Ocean Equipment, Salvage, Search & Recovery Operations and Seismic & Survey Exploration. Work directly with our **Engineering & Design** team from initial product concept to production. Our state-of-the-art **Cable Testing** facility simulates at-sea conditions and offers complete testing services from product design verification through acceptance testing. **PMI Underwater Cable Solutions:** performance, reliability, peace of mind.

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Ceramco, Inc.

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E-mail: info@ceramcoceramics.com
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Contact: K.Ruelas, pres.; K.Athies, Director of Business Development; E.Bickel, technical sales

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E-mail: sales@ak-ind.com
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.



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Website: www.birns.com
Contact: Eric Birns

BIRNS, Inc. is an ISO 9001:2008 certified global leader in the design and manufacturing of high performance connector and lighting solutions for the subsea industry. With more than half a century of expertise, BIRNS provides unmatched lead times and industry-leading exclusive features. Its world class molding facility is NAVSEA S9320-AM-PRO-020 certified, and the company specializes in sophisticated connector products and custom cable assemblies—with electrical, optical, electro-optical, electro-coax, and EOM (electro-opto-mechanical) connector lines. BIRNS leads the industry with high volume hydrostatic and helium pressure testing—its vast range of electrical penetrators is ABS Product Design Assessment (PDA) certified, with inclusive pricing and lead times for ABS/DNV witnessing. BIRNS is equally renowned for its lines of innovative LED and tungsten-halogen marine, chamber and commercial diving lights, and revolutionary MPI-NDT equipment.

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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 (Scorpion Oceanics) South Africa (Marine Solutions) Holland (Seascape) as well as dealers in Canada, Italy, Russia, China, and Brazil.



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Website: www.seaconworldwide.com

The SEA CON® Group of companies are leaders in underwater connector technology and provide an extensive and diverse range of electrical, optical and hybrid connector assemblies, submersible switches and cable system solutions for many applications within the oil and gas, defence, oceanographic and environmental markets. With locations in California, Texas, Rhode Island and Florida in the USA, Brazil, the UK and Norway as well as a worldwide network of agencies and representatives, SEA CON® is able to provide quick solutions with either existing or custom designed products across the globe.



International MacArtney A/S (Headquarters)

Esbjerg, Denmark
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Toll free: 800 256 9187
E-mail: sales@gjfood.com
Website: www.gjfood.com
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Motion Systems – Sea Operations – Sonar Systems



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Contact: Ross Johnson

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MARINE ENVIRONMENTAL CONSULTING SERVICES



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Tel: 772 219-3000, Fax: 772-219-3010
E-mail: rmulcahy@conshelf.com
Website: www.csaocean.com
Contact: Robert Mulcahy



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, freshwater, and terrestrial environments.

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E-mail: km.seatex@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne
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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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Web: www.aslenv.com

ASL provides physical oceanographic consulting services and instruments. Services: flow measurement, ice studies, wave measurement and analysis, numerical modeling, and remote sensing. Products: Ice Profiler- measures ice-keel depths; Acoustic Zooplankton Fish Profiler- monitors the presence and location of zooplankton, fish or sediments; and the WERA NorthernRadar- measures surface currents and waves from shore up to 200km. ASL has a large lease pool of oceanographic instruments.



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E-mail: larry.bobbit@oegoffshore.com
Website: www.oegoffshore.com
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OEG Offshore LLC is the industry's first choice in supplying DNV 2.7-1 equipment on a worldwide basis, either for rental or purchase. The equipment supplied is all types and sizes of DNV 2.7-1 containers, baskets, skips, gas bottle racks, refrigerated units, workshops and hazardous area modules. Our specialty is ATEX, which includes pressurization, air conditioning, fire & gas systems. If we don't have the type and size you need, call us for a custom build. OEG's corporate office is located in Aberdeen, Scotland with operational offices in Houston, Perth and Singapore.



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E-mail: infous@uniquegroup.com
Website: www.uniquegroup.com

Unique System, L.L.C.
(Diving Equipment)
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Ocean Specialists, Inc (OSI) provides a broad range of capabilities and services to the Offshore Oil & Gas, Submarine Telecom, Government and Scientific markets, including: Market analysis, project consulting, submarine fiber cable systems, subsea technology development, & corporate services.

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Contact: Mike Kernaghan

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Rovsco provides support and solutions to the offshore subsea and marine industries; work-class ROV and Commercial Diving operations. We manufacture a number of tools/equipment and subsea video items. We have an excellent reputation worldwide, based on our product knowledge, dependability, commitment to customer service and speed of response.

