

MARINE TECHNOLOGY

November / December 2013

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REPORTER

Offshore IRM

Monitoring Performance Offshore

Subsea Engineering

Petrobras taps the power of teaming

ROV Market Report

Work Class ROV expenditures to grow 80%

Plus

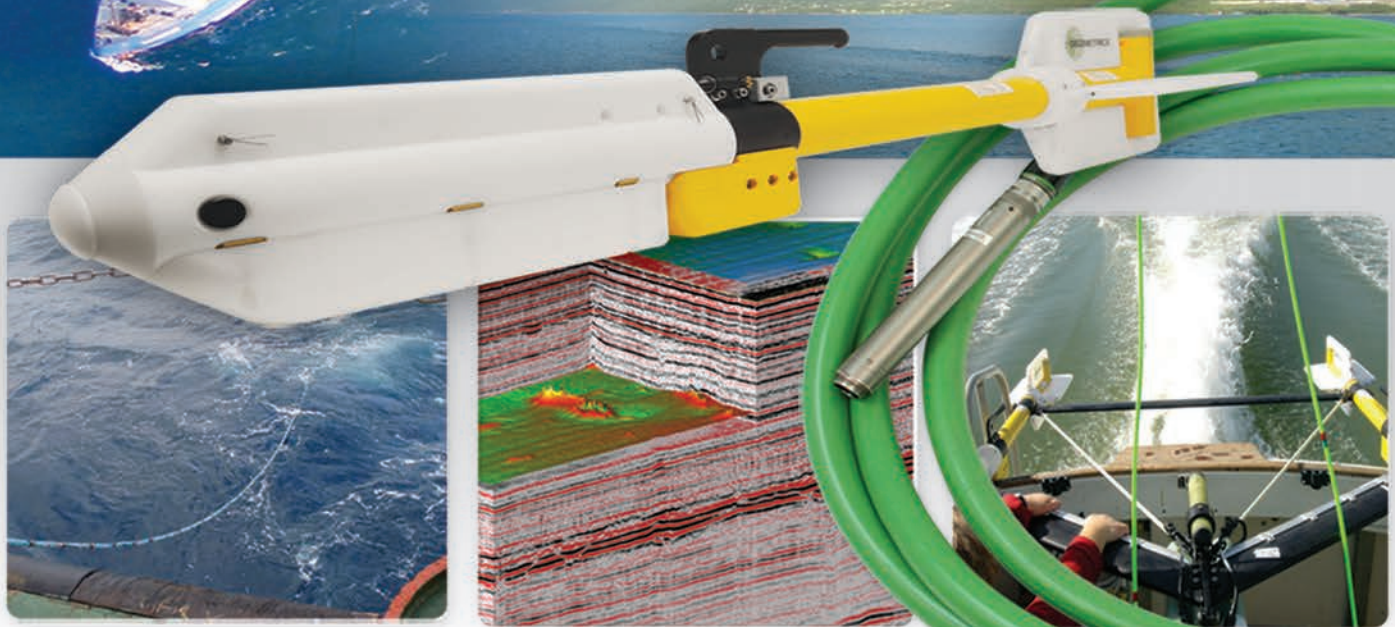
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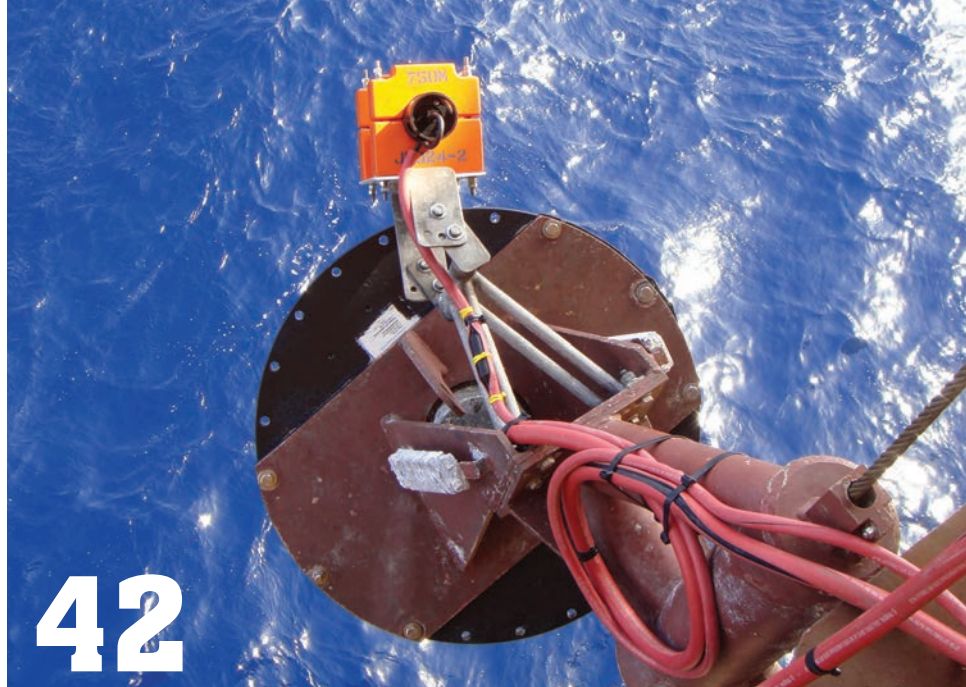
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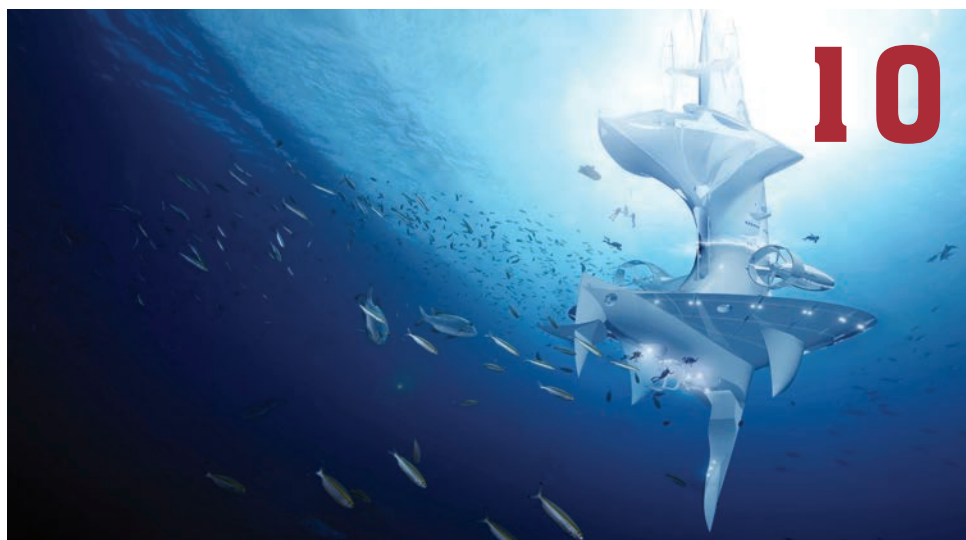
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Vessels

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ROV Market Report

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Underwater Intervention 2014 is scheduled for February 11-13, 2014 in New Orleans, where new subsea tech will be on tap.



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Kathryn Symes joined DW in 2013, graduating from Queen Mary College University of London with an MSci (Hons) Economics degree and then working for an investment firm in China. Since joining DW she has carried out research in the oil, gas and renewables sectors including numerous FPSO orientated research engagements, oilfield services and offshore and onshore logistics projects. Kathryn is also lead author of DW's World ROV Operations Market Forecast 2013-2017. *p.30*



Claudio Paschoa is a long-time contributor both in print and online, and is Marine Technology Reporter's correspondent in Rio de Janeiro. He also writes a twice weekly blog found on SeaDiscovery.com *p. 34*



Louise Ledgard has a PhD in Materials Engineering and Design, a Bachelor's Degree in Applied Physics and a Masters in Business Administration. With more than 15 years' experience working within the offshore oil and gas sector, Louise helps clients to identify an optimum solution for their offshore operational and marine engineering requirements. *p. 42*

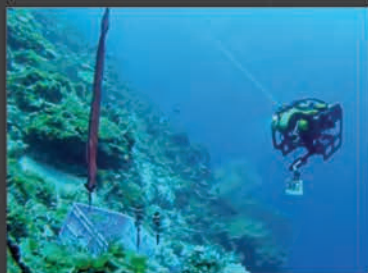
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Year-end serves as an opportune time to not only reflect on the year past but to project the trends to emerge. While my crystal ball is certainly not without fault, there are several fairly well-developed themes that should prove to provide a good percentage of our readership with buoyant business in 2014 and beyond.

• **A Healthy Ocean** The fact that the world's waterways are under attack from a variety of forces, from increased levels of pollution and acidity to name just two, is hardly a news flash. However 2014 could prove pivotal for several key initiatives to help turn that tide. Courtesy of my 20+ year affiliation with *MTR* sister-publication *Maritime Reporter & Engineering News*, I am happy to report that environmental initiatives in the maritime sector – which largely until now have served as nice brochure fodder and little else – are commanding real action and yielding real results. Ships designed, built and operated today are far cleaner and environmentally benign than ever before, and shipowners have come to realize, too, that “ECO Ship” designs can be far more fuel efficient.

• **Offshore Energy** The balance of world energy has changed virtually overnight, with the U.S. – courtesy of hydraulic fracturing and the resulting oil and gas boom – steaming toward energy independence in the not too distant future. The business of milking fresh resources from fields thought dead, discovering and recovering resources from fields in ever deeper waters, and the task to continually monitor and evaluate inshore water systems will present perhaps the best business opportunities for the coming year.

• **Government Business** The sting of Sequestration was felt by one and all, and the reality of ever-tightening government budgets is the new reality. But as we went to press, it appeared that the U.S. Congress had hashed out a budget deal, a deal that would restore many of the Sequestration cuts. Meanwhile, the U.S. Navy continues to do more with less as it depends more heavily on unmanned underwater systems and remote sensors to help it accomplish its missions.



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Offshore Wind Farm in the Shadow of Fukushima

Japan unveiled a new wind farm off the coast of Fukushima last week. Only 13 miles offshore from the Fukushima Daichi nuclear power station, the same nuclear station that notoriously attracted the world's attention during the 2011 Japanese tsunami, the new wind farm is expected to produce upwards of one gigawatt from 143 wind turbines. For comparison, the now-inoperable Fukushima Daichi nuclear power plant could provide 4.4 gigawatts. Marubeni Corp, one of the trading houses leading the project - which is funded by the government - hopes that the move will be a bellwether to promote wind power along other parts of Japan's coastlines. Japan's wind energy potential is predicted to be 1,570 gigawatts or five times the current national electricity output.

The turbines themselves are floating and tethered to the seafloor by 400-foot cables. One of the challenges facing Japan in their quest to create an offshore wind farm is the challenging ocean depths around the country. Whereas other countries who are powered by offshore wind turbines have shallow, sloping continental shelves, Japan is located in the "ring of fire" and is adjacent to undersea trenches caused by subduction zones.

These subduction zones are also responsible for the seismic activity that triggered the magnitude 9 earthquake on March 11, 2011 which caused all 50 of Fukushima's nuclear reactors to become inoperable. Opposition to nuclear power is strong in the country and efforts to phase out the energy source are in effect.

On November 1, Japan also opened the country's largest solar energy project on the southern Japanese island of Kyushu. The project, which cost \$280 million, has a capacity of 70 megawatts and is expected to power 22,000 Japanese homes on the island.

*Posted by Tyson Bottenus on
SeaDiscovery.com*

OTC Brasil 2013

Petrobras Geology & Geophysics Expertise

During the OTC Brasil 2013 there were many daily panel sessions with interesting themes. On October 30, the panel "Perspectives on E&P in the South Atlantic" had as one of its panelists Petrobras' E&P Director, José Miranda Formigli Filho, known throughout Brazil simply as Formigli (and featured this month in MTR starting on page 34). According to Formigli, Petrobras' knowledge of geology and geophysics (G&G) was vital for the national operator to meet the technological challenges and reach its exploratory success in deepwater pre-salt and post-salt E&P.

Formigli estimated that by 2020 the pre-salt production will represent 50% of Petrobras' output with the potential to reach some 31 billion boe. By 2035, some 39 million barrels per day of new crude oil supply will be needed. Currently, 30% of the company's exploration investments are directed to consolidation and appraisal of pre-salt and transfer of rights areas. The post-salt will stay with a 70% stake, including new discoveries taking place in Sergipe-Alagoas and Espirito Santo basins and the promising Equatorial Margin, a 36,897 square miles (95,563 square kilometers) area that features 192 exploration sites and 59 evaluation plans and a few significant discoveries. Formigli explained that G&G efforts led the company to find promising plays through integrated technologies such as well log modeling and simulation; calibration of imaging; rock pore space characterization; rock physics modeling; rock and fluid interaction; sedimentological contextualization; 3D imaging and DHI petro physical properties. He also explained that Petrobras was able to test these technologies in West African countries such as in Benin, Angola, Gabão, Namibia and Nigeria. G&G efforts will once again be vital in the upcoming increase in exploration efforts along Brazil's Equatorial Margin (North Coast), which runs from the border of the state of Amapá with Guiana, passing through the Amazon river basin all the way to the state of Rio Grande do Norte, where the coast turns downwards and where the Northeast coast begins.

*Posted by Claudio Paschoa on
SeaDiscovery.com*

NOAA **“There is no solid mass of debris from Japan heading to the United States”**

A slew of news reports have been published this past month alleging that a “Texas sized” field of debris is making its way to the shores of California. The debris field, caused by the 2011 Japanese tsunami, is on some accounts, said to be toxic but other reports suggest otherwise. At the time of the tsunami, the debris field contained 5 million tons of debris from Japan. But now, who knows how much has sank, how much has broken up, or - perhaps - how much has been consumed?

Most reports are claiming that there’s at least 1.5 million tons but this num-

ber is as controversial as any other.

This week, a post on NOAA’s Marine Debris blog states the following: “Here’s the bottom line: There is no solid mass of debris from Japan heading to the United States.”

In 2012, marine debris from the Japanese tsunami was a topic of intense scrutiny. Reports of a dock that had washed ashore in Oregon that containing 165 foreign species that had traveled from Oregon made national news.

And while the tsunami debris highlighted to many that plastic waste in our oceans is a big issue, it convoluted

that same issue as well.

What needs to be emphasized is not sensationalized reports of where the trash is or how big it might be. We need to emphasize the efforts we’re making to rectify the situation before it worsens. On the West Coast alone, the cost of cleaning up marine debris comes to more than \$13 per person per year, according to a recent EPA study. Since plastic doesn’t biodegrade, marine debris will only continue to become a problem.

*Posted by Tyson Bottenus on
SeaDiscovery.com*

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UI2014 FEBRUARY 11-13 NEW ORLEANS

The Shape of Things to Come?



SeaOrbiter is touted as a “space station of the sea,” and your guess if you ever see it on one of the world’s oceans is a good as ours. Last month saw the launch of a “crowd funding campaign” on KissKissBankBank to finance the construction of the “Eye” of the vessel, to start in spring 2014.

As designed, the Eye of the SeaOrbiter will be 18 meters (59 ft) high above the surface of the sea, with the overall vessel measuring 58 meters (190 ft), and it would support the crew’s nest and the suite of communications systems that will allow the

team to broadcast their adventures live. Weighing in at approximately 500 tons of recyclable aluminum, the semi-submersible SeaOrbiter is envisioned drift silently across the ocean, aided by a small propulsion system, and is designed to have a lifespan of 15 years. The SeaOrbiter is the culmination of 30 years of innovative research and the work of sea architect Jacques Rougerie.

The goal of the crowd funding campaign is to raise about \$450,000 in 90 days to finance the construction of the Eye of the SeaOrbiter.

Levels of contributions are:

- **€10 euros** Your name will be posted on the SeaOrbiter website.
- **€30 euros** You will receive a SeaOrbiter sewing patch + your name posted on the website.
- **€55 euros** Your name will be engraved in the Eye of the SeaOrbiter, your name on the website and receive a SeaOrbiter sewing patch.
- **€15,000 euros** Invitation for two to the Opening of the SeaOrbiter. (excluding travel expenses)

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Werum Equips RV with DSHIP



Source: Florian Lange, Alfred Wegener Institute.

The new RV Mya II equipped with Werum's DSHIP data management system, The RV Mya II, recently delivered to the German Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI), is equipped by Werum Software & Systems AG with its DSHIP data and information management system. The data management system will acquire the measurement data collected during the research cruises of RV Mya II.

It will also archive and centrally provide the measurement data on shore at the AWI. Being stationed on the German island of Sylt, RV Mya II will go on one-day research cruises on the Wadden Sea and on the North Sea up to Helgoland. RV Mya II is 21 meters long and, thus, the smallest research vessel Werum's DSHIP data management system is used on.

The vessel is equipped with a variety of measuring instruments and sensors as they are also installed on larger AWI research vessels. Now, all data can be acquired and administered with systems of the same type. Integration into the already existing infrastructure is ensured so that the scientists can archive and evaluate the data as they need it.

Makai Continues Energy Research in Hawaii

Makai Ocean Engineering received a \$3.6 million contract from the Hawaii Natural Energy Institute and the Office of Naval Research for research and design on the marine renewable energy known as Ocean Thermal Energy Conversion, or OTEC. Makai will perform this work at their Ocean Energy Research Center, located in Kona, Hawaii.

The promise of OTEC lies in the fact that tropical ocean is earth's largest solar collector. According to Dr. Joseph Huang, a senior scientist at the U.S. National Oceanic and Atmospheric Administration, "If we can use one percent of the energy [generated by OTEC] for electricity and other things, the potential is so big. It is more than 100 to 1,000 times more than the current consumption of worldwide energy. The potential is huge. There is not any other renewable energy that can compare with OTEC." Makai will work on two initiatives to serve the ultimate goal of making commercial OTEC a reality:

- Designing, manufacturing and testing an improved heat exchanger for OTEC, and
- Connecting power from its OTEC plant to the electric grid on the Island of Hawaii

Because heat exchangers make up about one-third of the cost of an OTEC plant, Makai will develop designs for an OTEC heat exchanger that is high-performance, low-cost, and corrosion-resistant. The goal is a product that is essential to developers of OTEC and valuable for other industries that use marine heat exchangers.

In addition, Makai will install a 100-kilowatt turbine at the Ocean Energy Research Center to generate OTEC power



(Photo: Makai Ocean Engineering)

er onto the local grid in mid-2014. This turbine will make Makai's Ocean Energy Research Center the largest operational OTEC plant in the world, and the first closed-cycle OTEC plant ever connected to a U.S. electrical grid. By operating the OTEC plant, Makai will gain operational knowledge that will aid in the design of future utility-scale power plants.

Bibby Concludes IRM Work from Brunei Shell

Bibby Offshore Singapore (BOS) said it has completed an extensive inspection, repair and maintenance (IRM) work on Brunei Shell Petroleum (BSP) offshore assets. The project involved the inspection of BSP's East and West assets and covered a total of 48 pipelines, with a combined length of 272km, and 93 platform risers.

The work was performed by the Bibby Spring operated by BOS. The DP2 ROV Support Vessel is fully configured for IRM operations and boasts dual ROV capability, including the Atom, the latest compact workclass ROV from SMD. The vessel is also equipped with comprehensive data acquisition and processing packages.

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ACSM Add Cougar ROV



(Photo: Saab Seayeye)

The Cougar XT undergoing tests off the Port of Ferrol, Spain.

Off the coast of Spain, subsea services company ACSM has completed sea trials of a second Saab Seayeye Cougar XT ready to add to its ROV fleet following successful trials offshore Norway and in the Baltic where ROV pilots and technicians reported minimal downtime and satisfaction with its performance. Operating near the Port of Ferrol, Spain, the 2,000m rated Cougar undertook a range of free-swimming tests including survey routes, manipulator intervention on structures and other wet tests. An additional test included a collaborative venture with Portugal-based Abyssal, trialing its 3D visualization system that uses Augmented Technology to provide the pilot with a heads-up display in 3D showing flight paths and checkpoints to guide the pilot to the exact target location.

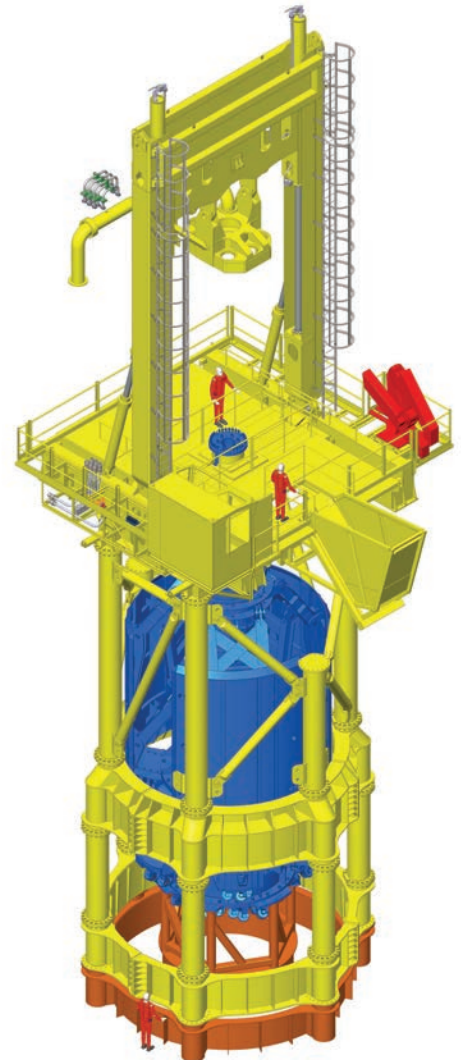
Fugro's Offshore Wind Farm Drill Ready

Fugro Seacore is building a pile top drill, the T120, for the offshore wind farm market to assist with monopole installations of up to eight meters diameter. The development represents a significant step forward in capacity, as its current big drill has 90 metric tons of rotational torque; the new one will have 120 metric tons. This new addition to the fleet means they will have two drills capable of relief drilling piles of larger than six-meter diameter simultaneously, for instances where larger monopoles are the chosen foundation for the wind farm sites of round three in U.K. waters and elsewhere in the European market.

“Our drilling rigs and associated equipment are custom built with specific markets and projects in mind,” said Alun Jones of Fugro Seacore. “We are constantly seeking to expand the parameters of drilling technology and enjoy rising to challenges, such as recently completing a 6.5-meter diameter by 63-m deep shaft – the largest drilled marine socket in the world.”

The entire pile top drill set-up, weighing approximately 350 metric tons, was scheduled to be completed this month and on site in early February 2014.

www.fugroseacore.com



The new T120 drill on top of the Conductor (framework that lifts it above the waves) all in yellow, and also showing the down hole equipment in blue. It will be configured as shown here and attached to the orange steel frame which is fixed to the deck of the transport installation vessel (TIV).



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Guide for Marine Spatial Planning

As the need for Marine Spatial Planning (MSP) and its development continues to grow, The Nautical Institute has worked with the World Ocean Council to produce a guide aimed at helping maritime professionals to better understand MSP and take a more active role in representing shipping issues within the process. Entitled “The Shipping Industry and Marine Spatial Planning – a professional approach” and launched a seminar hosted by the Institute’s Hong Kong branch, the guide provides an overview of the key shipping-related issues that need to be considered in developments to ensure that ship-

ping issues are harmonized with other stakeholders to best serve society as a whole. MSP involves an increasingly diverse array of organizations and interest groups, from shipping, fisheries and dredging to renewable energy, tourism and oil and gas. The Nautical Institute and the World Ocean Council are working to ensure that professionals from across the maritime spectrum become more informed and involved in MSP, particularly at the local level. The guide can be downloaded from The Nautical Institute’s MSP Forum:

nautinst.org/en/forums/msp

Printed copies can be ordered through
email: pubs.admin@nautinst.org



**Paul Holthus, CEO,
World Ocean Council**

Book Review

Ocean Zoning for Coastal Zone Management

With oceans considered by many as one of the last frontiers, a new American Bar Association book will help experts and government planners use zoning as a vehicle for ocean development and management.

Zoning the Oceans: The Next Big Step in Coastal Zone Management is the first book to focus on new and emerging state ocean zoning programs in the context of recent developments in offshore coastal zone regulation at the state and federal levels. The timely and relevant book delves into a wide range of coastal

zone management issues, including how states can use ocean zoning regulations to foster offshore renewable energy development, such as wind and wave energy. The book also explores how to protect sensitive coastal environments from harm. *Zoning the Oceans* contains four parts: Two provide an overview of coastal zone management and ocean zoning approaches at the state and federal levels, and two focus on the development, design and implementation of the Rhode Island’s Ocean Special Area Management Plan, the nation’s first

state ocean zoning plan to be federally approved. Other states have looked to this plan as a possible blueprint for ocean zoning initiatives.

Author John Boehnert practices real estate, real estate development and environmental law in Providence, R.I., and is experienced in coastal permitting, waterfront-property rights and public trust doctrine issues. The book was published by ABA Publishing in conjunction with the ABA Section of State and Local Government Law.

americanbar.org

Calecore Purchases Geotechnical Drilling Rig

Calecore Directors Sarah Cashmore, Steven Lloyd and Richard Parkinson announced the purchase of the geotechnical drill rig installed to the DP2 Highland Spirit, securing third month rotation for Kara Sea Project, Russian Arctic. Earlier this year Calecore took investment from Netherlands based investment company VEP. VEP's equity position sees the board of Calecore unchanged but the drill rig purchase is viewed as just the start of bringing significant and key assets to the balance sheet.



EdgeTech4600 for Project Contour

The team of Project Contour has captured stunning underwater photos, videos and acoustic images in the Western Crete area. The group has taken on the task of mapping and exploring an area not previously charted or dived upon using high tech underwater imaging or diving equipment. Searching the area for shipwrecks and other items of archaeological interest the team is providing daily updates and commentary on this mission of underwater exploration.



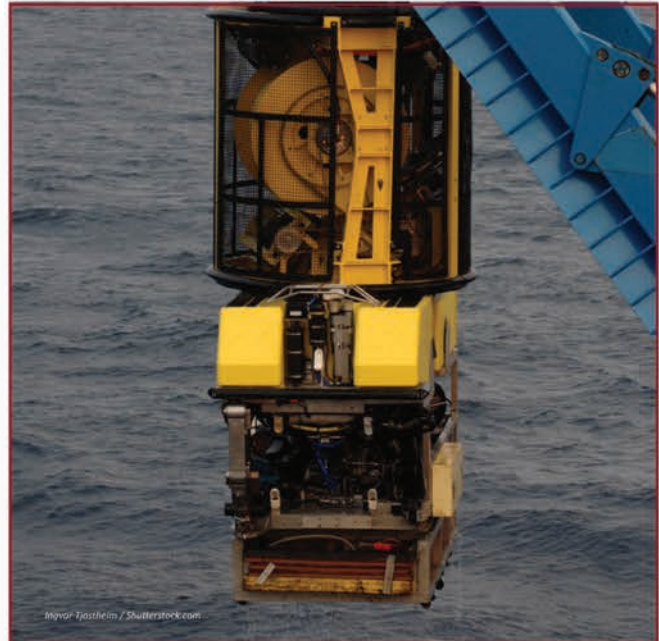
On the survey side, to make the most of the underwater dive missions, it is important to cover a lot of ground in an efficient manner.