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Sonatech
A Division of Channel Technologies Group
869 Ward Dr, Santa Barbara, CA 93111-2920 USA
Tel: (805) 683-1431; Fax (805) 683-4862
E-mail: marketing@sonatech.com
Website: www.channeltechgroup.com
Contact: K.Ruelas, pres.; R.Franklin, v.p., nav & range sys; M. Shaw, v.p., sonar & transducer sys; B. Febo, Director of Business Development

Sound Engineering Solutions – Sonatech, A Division of Channel Technologies Group (CTG) develops innovative solutions for underwater acoustic applications. Existing technologies span a wide variety of acoustic systems, including sonar systems, navigation systems, and custom acoustic solutions. Our solutions are based on a 36-year career of developing high-performance, high-reliability undersea systems that are continually improved through research and development.



Teledyne BlueView, Inc.

2515 N. Northlake Way, Suite 214
Seattle, WA 98103, USA
Tel: (206) 545-7260, Fax: (206) 545-7261
E-mail: swa_info@teledyne.com
Website: www.blueview.com

Teledyne BlueView delivers state-of-the-art, compact acoustic imaging, measurement, and automation solutions for defense, energy, civil engineering, transportation, and port security applications worldwide. Teledyne BlueView's advanced acoustic systems support underwater operations from a wide variety of platforms, including ROVs, AUVs, surface vessels, fixed mounts, manned submersibles, portable tripods, and diver handheld systems.

SOUND VELOCITY PROBES/CTDS

SAIV A/S

Nygardsviken 1, 5164 Laksevag, Norway
Tel: +47 56 11 30 66, Fax: +47 56 11 30 69
E-mail: info@saivas.no
Website: www.saivas.no
Contact: Gunnar Sagstad

• STD/CTD, Sound Velocity probes/recorder with optional multi-parameter facilities; Turbidity, Fluorescence, Oxygen etc.

• Precision pressure/depth (0.01% accuracy) and temperature sensors/recorders. Applications: hydrographic profilers, installation on ROVs and towed systems, etc. Robust and compact designs are combined with accuracy and "plug-and-play" compatibility. Output format for sonar equipment, e.g. EM1002, EM3000, SSP, HitPAP and Reson 8125.

SUB-BOTTOM PROFILES



iXBlue
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Website: www.ixblue.com

ECHOES

- wide band
- flat spectrum
- from 500 Hz to 15 kHz
- fish, hull-mounted, pole-mounted, AUV-mounted
- shallow to 6000 m deep

iXBlue provides a range of fine, high-technology equipment, systems and turn-key solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.

Acoustic Products – Advanced Components
Inertial Products – Integrated Solutions – Marine Works Motion Systems – Sea Operations – Sonar Systems

SUBSEA FABRICATION



NEW Industries
6032 Railroad Avenue
Morgan City, LA
Tel: 985-385-6789
E-mail: bill.new@newindustries.com
Website: www.newindustries.com
Contact: Bill New

New Industries (NI) provides quality fabrication services to the offshore oil & gas and marine industries. NI focuses on large diameter, pressure vessels and deepwater subsea equipment such as jumpers, PLETs, PLEMs, suction piles and ROV components.

SUBSEA TOOLING

Seanic Ocean Systems
8860 Fallbrook Drive
Houston, TX 77064
Tel: 713-934-3100
E-mail: contact@seanicusa.com
Website: www.seanicusa.com
Contact: Karen North

Seanic Ocean Systems is an industry leader in providing simple, rugged and reliable subsea tooling for remote intervention.

SWITCHES



SEACON Advanced Products, LLC.
1321 Nelius Road, P.O. Box 767
Bellville, Texas 77418, USA
Tel: (979) 865-8846, Fax: (979) 865-8859
E-mail: sales@seacon-ap.com
Website: www.seacon-ap.com

SEACON Advanced Products, LLC., manufactures a wide variety of versatile and robust switches to suit a number of applications. These include Limit, Positive Action and Proximity switches in a range of materials including Titanium, Plastic and Stainless Steel which can be supplied in varying load capacities up to 7 amps and pressure rated to 10,000 psi. To further aid simplicity, our proven range of Modular Proximity Switches have been integrated with the Micro WET-CON electrical wet-mate connector making this switch a very modular component that is easily installed and replaced in the field, but without compromising reliability.