Enabling the fast wide swath acoustic imaging needs is the EdgeTech 4600. As noted by Project Contour, "Our survey vessel is up and running with an EdgeTech 4600, combined bathymetry and sidescan sonar system. The vessel and electronics are now functioning flawlessly, with today being the first real mapping day. Over 100 gigabytes of sea floor information was mapped, mostly at a speed of 4.5 knots."

MMT Upgrades ROTVs

MMT has two remotely operated vehicles (ROTV) equipped with various survey equipment for complete geophysical surveys. MMT has now upgraded the systems to be fully equipped with side scan sonars and sub bottom profilers, in addition to multibeam echo sounders, inertial navigation system and doppler velocity log. This means a complete geophysical survey can be done from this platform in a speed of six knots and down to a water depth of 400m. The ROTV is a powerful tool for accurate line keeping during a survey. The system enhances the control of the tow-fish and allows both a constant altitude above the seafloor as well as maintaining the planned survey lines. The ROTV also improves the actual direction of the tow-fish unit which greatly improves the data quality of the side scan sonar.

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Dr. Jennifer Brower, Prometheus

Please discuss your background, how you came to your current field, including details on your tenure and role @ Prometheus.

I have been a Prometheus Principal Scientist and Administrator for 18 years. While at Prometheus I have developed technology applications for Prometheus algorithms, co-developed a DCAA approved accounting system and managed several Prometheus efforts in mathematics and business development, including current efforts to integrate the Materials Identification Reflectivity Kernel algorithm suite into the ANN/BQQ-10 sonar system.

In addition, as Executive Vice President of the International Neuroscience Network Foundation (INNF), I managed a large four-year multinational neuroscience project for Nestle examining the relationships among taste psychophysics, metabonomics and genetics. I also led INNF's education outreach program, working to stimulate STEM (science, technology, engineering and math) interest and excellence in K-12 students.

While at RAND, I was Co-Director of the Congressionally-mandated Advisory Panel to Assess Domestic Response to Terrorism Involving Weapons of Mass Destruction

(the Gilmore Commission). As part of this well-regarded multi-year project, I supervised more than 50 personnel and developed and oversaw the research agenda for the panel, which included research on technologies to combat (biological, chemical, infrastructure) terrorism as well as policies and procedures in the areas of critical infrastructure, border protection, and health and emergency services.

I completed a National Research Council postdoctoral fellowship at the Naval Research Laboratory in Washington, D.C., and I hold a Ph.D. in Environmental Engineering and Microbiology from Harvard University, and two Bachelor degrees in Engineering from Dartmouth College and the Thayer School of Engineering at Dartmouth College. I have co-authored several peer-reviewed articles, fsbook chapters and books.

Looking at Prometheus' turnover in a given year, please give an overview description of your client base.

Prometheus' client base is primarily the Department of Defense and defense contractors. Currently, our primary customer is the U.S. Navy and more specifically the Naval

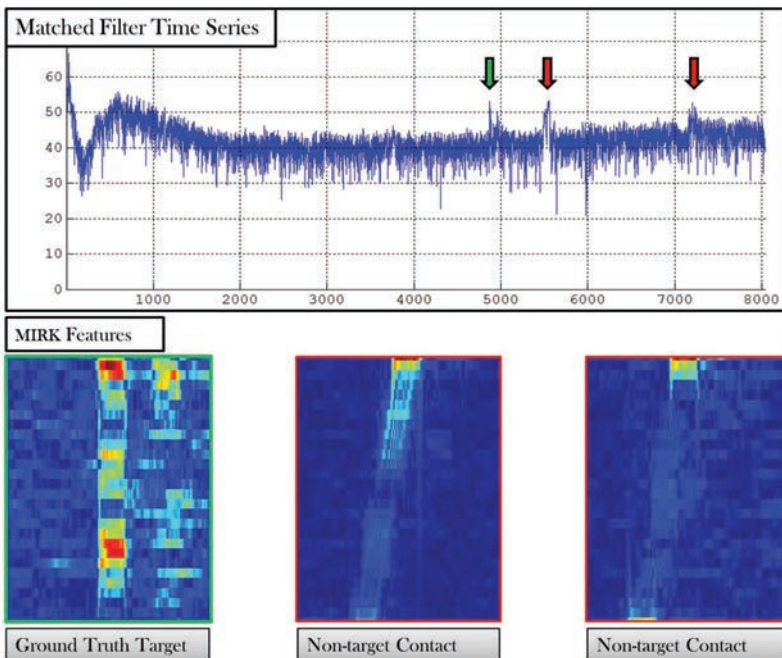


Image of Prometheus' signal processing work showing the difference in "featuregrams" between targets and non-targets using Prometheus MIRK processing. The match filter processing (commonly used by Navy) identifies all of the noted peaks as targets but when the signal is processed using a Prometheus algorithm suite, targets and non-targets are correctly identified.

Sea Systems Command and the Office of Naval Research. Our projects are moving from more basic research support from DoD to transition and integration support from DoD and the commercial sectors. In addition to the aforementioned the following organizations have been our clients: Space and Naval Warfare Systems Command, San Diego; Defense Advanced Research Projects Agency; the U.S. Air Force including Brooks AFB / Citybase, U.S. Air Force Office of Scientific Research, Mathematics and Information Sciences and the U.S. Air Force Research Laboratory, Sensors Directorate, Rome, New York; the U.S. Army including the Space and Missile Defense Technical Center, Huntsville and the DASD Munitions and Chemical Matters, OUSD AT&L. We have partnered with Raytheon, BBN Inc., Cisco Systems and Newport News Shipbuilding to bring technology solutions to the DoD.

Looking at the military / defense applications: what are the overriding drivers for your business in this market today?

• The overriding drivers for our technology are the

ability to do intensive computation onboard defense systems due to leaps in computing power and the need for technology solutions that will significantly increase performance of existing systems while reducing costs.

Specifically, can you share with MTR readers a specific, recent project where your specialized applications were applied to significantly enhance production, reduce costs, or both?

• Prometheus is currently working to integrate its algorithm suite MIRK into the AN/BQQ-10 sonar. It is anticipated to significantly reduce false alarms and work in real time based on results with at sea data, saving the Navy both time and money. This algorithm suite was first developed for radar, and there have been and will be future cost efficiencies because the algorithm has been and can be adapted to multiple active sonar and radar systems.

In analyzing the subsea market, what do you count as the biggest technological leaps that

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*Gemini NBI sonar image of a cable being trenched >
Image courtesy of Reef Subsea Dredging & Excavation*



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have most affected our ability to collect, disseminate and analyze data from the oceans?

Similar to the third question, increases in computing power allow MIREK and other Prometheus algorithms to work in real time, in a single pass on board a variety of Navy and other defense systems. The creation of numerous platforms including UUVs and AUVs that will benefit significantly from the integration of Prometheus algorithms also allows increased data collection and analysis of results.

The premise of your firm sounds fairly straightforward: to use software solutions in lieu of more timely and costly hardware switches. Give perspective, if you will, on how prevalent this concept is today in the subsea industry.

The concept is prevalent due to technology advances and budget constraints, but the integration of truly autonomous, real-time, single pass software is rare.

What do you consider the greatest challenges to making it more commonplace?

One great challenge is connecting small business technology/software developers with DoD and prime contractors. It is difficult, particularly for businesses new to defense contracting, to understand the specific needs and systems. The contracting process itself also stands in the way to innovative software integration.

What initiatives specifically do you as a company engage to help spread your solutions?

We present at conferences, actively review government opportunities on FedBizOpps, actively seek out opportunities on the web and contact the relevant people, arrange meetings, and develop partnerships and hire people with experience with various market segments.

Military spending has increasingly come under tight constraints. How has this impacted your business (ie. have you seen an uptick in attracting business by showing how various tasks can be accomplished more cost effectively?)

This allows us to sell our message more effectively - to improve our customers' system performance by the formulation, design and integration of accurate and computationally efficient algorithms.

What do you consider the biggest challenge to running your business, efficiently and effectively, today?

The tremendous burden of contracting and other regulations on small businesses. Each person who works for Prometheus must be able to do a little bit of everything, as opposed to larger companies who have departments to deal with contracting, security, etc.



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21 Arnold Ave., Newport, R.I., U.S. 02840
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Email: jim@prometheus-us.com
Website: www.prometheus-us.com
CEO/President: Jim Byrnes
Number of Employees: 26

Prometheus Inc., incorporated in 1983, is a mathematics and engineering research firm that specializes in the application of high-level mathematics to modeling, simulation and signal processing. Its objective is to improve its customers' system performance by the formulation, design and integration of accurate and computationally efficient algorithms. Developers of radar, sonar and oceanographic systems which require management and analysis of large amounts of data are our principal customers. In most cases it eliminates the need for changes in hardware. **Its goal: Provide mathematical solutions and real-time code to improve system performance at reduced costs.**

Prometheus has provided computationally efficient mathematical solutions for: remote material discrimination with radar and sonar; feature-based pattern recognition; real time broadband reverberation modeling; closely spaced

object discrimination; waveform diversity, particularly for space-based radar and the Advanced Acquisition Decision Aid to evaluate technology investments. Supported by the U.S. Navy, Air Force and National Reconnaissance Office, Prometheus developed algorithms leading to the automatic determination and discrimination, in intense clutter, of organic materials including foliage, people, chemicals and biologicals at various temperatures and moisture content, as well as man-made objects such as submarines and mines. Its algorithms compute materials identification in real time from scattered measurements, have good noise rejection and are robust to clutter. Its success in providing the Fleet with information not available in today's operational sonar systems is exemplified by the FY12 award of a \$3 million Rapid Innovation Fund contract by the Navy, which funded only 34 of the several thousand proposals received.

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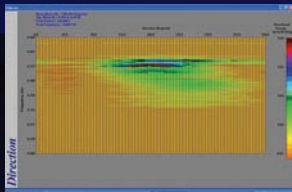
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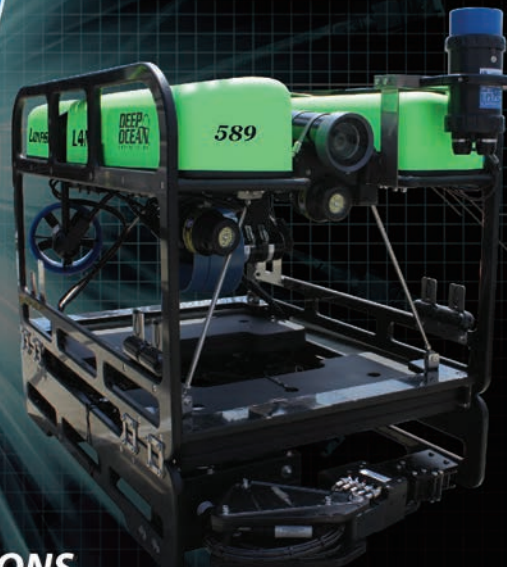
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Bourbon Continues to Build

Seismic Survey Success

By Eric Haun

Announced in June 2011, Bourbon and CGG entered a five-year charter agreement for a series of six custom newbuild seismic support vessels. Now more than two years later, the third ship in the series, Bourbon Gannet, is due to enter service in the early part of 2014, following the launch of the first two vessels, Bourbon Petrel and Bourbon Fulmar, in summer and autumn 2013, respectively. The remaining three sister vessels are under construction in Dubai's Grandweld Shipyard, also slated for launch in 2014.

The six Bourbon ships were engineered by naval architecture company Offshore Ship Designers to assist CGG's offshore seismic operations. The Cyprus-flagged, 53-m vessels boast 50-metric-ton bollard pull capabilities and are designed for following tasks: personnel transportation for crew rotations, equipment transportation, bunkering operations, supply of water and provisions, sewage and sludge transfer, operational protection assistance (anti-collision, clearing transit routes), emergency towing capacity to ensure the continuity of seismic

operations and maritime assistance and support during maintenance operations.

Bourbon Petrel has been supporting the CGG Symphony seismic vessel in the Black Sea since July 2013, where it has carried out many refueling operations, including inline bunkering, in addition to towing work and crew rotations. Bourbon Fulmar is currently assisting the Viking Vanquish, a seismic vessel operating in Northern Europe.

Importantly, the six support vessels operate on versatile hybrid propulsion systems to provide optimized fuel efficiency over a diverse range of tasks: diesel-electric power is often better suited for escort operations, while mechanical propulsion is used for maximum power in transit and during operations. The propulsion systems include Berg shaftlines, Caterpillar engines and generators and Techsol electrical systems.

Representatives from Bourbon and CGG declined to say how much the hybrid propulsion hiked the ships' overall cost, but they did estimate fuel savings in the range of 30-40% com-

The vessel sports a hybrid propulsion system that saves an estimated fuel savings in the range of 30-40% compared to standard vessels.



(Photo: choppershoot.com courtesy Bourbon)



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- ▶ Price: from \$15,000



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Photo: choppershoot.com courtesy Bourbon

Main Particulars

Length, o.a.	53.8 m
Breadth, molded	13 m
Depth	6.3 m
Max./Design draft	4.8 m/4 m
Deadweight	approx at max. draft 1,360 mt
Bollard pull at Diesel - mechanical mode	40 mt
Bollard pull at boost mode	50 mt
Gross/Net tonnage	approx 1,358/407
Type	Seismic support vessel. IMT 952
Class:	BV
Flag	Cyprus. + AUT-UMS
Deck area	approx. 230 m ²
Max Deck cargo	205 mt
Domestic MDO (@ 97 %)	271 cu. m.
Cargo MDO/Cargo HFO (@ 97%)	77 cu. m./895 cu. m.
Deliverable MDO/HFO cargo	950 cu. m.
Fresh water	121 cu. m.
Ballast water	519 cu. m.
Lub oil	10 cu. m.
Thermal oi	4 cu. m.
Cargo slops	10 cu. m.
Cargo HFO/MDO	2x 200 cu. m./h at 60 m
Cargo MDO	50 cu. m./h at 60 m
Cargo fresh water	50 cu. m./h at 60 m
Ballast/Fire pump	75 cu. m./h a 50 m
Bilge system	50 cu. m./h at 50 m
Accommodations	24 pers. (including 12 passengers)
Main Diesel engines	2 x 1,575 bhp
Auxiliary Diesel generators	3 x 550 kW
Electric motor plant	2 x 350 kW
Main propulsion	2 x Hybrid propulsion package on CP propellers
Bow tunnel thrusters	2 x 300 kW
Emergency generator	1 x 95 kW
Speed/Consumption (at 4m design draft)	
Diesel—Mechanical mode	11.8 t/day at 11 knots
Diesel—Electrical mode	3 t/day at 6 knots
Boost mode	15.4 t/day at 11.5 knots

pared to standard vessels. Each vessel saves a few thousand dollars per day on fuel thanks to the operational flexibility of the hybrid propulsion systems.

In addition to these advantages, Yves Rastoin, Maritime Director, CGG, said his company reaps a number of other benefits from its partnership with Bourbon. He said Bourbon fit CGG’s need for a “long-term partner of choice” while meeting the specialized nature CGG’s 22 globally active seismic vessels – and at a good price. Furthermore, Rastoin cited Bourbon’s strong track record as a platform on which to develop a long-term relationship. “We selected Bourbon for their experience in vessel series management, and for their capacity to optimize their availability and deliver their high operating standards.”

“Along with our efforts to streamline our fleet of seismic vessels and reduce the number of shipmanagers, CGG has launched a dedicated program for its chartered fleet of support vessels,” Rastoin said. “The series of six specially designed vessels under a long-term charter agreement with Bourbon is the first of its kind for our industry. Given the successful operations already carried out by the Bourbon Petrel and the Bourbon Fulmar, we feel confident about having made the right choice of partner and customized support vessel design for our seismic operations.”

For Bourbon, the newbuilds are encompassed in its “Bourbon 2015 Leadership Strategy” plan, which entails company-wide investments nearing \$2 billion (USD) to bolster the group’s global fleet. “The partnership with CGG is entirely consistent with Bourbon’s development strategy, based on a modern, standardized, high-performance fleet and perfectly trained crews, in accordance with our operational excellence goal,” said Rodolphe Bouchet, vice president of business management for Bourbon’s marine services department. “The success of these first seismic support vessels attests to Bourbon’s capacity to assist clients on demanding projects by providing them with quality services in constantly evolving environments and markets.”

Also part of the deal, Bourbon and CGG extended their partnership in a number of other related areas, most specifically safety and training operations: the captains of the Bourbon vessels receive training on CGG’s seismic operations simulator; drills and training exercises focusing on operational quality are held on a regular basis to prepare Bourbon and CGG crews together and to share best practices; and finally, a single contact person at Bourbon is responsible for vessel contract administration - this person is the key client contact on a daily basis.

Bibby Offshore Charters CSV

Bibby Offshore signed a charter agreement for construction support vessel (CSV), the Olympic ARES. The agreement with Olympic Shipping will initially be a seasonal charter beginning at the end of Q1 2014 with options to extend. The vessel will be mobilized with ROVs from Bibby Offshore's sister company Bibby Remote Intervention Limited and the companies together with Olympic Shipping shall jointly market the vessel from when it arrives in Aberdeen.

"Adding to our fleet increases our offering to the IRM and construction market, which is an important growth area for the business," said Andrew Duncan, president and managing director of Bibby Subsea. "We have recently secured a number of major contracts in these areas and the Olympic ARES will be used to execute large and complex projects in the UKCS, Denmark and elsewhere in the North Sea, while offering our clients greater choice and availability."

"The Olympic ARES is a superior vessel with excellent specifications, including a 250-metric-ton heave compensated crane for subsea use and 1,300 sq. m. of clear back deck space."

Bjorn Kvalsund, EVP for Olympic Shipping said, "The ROV Services Agreement with sister company Bibby Remote Intervention will allow us to both take advantages of additional opportunities together and we hope to grow and expand this working relationship in the future."

Bibby Offshore with new sister company Bibby Remote Intervention Limited (BRIL), has grown from 10 employees in 2003 to now employing more

than 1,300 people onshore and offshore worldwide, with offices in Aberdeen, Liverpool, Singapore, Trinidad and Houston. The company has an interna-

tional fleet of six subsea support vessels and 13 Remote Operating Vehicles (ROV) and will continue to add to their fleet to meet demand.



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KEVIN BOSWELL – Florida International University

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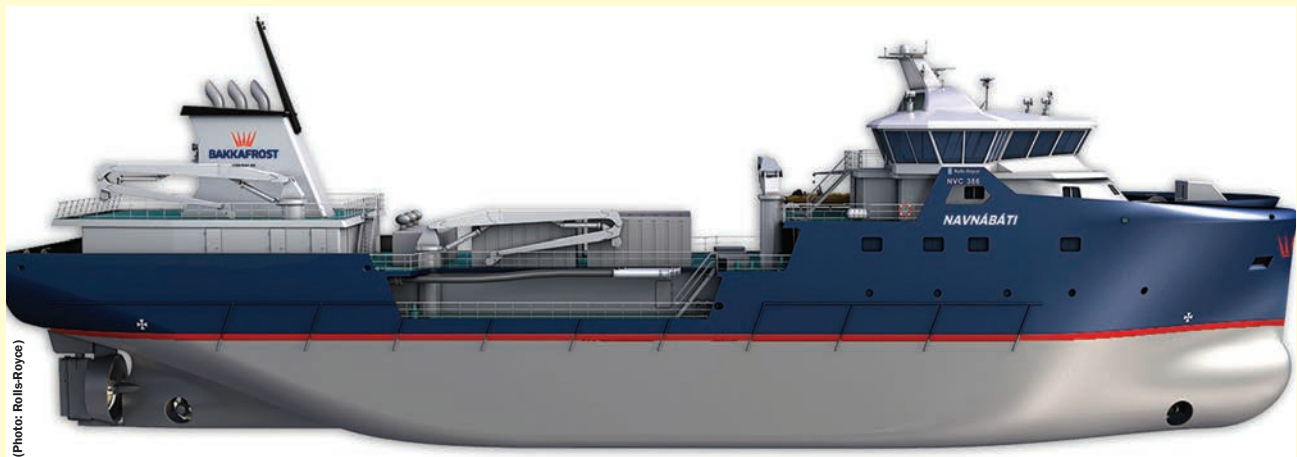
Viking Welding & Response Marine recently completed a 36 ft. research vessel, which is being used in U.S. Coast Guard Academy coursework this fall. Christened the Michael J. Greeley Spirit of '61, the vessel was largely funded by gifts from the Academy class of 1961 and named after a class member who passed away while a cadet at the Academy. The Michael J. Greeley adds capacity, capability and versatility to the marine research and lab work offerings of the Academy. With more than 170 sq. ft. of open working deck, 1,500-pound capacity A-frame with hydraulic winch and two 500-pound capacity davits with hydraulic capstans, hauling and sampling is more efficient and versatile than on the smaller academy boats. For lab and sorting work there are two 4 x 3 ft. portable, flow-through tables. The pilothouse interior features counter space for computers and a 19 in. diameter thru-hull well for various sampling and sonar instruments. Power is twin Cummins 220 hp diesels with electronic controls and monitoring, producing over twenty knots top speed.



Designed by Response Marine, Inc. the boat is very similar to other 36 footers designed for the University of Connecticut and Michigan Technological University. Plans and construction were inspected and approved under Subchapter T regulations and Simplified Stability tests were conducted both with and without lifted weights. Without lifts the vessel meets stability for 19 passengers on a coastwise route. With lifted weights, the vessel meets stability for 19 passengers on a partially protected route.

Rolls-Royce to Design, Power Fish Carrier

Rolls-Royce signed a deal for the delivery of design and equipment for a live fish carrier, to be built at the Tersan shipyard in Turkey for Faroese ship owner Bakkafrost. The contract is worth approximately \$9m to Rolls-Royce. The vessel is a Rolls-Royce design, type NVC 386, featuring the characteristic wave-piercing bow. The vessel will measure 75.8 x 16m, with a carrying capacity of 3,000 cu. m., which corresponds to approximately 450 metric tons of live fish. When it enters service, it will operate for Bakkafrost's own fish-farming industry, transporting live fish from fish farms into on-shore processing factories. On board, the fish will be kept in three holds constructed for the optimum transportation of live fish, with full pump-circulation capacity in a closed circuit. The system also provides for the full filtering of water, with separate systems for loading all tanks simultaneously and pressurized discharge to shore. A high capacity system for de-licing will also be installed.



(Photo: Rolls-Royce)

Fugro's New Geotechnical Drilling Vessel for Asia Pacific

Fugro Voyager, a purpose-built DP2 geotechnical drilling vessel, is entering service with Fugro's Offshore Geotechnical Division to expand its operations in the frontier areas of the Asia Pacific region. At 83 x 20m, with a twin tower drilling derrick over a centrally located moon pool, the vessel has automated pipe and tool handling equipment. Equipment includes both downhole and seabed sampling and testing systems rated for 3,000m water depth. Fugro Voyager is equipped with DP 2 and is built to Comfort Class COMF-V(3) standards with quarters for up to 60 people. A large soil laboratory is centrally located next to the drill floor giving a unique open-plan working environment for the geotechnicians.

December sees Fugro Voyager departing for her maiden contract off the northwest coast of Australia, where she will undertake work to aid foundation design for seabed infrastructure. She will be performing seabed in situ testing, large diameter piston cores, drilled borings and downhole in situ tests in water depths up to 1,350m. Fugro Voyager is part of Fugro's global fleet renewal strategy, where older tonnage is being replaced with new modern vessels



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McDermott Wins Subsea Contract for Petrobras

McDermott International said that one of its subsidiaries entered into an agreement with Petrobras for a short term charter to supply its subsea construction vessel North Ocean 102. The NO102 will carry out deepwater umbilical and flexible pipe installation offshore Brazil and is expected to begin work during the third quarter of 2014. “This contract award highlights Petrobras’ confidence in McDermott as a significant player in the subsea industry,” said Tony Duncan, Vice President and

General Manager, Subsea, for McDermott. “The performance of our first pipelay support vessel in Brazil, the Agile, has provided Petrobras the assurance that McDermott can execute deepwater subsea installation services to high standards of safety and quality with a strong performance scorecard.”

The NO102 is a fast-transit, dynamically positioned (DP2) vessel with a high top tension Vertical Lay System for SURF needs that operates across a wide variety of water depths.

North Ocean 102 will carry out deepwater umbilical and flexible pipe installation offshore Brazil and is expected to begin work during the third quarter of 2014.



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CTruk Delivers Wind Farm Service Catamaran

CTruk delivered its 12th 20T multi-purpose catamaran, CWind Challenger. As well as being the first of these popular offshore wind support vessels to be designed, built and classed to Bureau Veritas (BV) rules, the 18.5m multi-role workboat is also the first Category 1 vessel built by the company under the MCA MGN 280(M) rules. To top off the CTruk team's achievements, CWind Challenger is the first craft to be classed by Bureau Veritas under its Wind Farms Service Ship class notation.

CWind Challenger is part-owned by Scott Wharton of North Devon-based S&P Fish. Scott signed up to offshore wind industry service provider CWind's boat share scheme earlier this year, and the composite workboat has since joined the company's growing charter fleet.

Scott has owned numerous fishing vessels over his 29 year career fishing the Bristol Channel and currently operates a fleet of six. Commenting on the features that drew him to CTruk's twin-hull design Scott said, "These boats are durable and strong with great maneuverability, and the fact that their lighter weight saves on fuel is a huge plus. In commercial fishing one of the biggest problems we face is the rising cost of fuel, which has a huge impact on profitability. Costs are also a major consideration for the offshore wind industry, so that was a big tick in the box for me."

For CTruk, delivery of the first offshore wind support vessel to meet internationally recognized classification standards is a key milestone in the company's three-year history. Designed and built to Bureau Veritas HULL MACH Wind Farms Service Ship S1 classification rules, CWind Challenger also meets U.K. flag (MCA) MGN280 requirements for Category 1. As well as building vessels to full BV class, CTruk continues to offer standard craft built to DNV or BV letters of compliance.



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Expenditures to Grow 80%

By Kathryn Symes, Douglas-Westwood

In the latest edition of its World ROV Operations Market Forecast, Douglas-Westwood (DW) expect annual expenditure on work-class ROV operations to increase from \$1.6B in 2013 to \$2.4B in 2017, a compound annual growth rate (CAGR) of 11.3%. The market is expected to total \$9.7B over the period, a growth of 79% over the previous five years.

Expenditure is forecast to increase more than operational days due to the move towards deeper waters and more complicated offshore field development programs. These are demanding higher specification, higher cost ROVs to cater for their support needs.

Drilling support, of both exploration and appraisal (E&A) and subsea development (DV) wells, is the main ROV activity demand driver, accountable for 75% of the total expenditure between 2013-2017. Construction support accounts for 20% and repair and maintenance (R&M) for 4%.

The largest regional market is expected to be Africa, with Latin America, North America and Asia also important players. The 'Golden Triangle', comprised of Brazil, the Gulf of Mexico and Africa, is forecast to account for the majority of global ROV demand, but Asia will see significant growth.

Global ROV Supply

The current industry structure is the result of many mergers and acquisitions over more than 30 years. The world fleet of work-class ROVs currently consists of 1,102 units operated by 25 companies. Of this the top ten players dominate the market with almost a 60% share. Oceaneering are the largest operator with 316 ROVs in its fleet, accounting for approximately 30% of the global total with their operations primarily being on drilling support.

In its 2013 Q3 release, Oceaneering says it anticipates adding 20 units to its fleet. Longer-term, the company believes it could add 90-95 incremental vehicles (55 drilling support, 40 vessel support) by 2017 based on its current market share and its outlook for demand.