TRANSDUCERS



ITC

A Division of Channel Technologies Group
869 Ward Dr, Santa Barbara, CA 93111-2920 USA
Tel: (805) 683-2575, Fax (805) 967-8199
E-mail: sales@itc-transducers.com
Website: www.channeltechgroup.com
Contact: K.Ruelas, pres.; B.Dolan, Director of Business Development; E.Kunstal, eng. mgr.

The Science of Sound Performance – ITC, a Division of Channel Technologies Group (CTG), designs and manufactures both custom and off-the-shelf underwater, air, and ultrasonic acoustic transducers, projectors, hydrophones, hydrophone/preamp, side-scan arrays, OEM and end-item products for commercial and military applications.

UNDERWATER THICKNESS GAUGES



Cygnus Instruments, Inc.
PO Box 6417
Annapolis, MD 21401 USA
Tel: (410) 267 9771
Fax: (410) 268 2013

E-mail: sales@cygnusinstruments.com
Website: www.cygnusinstruments.com
Contact: Rod Sanders

Cygnus manufactures the world's first true multiple echo ultrasonic thickness gauge. Multiple echo means that coatings, such as paint or epoxy, do not have to be removed in order to measure the steel. We offer hand held gauges that divers take into the water. Also have models that can communicate topside to a display repeater or PC. Also offer a range of shallow to deepwater units for ROVs. Manufacturing to ISO 9002 standards. Approved by classification societies.

UNDERWATER VEHICLES

AUVs



Exocetus Development LLC
1444 East 9th Avenue, Anchorage, AK, 99501
Tel: 858-864-7775, Fax: 907-569-0268
E-mail: sales@exocetus.com
Website: www.exocetus.com
Contact: Ray Mahr, VP Sales & Marketing

The new Exocetus Coastal Glider is specifically designed for use in coastal waters where high currents and large variations in water densities occur. A larger buoyancy engine than legacy gliders designed for open-ocean operation enables the Exocetus Coastal Glider to easily operate in up to 2 knots of current, handle densities from 7 ppt to 37 ppt, operate up to 60 days with a lithium battery pack and easily integrate additional sensors.

OCEAN INDUSTRY DIRECTORY

ON&T's Product & Service Directory

UNDERWATER VEHICLES

AUVs



A KONGSBERG COMPANY

Hydroid, Inc.

a subsidiary of Kongsberg Maritime

6 Benjamin Nye Circle, Pocasset, MA 02559-4900, USA

Tel: 508-563-6565, Fax: 508-563-3445

E-mail: glester@hydroid.com

Website: www.hydroid.com

Contact: Graham Lester

Hydroid, a subsidiary of Kongsberg Maritime, is the world leader in manufacturing advanced Autonomous Underwater Vehicles (AUVs). REMUS AUVs provide innovative and reliable systems for the marine research, defense, hydrographic and offshore/energy markets. Hydroid vehicles represent the most advanced, diversified and field-proven family of AUVs and support systems in the world.

ROVs



SUBSEA TECHNOLOGIES
everything remotely possible™

Perry Slingsby

10642 West Little York, Suite 100

Houston, TX 77041

Tel: 713-329-8230, Fax: 713-329-8299

E-mail: perry.sales@f-e-t.com

Website: www.f-e-t.com/Subsea

Forum Energy Technologies' Perry Slingsby brand supplies deepwater work class ROVs, tooling solutions, burial systems, and control-system-based products to the oil, gas, and telecommunications industries. Providing the most advanced, robust and dependable ROVs and subsea products in the world, Forum's Subsea group has facilities in the US and UK and sales offices and agents around the world.



SeaBotix Inc.

2877 Historic Decatur Road, Suite 100

San Diego, CA 92106 USA

Tel: +1 619 450-4000

Fax: +1 619 450-4001

E-mail: Info@SeaBotix.com

Website: www.SeaBotix.com

SeaBotix Inc. is the world leading manufacturer of capable MiniROV systems. The Little Benthic Vehicle range of systems have become the benchmark in compact ROVs around the world. All systems perform a multitude of tasks including maritime security, body rescue, sensor deployment, object recovery, hazardous environment intervention, and hull inspection.