Drivers and Indicators

While ROV support is needed in a number of different industries, such as research and military, and on offshore wind-power projects, their primary use is in the oil & gas sector. Thus, the global demand for energy of which oil & gas makes up 57%, is the main underlying driver behind ROV demand. Oil & gas demand has grown substantially in recent years, increasing by 31% since 2000 and primarily driven by the developing world. Demand is forecast to keep growing significantly as oil, particularly in its use within the transportation industry, cannot be easily substituted by alternative energy sources. As supply from conventional resources begins to limit, production will have to move to deeper water, creating a greater need for ROVs as activity in all areas of the subsea market increases. Some ROVs may be installed on a vessel where they are essential but not used on a full time basis. However, others may be in virtually continuous use, particularly those used for drilling support. Therefore, there can be significant differences between the total available days of the ROV fleet and actual operational days. ROV support activity is driven by a number of other supply and demand side-factors;

- Increasing offshore exploration, appraisal and development, and the move to deeper water drives expenditure on ROV drilling support operations.
- Increasing installation of subsea equipment and hardware, requiring greater ROV construction expenditure.
- A large and growing offshore infrastructure of platform installations, subsea wells, flowlines, cables etc., driving the use of ROVs in the subsea inspection R&M market.

Market Forecast

ROVs are used for various subsea construction support and drilling support activities, as well as the repair & maintenance.

• Drilling Support

ROVs are needed to support the drilling of E&A and DV

wells. While E&A wells account for the largest proportion of ROV drilling support (69% in 2013), subsea DV wells are expected to experience higher growth during the 2013 to 2017 period, increasing at a CAGR of nearly 10%.

• **Construction Support**

Subsea construction activities that require ROVs include the installation of subsea trees, umbilicals and flowlines, TMFJ (templates, manifolds, flowlines and jumpers), subsea processing, FPSO mooring and risers, and trunk-line installation. Expenditure on construction support is set to grow substantially, with an increase of \$166m forecast by DW between 2013 and 2017. Africa will be the largest regional market with construction support spend expected to grow at a CAGR of 20%. In 2013 TMFJ will account for the highest proportion of total ROV construction support demand at 62%, and umbilicals and flowlines at 18%.

• **Repair and Maintenance**

The demand for ROVs to be used for R&M activities is driven by the ever increasing volume of installed subsea hardware. However, R&M only accounts for a very small proportion of the total ROV market (4% in '13 and '17).

Regional Analysis

• **Africa**

Africa will remain the largest market between 2013 and 2017, with total Capex forecast at \$2.4B during this period. Angola and Nigeria in West Africa are significant deepwater locations, forming part of the so-called 'Golden Triangle' of deepwater oil & gas. The discovery of new deepwater provinces offshore East Africa will further drive the demand for ROV operations in this region.

• **Latin America**

Latin America is forecast to be the second largest market with a total spend of \$1.9bn during the five-year forecast

period, predominately due to the large number of discoveries and developments offshore Brazil, where deepwater reserves are increasingly being developed and the region is also moving towards developing its ultra deepwater (>2,000m) pre-salt reserves. For these

reasons, expenditure in Latin America is forecast to grow the fastest rate of all the regional markets at a CAGR of near 16%.

• **Asia**

Asia is expected to be the third largest

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ROV operations market during this period, with expenditure forecast to total nearly \$1.4B between 2013 and 2017. Production was previously restricted to shallow water activity, but there are now a number of projects that are either producing or underway in deepwater areas. Thus demand for ROV support has increased in recent years, and since 2009 Asia's spend on ROV activity has been higher than that in North America, its previous competitor.

• **North America**

Issues relating to the Macondo well oil spill in the Gulf of Mexico meant that between 2009 and 2010 the North American oil & gas industry faced a significant downturn, particularly when coupled with the global economic recession. However, an increase in offshore drilling rig numbers and substantial forecasts in subsea hardware expenditure will drive demand for ROV support to pre-Macondo levels in 2013. The majority of ROV activity will be in the US Gulf of Mexico, where major deepwater oil finds are expected to drive growth of ROV demand.

• **Australasia**

Between 2009 and 2012 the demand for ROV support offshore Australia remained very steady, but a sharp increase in demand in 2013 meant ROV days almost doubled from their 2012 levels. Large shallow-water gas developments now dominate subsea activity here, so Australasia's demand is set to decline substantially over the forecast period.

• **Eastern Europe & FSU**

Eastern Europe & FSU is forecast to be one of the smallest regions in terms of ROV activity. However, it will experience some growth in demand between 2013 and 2017 as required ROV support days grow at a low CAGR of 6%. Demand within the Eastern Europe & FSU region will be driven almost entirely by trunkline installation and E&A well drilling.

• **Middle East**

The Middle East is the smallest ROV operations market, accounting for less than 2% of the global total ROV days in 2013. As a predominantly shallow-water region, the growth in activity levels forecast in the other regions is not expected to be mirrored in the Middle East. Expenditure on ROV support in the Middle East is forecast to fall substantially, almost

The Author

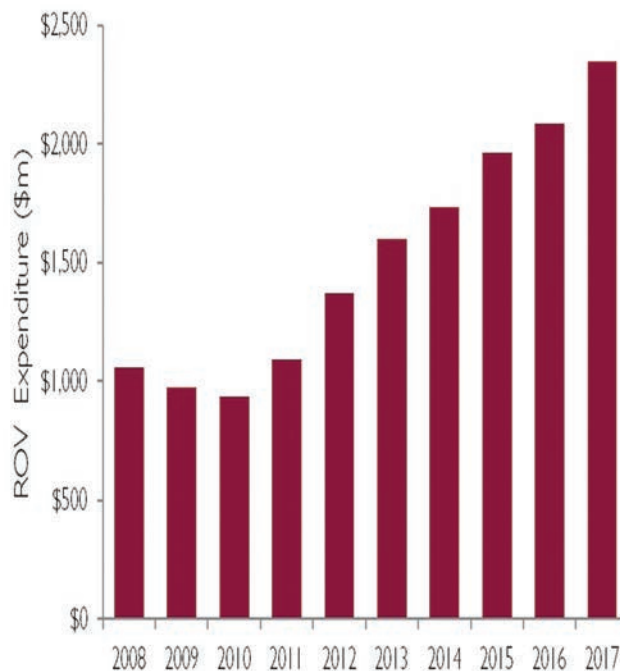
Kathryn Symes joined DW in 2013, graduating from Queen Mary College University of London with an MSci (Hons) Economics degree and then working for an investment firm in China. Since joining DW she has carried out research in the oil, gas and renewables sectors including numerous FPSO orientated research engagements, oilfield services and offshore and onshore logistics projects. Kathryn is also lead author of DW's World ROV Operations Market Forecast 2013-2017.



The Report

World ROV Operations Market Forecast 2013-2017: comprehensive examination, analysis and ten-year view of ROV operations, with historic data covering the period 2008-2012 and forecasts for 2013-2017. The report contains detailed forecasts of ROV activities, including work requirements on subsea trees, umbilicals & flowlines, subsea processing, FPSO mooring & risers, trunkline installation, etc.

For more information see: www.douglas-westwood.com



Market for Work-Class ROV Operations 2008-2017

Source: Douglas-Westwood

halving as it decreases to \$27m in 2017. ROV activity in this area is almost entirely driven by trunk-line installation and E&A well drilling support.

• **Norway**

Norway is expected to see a decrease in the Capex associated with ROV support activity during the forecast period as expenditure falls from \$119m in 2013 to \$113m in 2017, mainly due to Norway being a mature region with little deepwater development and existing production concentrated in relatively shallow waters.

• **UK**

Another mature market, the UK is dominated by shallow water developments and is only anticipated to see a small increase in ROV support demand between 2013 and 2017, at a CAGR of 4%. Drilling support expenditure is forecast to be the most significant part of this rise.

• **RoWE**

The Rest of Western Europe is also a mature region with limited deepwater activity, with relatively low levels of ROV demand during the forecast period. Growth is expected to be steady, again at a CAGR of less than 4%. Increasing water depths of oil & gas industry operations is the key driver of future work-class ROV demand as more activity becomes beyond the reach of divers. Globally there is strong growth for work-class ROV operations over the 2013 to 2017 period with drilling activity forecast to account for the largest proportion of demand. As ultra-deep waters are drilled and developed there will be a growing need for high powered ROV's, increasing the total spend. The deepwater 'Golden Triangle' regions of Africa, Latin America and North America are expected to continue to hold the most long-term growth potential and the biggest markets. Asia will also show significant growth.



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Petrobras

& Developments in Subsea Engineering

By Claudio Paschoa

Brazil's Petrobras has been one of the leading players in deepwater, subsea development projects since the turn of the century. These projects include pre-salt and post-salt plays, which require extensive and complex subsea engineering and construction efforts. It would be impossible for Petrobras to develop all of its projects alone, therefore much is done by specialized companies, mostly of foreign origin. "We could not have advanced in this project (pre-salt) conventionally, developing the production individually. We needed a global vision of the projects, starting from

a high level plan," said José Formigli, Petrobras' Executive Director of E&P, speaking of the primary plan for the development of the pre-salt at the Santos Basin, the Plansasal, which was created in 2008. According to Formigli, "The Plansasal led to a 'virtuous cycle,' which has guaranteed better results each year."

In the last 10 years Petrobras investment in R&D grew 22.7% per year, reaching \$1.1 billion in 2012. Petrobras rarely operates alone when it comes to subsea engineering and construction. Partnerships are part of Petrobras' DNA and by



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José Formigli
Executive Director of E&P,
Petrobras

working in cooperation with institutions such as the ANP (National Petroleum Regulator), universities such as the Federal University of Rio de Janeiro (UFRJ) and service companies like FMC Technologies, Subsea 7 and DeepOcean, Petrobras has found solutions to many problems and challenges in sub-sea development that might have taken much longer to realize if the company were to go at it alone.

Some of the problems and challenges are directly related to the harsh environment where the constructions are undertaken, specific challenges are strong deepwater currents, ir-



(Photo: Petrobras)



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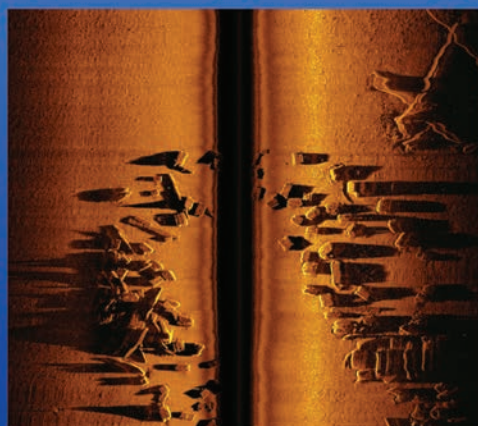
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regular and unstable seafloor, along with equipment corrosion and equipment failure during and after installation, to name just a few. “It is important to have access to reserves, technology and the adequate mechanisms to manage production to be competitive,” said José Miranda Formigli, Petrobras’ E&P Director during the recent Offshore Technology Conference (OTC Brazil 2013) in Rio de Janeiro.

“In terms of wells and subsea, we have problems associated with hydrate formation and, in some cases, we have also to make work-over on the wells for sand control, and I would say traditional workover for replacing gas lift valves. So this is a very traditional work-over that we have to do in all fields with the mature areas that we have in Campos Basin. Beside that, in some areas we have also some electrical submersible pump replacement work to be done. For example, this affected P-57 produc-

tion,” said Formigli.

Teaming with FMC Technologies

In terms of subsea engineering FMC Technologies is at the forefront with important projects in Brazil, such as the subsea separation system at the deepwater Marlim field at the Campos Basin, which is one of the major global subsea separation projects in existence. “Subsea oil/water separation, as-delivered in Marlim is the first step in removing enough water to prevent flow assurance issues,” said Rob Perry, Director of global subsea processing systems for FMC Technologies.

Marlim is Petrobras’ largest field in the Campos Basin, located 110 km (70 miles) offshore Rio de Janeiro. It was once considered the world’s largest subsea development, with 129 wells and 8 floating production units (FPU), devoted to the extraction of oil and gas. The Marlim field is spread out be-



(Photo Wuchang Shipbuilding)

tween depths of 640 to 2,590m (2,100 to 8,500 ft.), with the separation system itself located at the 900m mark (2,950 ft). This is the first system worldwide to include deepwater subsea separation of heavy oil and water, with sand removal systems and reinjection of water to boost production in this mature field. The separation system also includes cyclone modules that will perform water treatment before re-injecting the water back into the reservoir. The separated gas is added back to the oil stream to aid its lifting to the FPU, while the separated water is pumped back into the reservoir to further increase production. FMC supplied the subsea separation and pumping system, utilizing a novel pipe separator design, licensed and developed in cooperation with Statoil. The system is being engineered by FMC's operations in Brazil, Norway and the Netherlands with final manufacturing and integration activities per-

formed at the company's Rio de Janeiro facility. For this project FMC is responsible for the offshore commissioning and for technically assisting in the installation. "Marlim is the fifth field in the world that will utilize FMC's subsea separation technologies," said Tore Halvorsen,. "The project will enable a broader application of our separation technologies for future subsea processing opportunities."

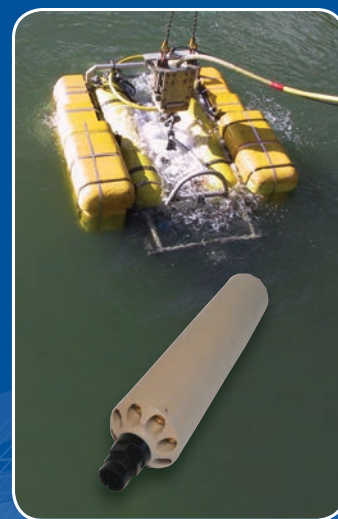
Subsea 7

Subsea 7 is another major Petrobras partner in subsea engineering and construction projects. Only this year Subsea 7 has been awarded a \$350m, five-year contract for a pipe-laying vessel. The contract covers the operation of Kommandor 3000, a 118 m PLSV with a top tension capacity of 15 tons, two work class ROVs, two 30 ton cranes and three carousels for flexible pipes. The PLSV is capable of



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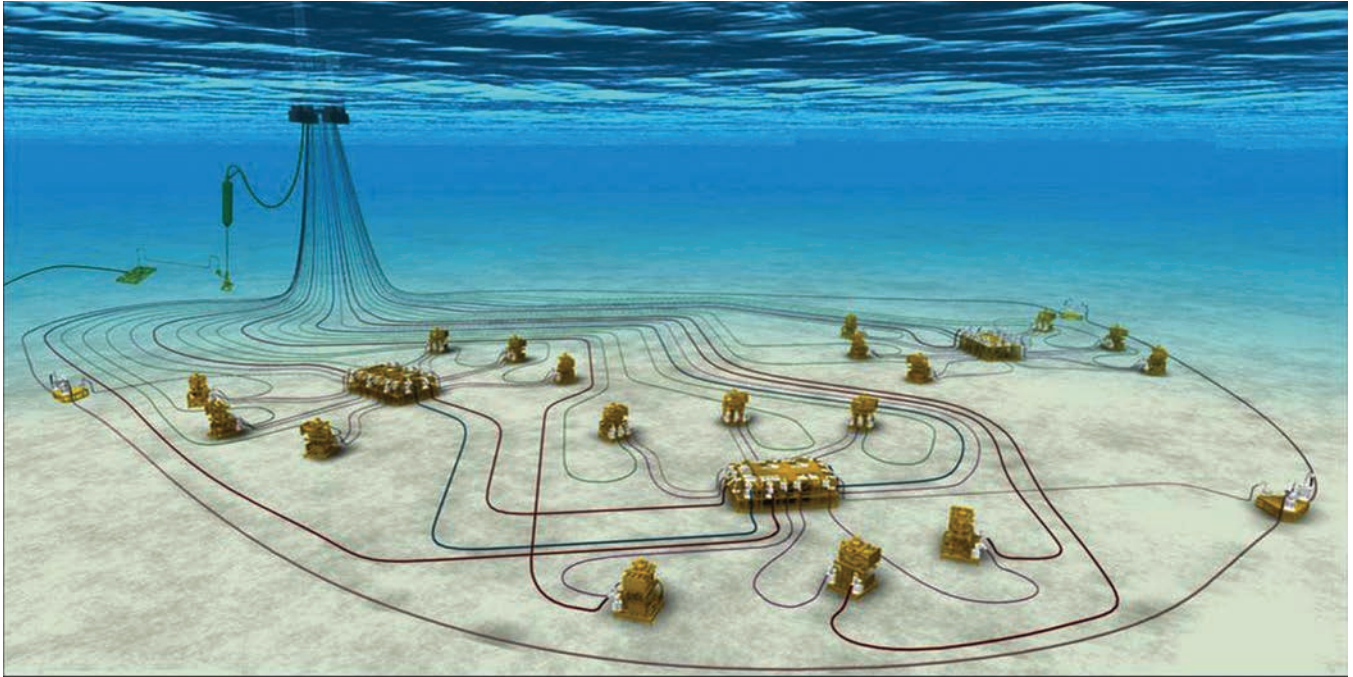


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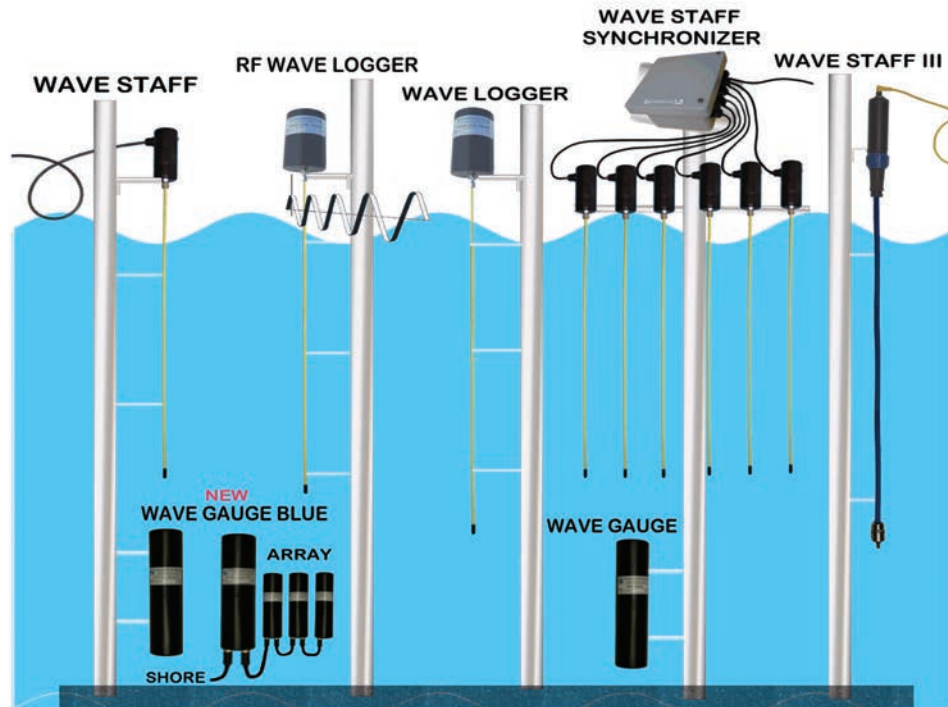
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installing flexible lines, umbilicals and equipment to a depth of 2,000m and will start work under the contract this year. Victor Bomfim, Subsea 7's Senior Vice President for Brazil, said "Subsea 7 has one of the most advanced vessel fleets in the world for subsea engineering and construction, and we look forward to supporting Petrobras in future developments." Another important Subsea 7 project is the seabed-to-surface Guar-Lula NE project. Guar and Lula are part of the large pre-salt discoveries made by Petrobras in the Santos Basin, Brazil in ultradeep water depths of beyond 2,100m, 300km from shore. The Guar-Lula NE project is a US\$ 1billion contract awarded to Subsea 7 in 2011 by Petrobras and to date is the largest EPIC-SURF contract awarded in Brazil. The project scope includes the subsea engineering and the subsea installation of four decoupled riser systems featuring large submerged buoys supporting 27 steel catenary risers. The engineering and project management work is ongoing at Subsea 7's offices in Rio de Janeiro. The SCRs are being reel-laid by the Seven Oceans vessel and hooked-up to the subsea buoys. The production and water injection lines are constructed predominantly from Mechanical Lined Pipe (BUTTING BuBi). This is a result of a joint development programme by Subsea 7 and BUTTING, with Petrobras participation. Offshore installation commenced during the second half of 2012, using Seven Oceans, Acergy Polaris and Skandi Seven.

The system includes:

- 4 submerged buoys each weighing about 2,000 tonnes to be installed approximately 250 meters deep, buoy foundations and associated tethers
- 27 steel catenary risers of 3.9km
- 21 x associated pipeline end terminations (PLETs) of which 18
- 7.5-inch production lines, three 9.5-inch water injection lines and six 8-inch gas injection lines
- 27 x anchor suction piles
- 4 x monitoring systems for buoys and

SCRs

On October 21 Subsea 7 was awarded two new contracts with a combined value in excess of \$600 million from Petrobras, for operation of the PLSVs Seven Mar and Seven Condor on a day rate basis for approximately three years,

with operations starting toward the end of 2013 for Seven Mar and in the third quarter of 2014 for Seven Condor. Both vessels have operated for Petrobras for several years and are currently under contract with the national operator. The work scope of the contract is similar to

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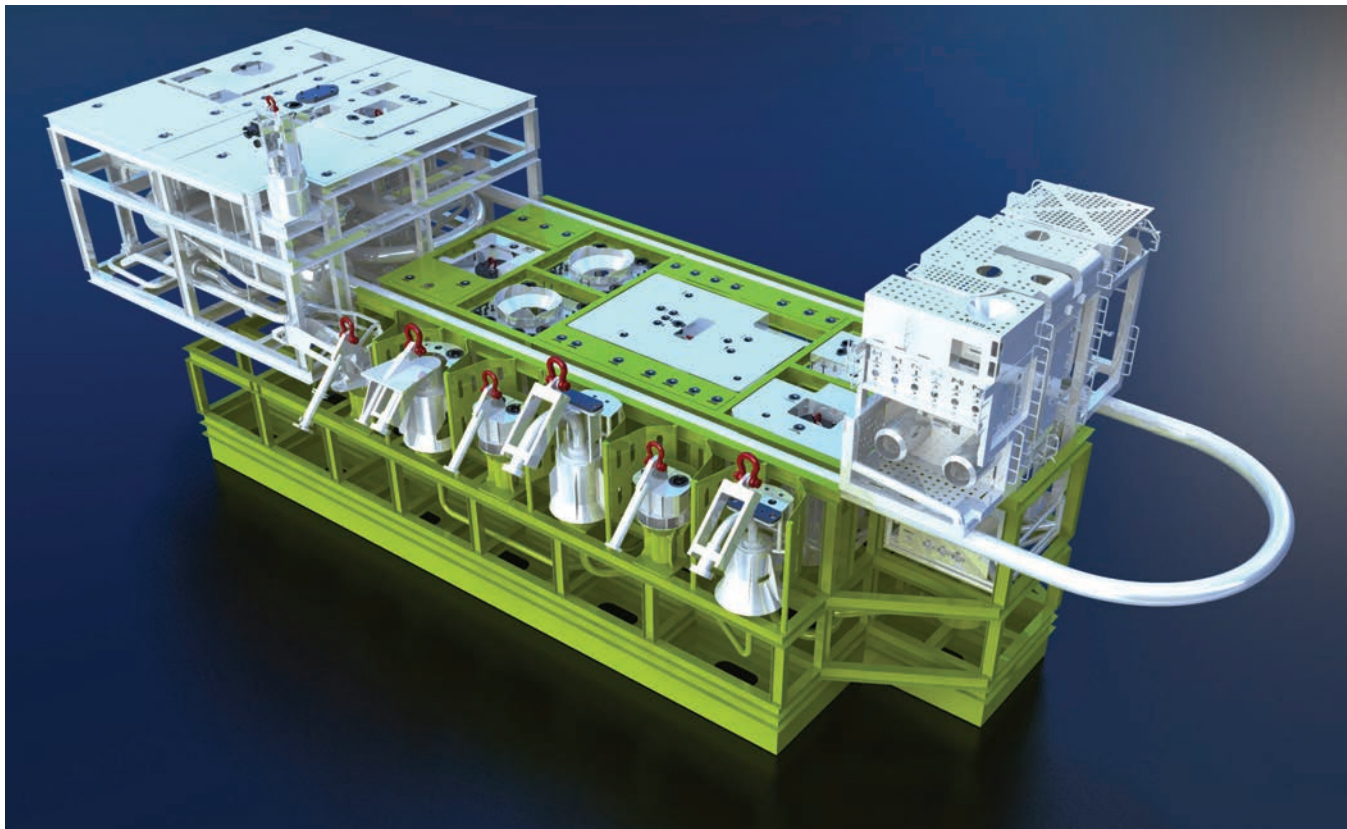
that of other PLSVs which Subsea 7 currently operates offshore Brazil, comprising project management, engineering and installation of flowlines, umbilicals and equipment supplied by Petrobras. "Following on from the renewal of contracts for the K3000, Seven Phoenix and Normand Seven, the renewal of contracts for Seven Mar and Seven Condor further strengthens our presence in the day-rate PLSV business segment in Brazil," said Victor Bomfim, Senior Vice President for Brazil.

Over the years Petrobras has installed an expressive amount of subsea equipment and underwater pipelines up to 3000m deep. In many cases it is impossible to inspect them with intrusive techniques, and the need of advanced underwater in-service inspection tools and self-monitored equipment has become imperative. The CENPES, Petrobras' Research Center is focused on advancing inspection and monitoring technologies to face these challenges, leading a project which main goal is provide reliable and practical solutions applied to SURF components inspection (subsea structures, Xmas trees, umbilicals, control systems and subsea piping). Many tools are being developed locally and show how much subsea engineering has developed in Brazil in the last 10 years. CENPES is also working on developing new and more efficient systems,

methods and procedures for deepwater subsea construction, with a eye at increasing subsea construction efficiency for the many deepwater pre-salt development set to take off in the coming years, including the recently auctioned Libra pre-salt field, which is expected to require something to the tune of 60 to 90 support vessel, many of which will be exclusively used for subsea construction efforts. "Development of subsea systems and equipment, new or optimized, are vital to produce in deep and ultra-deep waters, pursuant to concepts of compact subsea oil, water and gas separation, re-injection of produced water into the seabed, gas-lift technology enhancement, subsea gas compression, oil boosting from the seabed, and a new generation of submersible electric pumps," said Marcos Isaac Assayag, Director of the CENPES Research Center.

Petrobras is looking to improve its the pre-salt production systems and reserve recovery factor by intensive use of compact subsea solutions, injection systems, and by improving the capacity of new pre-salt FPSO units. In order to do this Petrobras and partners are constantly working on the development of subsea systems and equipment, new or optimized, to produce in deep and ultra-deep waters, experimenting concepts of compact subsea oil, water and gas separation, reinjection of produced water into the seabed, gas-lift technology enhance-

FMC built subsea separator used at the Marlim field-image FMC Technologies.



(Photo: FMC Technologies)

ment, subsea gas compression, oil boosting from the seabed and a new generation of submersible electric pumps. "One of the new technologies related to subsea engineering comprises the new flexible riser top connector for use in deep and ultra-deep waters features an innovative design that allows the pipe to be anchored onto the connector without traction reinforcement bending. This improves traction reinforcement structural performance, enabling greater fatigue resistance of the risers' system. The connector concept was developed and patented by Petrobras and engineered by the Federal University of Rio Grande do Sul(UFRGS). A prototype was assembled on a flexible line sample and passed the initial tests. Fatigue performance tests are currently in progress at UFRGS. Once the technology has been confirmed by the qualification tests, Petrobras may license the connector to the traditional suppliers in the area," said Assayag.