SUBSEA TECHNOLOGIES
everything remotely possible™

Sub-Atlantic

Woodburn Rd, Blackburn Business Park, Blackburn, Aberdeen, AB21 0PS, Scotland

Tel: +44(0)1224 798660, Fax: +44(0)1224 798661

10642 West Little York, Suite 100

Houston, Tx, 77041-4014, USA

Tel: +1 713 329 8730, Fax: +1 713 329 8299

E-mail: sub-atlantic.slaes@f-e-t.com

Website: www.f-e-t.com/Subsea

Forum Energy Technologies' sub-Atlantic brand manufactures world class ROVs ranging from portable units to light work class systems. Sub-Atlantic also supplies thrusters, hydraulic power units, valve packs, compensators and pan and tilt systems to other ROV manufacturers. Sub-Atlantic is part of the FET subsea group and has facilities in the US and UK and sales offices and agents around the world.

Continued ■



VideoRay

580 Wall Street, Phoenixville, PA 19460

Tel: (610) 458 3000, Fax: (610) 458 3010

E-mail: info@videoray.com

Website: www.videoray.com

Contact: Brian Luzzi

With more than 1,900 Remotely Operated Vehicles (ROVs) in service around the world, VideoRay has clearly become the global leader in Observation ROV technology. VideoRay is an extremely versatile, portable, affordable, and reliable solution for underwater operations including surveys, offshore inspections, search & recovery, homeland & port security, science & research, fish farming, and other unique applications in underwater environments. VideoRay is available on the General Services Administration.

UNDERWATER VIDEO EQUIPMENT



Kongsberg Maritime Ltd.

Camera Division
Campus 1, Science & Technology Park
Balgownie Rd Bridge of Don,
Aberdeen
AB22 8GT, UK
Tel: +44 (0)1224 226500
Fax: +44 (0)1224 226598

KONGSBERG

E-mail: km.camsales.uk@kongsberg.com
Website: www.kongsbergmaritime.com
Contact: Bill Stuart

Kongsberg Maritime Ltd is a world leader in providing harsh environment underwater camera & imaging technology and marine CCTV systems to the Offshore Oil Field & Renewable Energy, Power Generation, Scientific, Maritime and Military sectors.

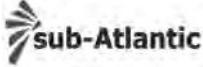


SIDUS Solutions, Inc.

San Diego, CA Office:
Tel: (619) 275 5533
Fax: (619) 275 5544
Houston, TX Office:
Tel: (281) 658-2555
E-mail: info@sidus-solutions.com
Website: www.sidus-solutions.com

SIDUS Solutions LLC is an integrated systems provider for security and video surveillance systems specializing in customization. Our products are operational to sub-sea depths of 6,500m, serving industries worldwide. We are a full service provider, offering end-to-end solutions from concept design, product selection, engineering, manufacturing, technical and customer support. Industries we serve are Oil and Gas, Scientific, Military and Academic.

WINCHES, HANDLING & CONTROL SYSTEMS



Hawboldt Industries

220 Windsor Road
Chester, Nova Scotia, Canada B0J 1J0
Tel: 902 275 3591
Fax: 902 275 5014
E-mail: paul.phillips@hawboldt.ca
Website: www.hawboldt.ca
Contact: Paul Phillips

Hawboldt Industries has built robust commercial and scientific deck machinery for over a century, focusing on custom winch solutions and satisfying project requirements from engineering to commissioning. ROV winches, A frames, and electro-hydraulic power packs are available to satisfy the offshore and subsea markets. Our scientific winches, preferred by universities and governments worldwide, are renowned for their durability and performance particularly in harsh environments.



MARKEY

Markey Machinery Company

7266 8th Ave. South
Seattle, WA 98108 USA
Tel: +1 800 637 3430
Fax: +1 206 623 9839
E-mail: info@markeymachinery.com
Website: www.markeymachinery.com

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Radoil, Inc.

12251 FM 529
Houston, TX 77041
Tel: (713) 937 4494
E-mail: pvanderlinden@radoil.com
Website: www.radoil.com

Radoil's goal is to identify challenges, design innovative solutions and manufacture quality products that solve your deepwater problems. Our business is to save you time and money. Everyone encounters delays and with day rates where they are any delay can be very costly to you, your clients and your vendors.



RAPP HYDEMA

Rapp Hydema AS

Buøyveien 31/33, Bodø, Norway
Tel: +47 75550100, Cell: +47 90755058
E-mail: runar.tunem@rappydema.com
Website: www.rappmarine.com

State-of-the-art hydraulic and electric winches are key to the range, featuring efficient, computerized control system and Launch & Recovery Systems. ROV Winches and Heavy Lift Winches with Pentagon Control Systems incl. Active Heave Compensation. ROV Moon Pool LARS Systems and Winch Drive Conversions. Rapp Hydema AS is represented in 22 countries worldwide.

WINCHES - UNDERWATER

ALL OCEANS Engineering Ltd.

Tyrebagger Works, Clinterty, Kinellar
Aberdeen AB21 0TT, UK
Tel: +44(0)1224 791001, Fax: +44(0)1224 791002
E-mail: admin@alloceans.co.uk
Website: www.alloceans.co.uk
Contact: Brian Abel

MECHANICAL HANDLING UNDERWATER
Launch and Recovery Systems - 6,000m plus Underwater Winches - ROV and Diver operated Tether Management Systems - 6,000m plus Torque Tools - Electric and Hydraulic systems - ROV and Diver operated General Products - Compensators, latches, swivels, metrology sets, cable reels, pressure housings, junction boxes
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Engineering - prototyping, product development, solutions engineering AC-ROV - The mini ROV that broke the mold.



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3 Which category best describes your business?

(Indicate the primary activity of your organization by placing a 1 next to the category. Place 2, 3 and 4 next to other markets served.)

- | | |
|---|---|
| A. <input type="checkbox"/> SHIPS, CONSTRUCTION, SALVAGE | O. <input type="checkbox"/> DIVING EQUIPMENT / SERVICES |
| B. <input type="checkbox"/> U/W VEHICLES / COMPONENTS | P. <input type="checkbox"/> CONSULTING, DATA SERVICES |
| C. <input type="checkbox"/> NAVIGATION / POSITIONING | Q. <input type="checkbox"/> MARINE ELECTRICAL / ELECTRONICS |
| D. <input type="checkbox"/> RESEARCH & DEVELOPMENT | R. <input type="checkbox"/> COMPUTER SERVICES / SOFTWARE |
| E. <input type="checkbox"/> OCEAN INSTRUMENTATION | S. <input type="checkbox"/> OCEAN RENEWABLES |
| F. <input type="checkbox"/> OFFSHORE OIL & GAS | T. <input type="checkbox"/> SUBSEA IRM |
| G. <input type="checkbox"/> COMMUNICATIONS / UTILITIES | U. <input type="checkbox"/> OCEAN OBSERVING |
| H. <input type="checkbox"/> SCIENCE, ENVIRONMENTAL | V. <input type="checkbox"/> SHIPPING/ TRANSPORTATION |
| I. <input type="checkbox"/> EDUCATIONAL INSTITUTION / LIBRARY | W. <input type="checkbox"/> SUBMARINE TELECOM |
| J. <input type="checkbox"/> GOVERNMENT MILITARY | X. <input type="checkbox"/> EQUIPMENT RENTAL |
| K. <input type="checkbox"/> GOVERNMENT CIVILIAN | Y. <input type="checkbox"/> MANUFACTURERS' REPRESENTATIVE |
| L. <input type="checkbox"/> MARINE HARDWARE / DECK EQUIP. | Z. <input type="checkbox"/> OTHER (Please specify below) |
| M. <input type="checkbox"/> FISHING INDUSTRY, AQUACULTURE | <hr/> |
| N. <input type="checkbox"/> SURVEY, MAPPING, EXPLORATION | <hr/> |

4 Which category best describes your job function? (check only one)

- | | |
|--|--|
| 1. <input type="checkbox"/> OWNER / EXECUTIVE | 5. <input type="checkbox"/> BUYER |
| 2. <input type="checkbox"/> MANAGEMENT / PROFESSOR | 6. <input type="checkbox"/> SALES |
| 3. <input type="checkbox"/> ENGINEER / SCIENTIST | 7. <input type="checkbox"/> OTHER (Please specify below) |
| 4. <input type="checkbox"/> TECHNICIAN / OPERATOR | <hr/> |

**5 How many other people will
read your issue of Ocean News
& Technology at this location?**



TSC, 8502 SW Kansas Avenue, Stuart, Florida 34997

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Imagenex Technology Corp. www.imagenex.com	3	Sea-Bird Electronics, Inc. www.seabird.com	100		
JW Fishers Manufacturing, Inc. www.jwfishers.com	72	SeaBotix www.seabotix.com	4		

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- accuracy: up to 0.04 degrees

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- range: up to 8000 m
- accuracy: better than 0.01 m

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From Streams to Lakes to Oceans



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