The Steel Lazy Wave Riser

Another interesting Petrobras development in subsea engineering is the Steel Lazy Wave Riser (SLWR) setup, which has optimized the cost of the Sapinhoá Norte riser collection system. The technology enables the use of steel risers connected directly to an FPSO. This riser system includes the use of floats in mid-water so as to afford a geometry that will provide the steel tube resistance to fatigue during the life of the project. Petrobras undertook extensive optimization studies on the system's structural configuration for the Santos Basin scenario, which enabled the choice of the SLWR for Sapinhoá Norte. The study allowed for the minimization of pipes with metallurgical clad in the production risers; that could be substituted in 70% of the length of the risers, for mechanical clad ones, which are less expensive and more readily available on the market. This will be the first SLWR connected to an FPSO anchored by spread mooring system, and the first in the Santos Basin pre-salt region. This will be the fourth system in the world to use the SLWR, after the Bonga Field, in Nigeria, the Parque das Conchas (BC-10), in the Espírito Santo Basin, and the Stones Field, in the Gulf of Mexico (still under development). However, Petrobras is reportedly having a frustrating time installing these riser-buoys, which are considered to be key equipment to increase production at the Sapinhoá and Lula Northeast plays. The project includes four submerged riser buoys, each weighing around 2,000 tons, hooked up in pairs to two FPSOs. "We have faced serious problems in the installation of the first of these two systems and this has caused long delays. The reason for this includes susceptibility that the installation vessel (Seven Polaris) has shown to maritime conditions," said Formigli.

He also explained that the first buoy is still held by temporary tethers but installation is expected to move forward in November, as maritime conditions in the South Atlantic become more agreeable with the onset of summer. The first pair of riser buoys are expected to start producing by the end of January, several months after the original deadline.

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Monitor Performance

Louise Ledgard, Head of Oil & Gas Business Development, BMT Group

Recent severe storms in the U.K. North Sea have resulted in a number of floating production, storage and offloading vessels (FPSOs) being shut down in order to assess and repair the damage caused. Notwithstanding the possible safety implications for operations crew, oil and gas majors are facing weeks, if not months without a critical asset which in turn, is having a significant impact on future production.

The design and operation of an FPSO in remote locations requires detailed information on the structural response of the vessel within the local environment offshore. Monitoring of critical components including the risers, hull and mooring lines simultaneously with the local environmental forcing of waves, wind and currents at the site location, provides a valu-

able insight into the performance and possible extension of the integrity life of the asset.

Louise Ledgard, Head of Oil and Gas Business Development at BMT Group, explains that as new technology is introduced, riser design becomes more sophisticated and extension of design life is required, it becomes increasingly important to monitor an asset's performance to assist with operational decisions, forensic investigation of marine incidents and the evaluation of design codes.

Over the last few years, an increase in the number of offshore incidents¹ related to FPSOs in the North Sea during extreme storm conditions has resulted in focused attention on the verification of design codes and a review of inspection procedures. With an average mooring failure projected at 8.8 years

Effective monitoring in the offshore environment is increasingly critical to efficient operations.



for an FPSO in the North Sea² and the consequential damage this could have on the riser, a number of Joint Industry Partnership (JIP) initiatives have concluded that the management and audit of the FPSO integrity is required. Furthermore, indicative costs resulting in the remediation activities required for a single mooring line alone have been estimated at \$3.2m for a North Sea FPSO and many companies believe that insurance premiums are likely to rise due to the number of claims now being made.

As an attractive and flexible option which eliminates the need to lay expensive long-distance pipelines, the number of FPSOs being put into service in remote locations is rising. As such, the complexities of understanding the performance of the vessel in given sea-states and the interaction of the FPSO with the subsea infrastructure, becomes imperative.

Marine monitoring systems have primarily been used to provide real-time information for operational support during production with typical examples of its use being: vessel position (particularly in storm conditions); information on the metocean conditions during operation; production riser tension, buoyancy and stroke and mooring line tension for failure detection.

Furthermore, monitoring systems provide information to verify the design of the asset and provide input into fatigue calculations for mooring lines and risers. Currently, finite mathematical modeling is carried out when designing the riser configuration for the FPSO, but what is often lacking is the robust data to validate the actual local environmental conditions. Feeding this data into the design process can help to validate the accuracy of the modeling tools being used and reduce uncertainty.

The standard sensors and parameters that should be measured within the system include:

- **Meteorological** – the monitoring of the meteorological conditions offshore is critical to ensuring the safe operation

of the asset. In 1981, the Civil Aviation Authority (CAA) and the Helideck Certification Agency (HCA) introduced the CAP 437 standard for the U.K. Continental Shelf and currently recommends that meteorological parameters and motion of the helideck are measured for an FPSO. Such parameters provide critical operational information which is sent back to shore so that companies planning any crew changes or helicopter operations are fully aware of the weather status on the vessel before dispatch. Safety of employees is of the upmost importance, therefore companies want to ensure safe take-off and landing conditions

- **Wave monitoring** – wave induced loads are the main source of fatigue for FPSO design and wave height is a significant factor to consider for the design of the risers, as well as assessment of mooring fatigue life and hull integrity. Recording the extreme events in storm conditions also provides valuable input



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to the marine forensic investigation of any offshore incident

- **Ocean current** – Surface currents can impact on any offloading operations from the FPSO to the shuttle tankers and influence the response of the risers and moorings, resulting in fatigue loads

- **Position and attitude** – measurement of the position of the FPSO is essential in storm periods to understand the vessel response to environmental forcing and the coupling of the resultant fatigue on risers and mooring lines. The position of the vessel is also critical in the assessment of any marine incident

- **Riser monitoring** - a detailed understanding of the environmental forcing to the FPSO combined with the riser response can aid the design process and provide the input to fatigue calculations.

- **Hull monitoring** – stress induced in the deck and hull of an FPSO can be monitored using a series of long base strain gauges positioned in strategic locations on the deck and flare tower. In addition, pressure sensors installed in the hull provide information on the vertical acceleration of the FPSO

- **Mooring line** – monitoring the mooring line is challenging and there is a scarcity of long-term in-situ observed data sets for mooring line tension. For forensic engineering and validation of design codes, it is essential that mooring line tension is collected simultaneously with metocean parameters on a common time base.

Each of the components mentioned above are likely to involve a number of third party suppliers, therefore the challenge that oil and gas majors are faced with is ensuring they all integrate into one effective monitoring system, to provide a holistic approach and support the assets' integrity management program. Correct placement of the sensors on board the FPSO and full integration of the data within a common time base is vital. By carefully setting up the sensor clocks and sampling frequency during the installation of sensors at strategic locations on the FPSO, companies can use the resultant data set to effectively study the coupled response of the vessel with the environmental and resultant dynamic loading on the risers and mooring lines to study fatigue.

Monitoring of all the different parameters within this common time base can also assist with forensic investigations of marine incidents.

For example, companies want to be able to match the time

ADCP Deployment

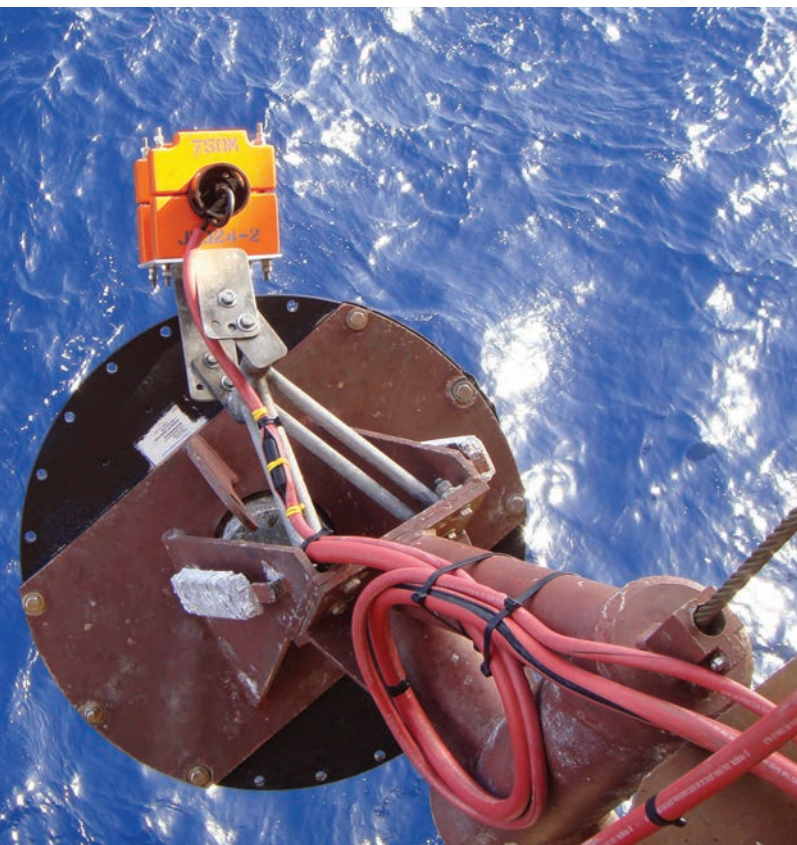


the mooring line broke with the highest wave that hit the FPSO. If the clocks on the mooring sensor are different to that of the wave sensor, forensic engineers will not necessarily marry the two together. Instead of working in isolation, the different parameters must be fully integrated to allow the root cause of the incident to be clearly identified.

Significant advances in technology over the last decade have meant that oil and gas majors can monitor the effect the local environmental conditions have on their critical infrastructure offshore.

Sophisticated sensors on board an FPSO can provide real time information for operational support and provide valuable input into studies on the performance of the FPSO in varying sea states.

However, to be fully effective oil and gas companies must look at the monitoring of their critical assets holistically with the end user taking an active role in the planning and implementation of an integrated marine monitoring system. It is vital that data is archived and stored in a common portal to allow engineers and operational teams to make the most of this valuable information. Only then can they feel confident that the system is indeed, fit for purpose and the risks of lost production due to repair or worse, a lengthy shut-down, are minimized.



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For Wave Hub, Coastline Surveys Completes

Submarine Asset Survey

Wave Hub is a grid-connected offshore facility in South West England for the large scale testing of technologies that generate electricity from the power of the waves. It is about 10 nm offshore and is designed to help companies developing new wave energy devices. The U.K. has some of the largest wave and tidal energy resources in Europe which in the right circumstances could generate up to 1/6 of the U.K.'s electricity consumption. Coastline Surveys won the contract to carry out the submarine asset survey including Multi beam bathymetry and side scan sonar, ROV Visual inspection and Cable Burial surveys. Additional Geotechnical investigations were undertaken in test berth four to assess the seabed nature for future anchoring of proposed test devices. The surveys for this renewable energy site were successfully completed in July and August 2013.

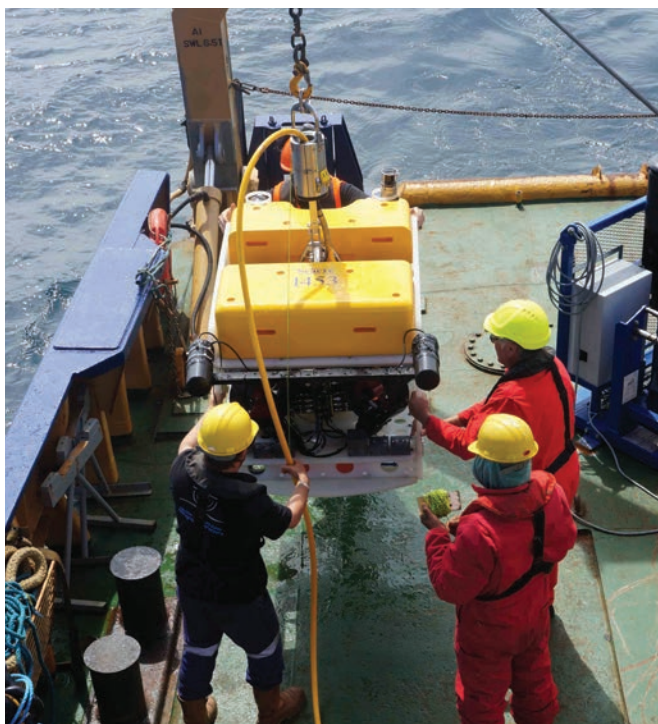
The MV FlatHolm, Coastlines' 24m fully equipped survey vessel was deployed from its base in Lowestoft and stationed in Newlyn harbor for the duration of the contract along with its fulltime crew and an in-house team of specialist hydrographic surveyors and geophysicists.

The scope of work included a complete bathymetric survey of the entire cable route to establish seabed and asset conditions. This was carried out with the high resolution R2Sonic

2024 Multi Beam Echo sounder together with a Klein 4200 dual frequency Side Scan Sonar. A Cable Burial survey was carried out on the inshore 8km of the cable. The cable Burial survey was completed with an Innovatum Smartrak cable detection system following a tone applied to the cable. The Smartrak system was mounted on a Cougar XT ROV which was also used for the Video inspection element of the works. Surface positioning was provided by a C-NAV 3050 GNSS System and subsurface was provided by a Nexus Easytrak USBL system. A combination of QPS QINSy, Fledermaus, EIVA Navipac and Innovatum software was used for acquiring and processing the survey.

The project was split into three phases to make the most of the MV FlatHolm's unique capabilities to carry out all three elements of the scope of works. The Geotechnical investigation was carried out first – comprising Vibrocores at each of the proposed anchor locations in Berth 4. The vessel was then switched to Geophysical mode to complete phase 2 - the full cable length bathymetric survey. Phase 3 comprised the ROV operations including the Visual and Cable Burial surveys.

The biggest challenge to the project was the strong tidal streams on the site which restricted the window of operations for the ROV work. Using the more powerful Cougar XT was a benefit in being able to extend the window of operations.



G&D's KVM Applied on Van Oord Pipelay Vessel

Dutch Van Oord's first shallow water pipe lay vessel's infrastructure holds KVM hardware from German Guntermann & Drunck. KVM provides surveyor and chief officer in charge with the computer applications required for the process of laying pipes. A broad range of all sorts of equipment from cranes to welding stations, even a gym and accommodation for up to 300 people is what the Stingray crew calls home. The barge itself and its standard equipment were built in China, but was later tailored and converted by Van Oord who adjusted it to their individual needs of a shallow water pipe lay vessel. The Stingray is designed in accordance with the quality and safety standards in the oil and gas industry and equipped with state-of-the-art machinery to install pipelines from 6-60 inches in diameter. The interior of the vessel looks like a mass production site of motor vehicles. It's a huge factory on sea.

AUV-based Sonar Assists GLRC Pipeline Survey

Ensuring the location and integrity of a subsea pipelines is important for the environment, the community and the operators of the asset, and the addition of high resolution and high quality sonars on smaller AUVs, these pipeline inspections can occur more readily and cover areas that can sometimes be a challenge to ship-based sonars alone. While recognized, this solution is not common, but the Great Lakes Research Center may help to change that.

While side scan sonar and multibeam bathymetry information has been, and is still, collected by ships using towed sonar or hull mounted systems, the ad-

dition of ultra-high resolution sonar and bathymetry on small AUV platforms opens up an even wider and more complete survey in many cases. In some instances ships surveys can be limited because of the location of the underwater pipeline. Surveying in busy ports, harbors and channels can be troublesome. Other times ship size can limit potential survey areas, neglecting either too deep or too shallow water due to ship draft, weather or equipment constraints.

Recently the Great Lakes Research Center (GLRC) at Michigan Technological University, deployed an Ocean-Server Iver AUV with an EdgeTech

2205 combined Side Scan Sonar and Bathymetry system with the goal of imaging an underwater pipeline. Side scan sonar and bathymetry images were used to check the location and integrity of the pipeline over a long and varied terrain. Using side scan sonar co-registered with bathymetry the team was able to view intricate details about the pipeline and the bottom topography, helping accomplish the mission.

With the recent addition of the Ocean-Server Iver AUV outfitted with an EdgeTech 2205 high resolution AUV-based sonar the GLRC has expanded its capabilities once again.

Exocetus Sets New Shallow Water Record

The Exocetus Coastal Glider (CG), a new oceanographic underwater glider that was developed to operate in coastal waters at depths as shallow as 10m, has been successfully tested in coastal waters shallower than 5m, said Dr. Joe Imlach, CEO/CTO of Exocetus Development LLC. The glider is designed for environmental monitoring in coastal waters with currents in excess of 1m/s and can operate in waters with large density variations due to the Exocetus patented adaptive ballasting control system. With the support of the University of Southern Mississippi [USM] staff at the Stennis Space Center, glider tests were conducted in the Pearl River on November 20, 2013, where water depths vary from 1 to 5 m. The Glider operated in both upstream and downstream water conditions, and was able to complete 180 degree turns in waters as shallow as 3 m, surpassing previous demonstrations of the product. When weather conditions improve in the Gulf of Mexico at the beginning of 2014, the hypoxia sensors on the Exocetus Glider will be further tested by USM staff. The hypoxia sensors include a WetLabs ECO FLNTU with a turbidity and fluorescence sensors; and a RINKO dissolved oxygen sensor.



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UI 2014 Technology Preview

If you plan visit Underwater Intervention 2014, February 11-13 in New Orleans, don't miss these exhibitors and the new tech on display.



Amron International, Inc.

The Amron 8330i Air Control is the newest member of Amron International's line of air controls and is compliant with the International Marine Contractors Association (IMCA).

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DeepSea Power & Light

DeepSea Power & Light announce the HD Multi-SeaCam camera, its first high definition video camera. Derived from the Multi-SeaCam camera, this general purpose camera has been widely used for more than 16 years in offshore oil, oceanographic, academic, and military applications around the world. Deep-Sea is proud to extend the legacy of the Multi-SeaCam family of cameras with the availability of true full HD video capabilities. The new HD Multi-SeaCam video camera builds on the same rugged design as the original, with a 6000m

UI 2014 Exhibitors

Company	Booth	Company	Booth	Company	Booth	Company	Booth
ABTEL, Teledyne Impulse, Venturetec, Xeos	732	Deep Trekker	407	Javeler Marine Services LLC	802	ROVSCO, Inc.	201
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AK Industries	819	Demonstration Tank	139, 141, 236, 238, 240, 137	Light and Motion	245	SEACON Brantner and Assoc, Inc.	705
Alpha Rentals, LLC	400	Denso North America	401	LinkQuest Inc.	905	Seamar Divers International	317
American Diving Supply	101	Digital Edge Subsea Ltd	829	MacArtney Inc.	320	SeaTrepid International, LLC	812
Amron International	110	DiveLab	104	MacTech Offshore	335	Seatronics	117
Ansell Protective Solutions Inc.	818	Divers Supply, Inc.	801	Marine Magnetics	931	SeeByte	925
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Aqua-Air Industries, Inc.	305	DYNACON, Inc.	601	Marine Technology Society	328	Sound Metric	711
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Atlantic Diving Equipment	728	Falmat Cable	301	Moog/Focal Technologies	211	Submersible Systems, Inc.	422
Author Booth - Meet the Author	105	Fisk Marine Insurance International, LLC	822	Morgan City Rentals	311	Subsalve USA	341, 343, 440, 442
AXSUB, Inc	623	Five Star Marine, Inc.	336	National Hyperbaric Centre	126	Subsea Technologies	411
Bauer Compressors, Inc.	420	Fluke Networks	927	NCS Subsea	237, 239	Surface Supplied	109, 107
Bay-Tech Industries, Inc.	609	Fugro Chance	633	Nuvair	217	Survey Equipment Services	726
BIRNS, Inc.	809	Germanischer Lloyd USA, Inc.	830	Ocean Reef	318	Synthetex, LLC	806
Bisso Marine	731	GF-Industrial / Latalco	321	Ocean Server Technology	933	Teledyne Blueview, Inc.	717
Blackwater Vision	911	Global Diving and Salvage	811	Ocean Technology Systems	506	Teledyne Marine Systems	722
Broco, Inc.	901	Global Dynamix, Inc.	913	Oceaneering International	306	Tetis Group	910
Cal-Dive International	210	Greensea Systems, Inc.	118	Oceanwide Safety at Sea	228	The Pipeline Development Company (PLIDCO)	738
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CM Lab Simulations	127	Innerspace Corporation	432	Penn State Applied Research Lab	106	Variators Webtool	133
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CompAir - Gardner Denver	536	International Special Risks	909	Praxair Distribution, Inc.	824	Wach's Subsea	230
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Cygnus Instruments, Inc.	730	J W Fishers	627, 629	Redfish Rentals	537		
Deep Ocean Engineering, Inc.	543, 541			Remote Ocean Systems	701		



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Deepwater Corrosion Services,

The Polatrak Deep-C-Meter 3000 AD cathodic protection survey system is designed for rugged service on work-class ROVs down to 3,000m (10,000 ft.). The new 316 SS pressure housing combines ROV-II and Polatrak EFG readouts into a single, smaller housing that can be conveniently mounted anywhere on the ROV. New programmable, ultra-bright LED displays have brightness adjustments, and the 3000 AD features RS-232 (standard ASCII string) digital data output. Also, the unit is ROV 24V DC-powered, so there are no batteries to change. The kit includes an ROV II probe, an articulated mount and standard replacement parts.

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SEA CON

Leighton Mauro (pictured) of SEA CON's Gulf Coast Sales office will be one of the speakers at the forthcoming Underwater Intervention conference and exhibition being held in New Orleans, Louisiana. Leighton will be presenting a paper titled 'Meeting the Connectorization needs of HD Cameras and other High Bandwidth Systems.'

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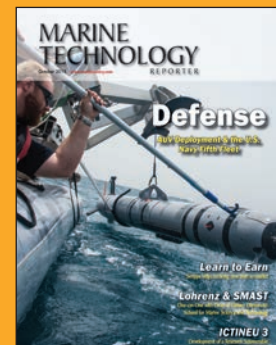
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Marine Technology Reporter

Stop by booth #219 for a copy of the latest edition of Marine Technology Reporter, the largest circulation b2b publication serving the subsea space.



November/December 2013

Fratantoni



Horizon Marine Expands its Team

Horizon Marine, Inc., provider of operational ocean current analysis and forecasting, announced the addition of David Fratantoni as Chief Technology Officer, Ryan Carlson as Technical Support Specialist, and the promotion of Marine Technician Joseph Bertrand to HSE Compliance Officer.

Dr. Fratantoni joins Horizon Marine after 17 years with the Woods Hole Oceanographic Institution (WHOI). As a tenured member of the WHOI scientific staff, founder and principal investigator of the Autonomous Systems Laboratory, Dr. Fratantoni contributed to the development and novel application of underwater gliders and conduct-

Carlson



ed pioneering research on eddies in the western Atlantic and Indian Oceans. He earned his B.S. in Ocean Engineering from Virginia Tech and a Ph.D. in Physical Oceanography from the University of Miami.

Chouest Appoints Fox to Lead Alaska Ops

The Edison Chouest Offshore group of companies (ECO) announced the appointment of Rick Fox as senior vice president and general manager of Alaska operations. Fox will be responsible for leading all ECO vessel activities in the Arctic, as well as overseeing the operation of Chouest affiliates Fairweather, LLC, Deadhorse Aviation Center, Tulugaq, LLC and VDOS, LLC.

Bertrand



Nautronix Strengthens Sales Team

Nautronix, announced three new appointments within its sales team. Bob Barrett joins Nautronix as Sales Manager at the company's global headquarters in Aberdeen. He will be responsible for developing awareness and understanding of all Nautronix products including NASNet positioning technology. Prior to joining Nautronix, Bob gained his experience in sales through previous positions within the aerospace and oil and gas industry.

They also have appointed Ashley Anderson and Scott Williams in the role of Sales Engineer and they will both embark on Nautronix' sales training program.

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NOAA Seeks Advisory Council Applicants

NOAA's Stellwagen Bank National Marine Sanctuary is seeking applicants for four seats on its advisory council. The council ensures public participation in sanctuary management and provides advice to the sanctuary superintendent.

"Each of the members brings a unique perspective to the council based on their experience in the New England area," said Craig MacDonald, sanctuary superintendent. "Since its establishment, the council has played a vital role in advising the sanctuary and NOAA on critical issues. We are very pleased that council members offer their considerable talents to help us manage the resources of Stellwagen Bank National Marine Sanctuary." The sanctuary is accepting applications for the following seats: recreational fishing (alternate), business/industry (alternate); youth (primary and alternate).

Candidates are selected based on their expertise and experience in relation to the seat for which they are applying, community and professional affiliations, and views regarding the protection and management of marine resources. Applicants who are chosen as members should expect to serve a three-year term.

The advisory council consists of 36 primary and alternate members representing a variety of public interest groups.

Applications are due by December 31. To receive an application kit or for further information please contact Elizabeth Stokes via email at Elizabeth.Stokes@noaa.gov; by phone at 781-545-8026 x201; or by mail at 175 Edward Foster Road, Scituate, MA 02066. Application kits can also be downloaded from the sanctuary's website at

<http://stellwagen.noaa.gov>

Fox



Geodis Wilson Appoints Geiken

Geodis Wilson said it plans to continue growing its Middle East network and has announced the appointment of Sascha Geiken as new Cluster Managing Director for the Middle East region. Geiken joined Geodis Wilson in 2009 as Managing Director of Geodis Wilson United Arab Emirates. In his new position as Cluster Managing Director, he will be responsible UAE, Qatar, Saudi Arabia and Bahrain.

L-3 Klein Promotes Cobis

L-3 Klein Associates promoted Frank Cobis to vice president and general manager, replacing John Cotumaccio, who has retired from L-3 Klein after seven years of service. "Frank has a strong background in program execution, engineering and operational management, along with outstanding customer focus and comprehensive knowledge of the marine technology marketplace," said John Fox, president of L-3 Ocean Systems. "With more than 30 years of experience in the marine electronics industry, he is well-positioned to lead L-3 Klein's continued business growth into the future."

Cobis most recently served as the vice president of programs for L-3 Klein, managing numerous navigation, mari-

Barrett



time security and sonar projects for both domestic and international customers.

OceanGate Names McCurdy COO

OceanGate Inc. (OGI), a global provider of deep-sea manned submersible solutions, named Neil McCurdy as chief operating officer (COO), responsible for administering OceanGate's corporate strategy and coordinating operations and sales programs to reduce costs and increase profitability.

FairfieldNodal Promotes Two

FairfieldNodal announced two promotions within the company: Roger Keyte is the company's new senior advisor to the CEO, and Morgan Gilmore has been promoted to sales manager for the data licensing division. Keyte is now the firm's senior advisor to the CEO. Keyte joined FairfieldNodal in 2009 as the director of marketing and strategy after serving as president of RFTTrax, a subsidiary. Bilmore is now responsible for development of the company's current Permian Basin program and expansion into emerging and existing plays throughout the Lower 48, as well as marketing FairfieldNodal's existing 3D seismic land data. She handles the Denver, Midland, Tulsa, Oklahoma City, Dallas/Fort Worth and Houston areas.

Anderson



Williams



Geiken



The 2H Management Team



New Management in Muir Matheson

Miros AS, a producer of oceanographic remote sensing equipment and advanced Met Ocean systems, acquired Aberdeen based Muir Matheson Ltd. on November 1, 2012 to strengthen the company's presence in the oil and gas Market. Muir Matheson has supplied meteorological and oceanographic monitoring systems to the oil and gas and aviation industries for more than 30 years. A change in leadership of Muir Matheson has now taken place to enhance the integration process with Miros. David McMillan has replaced the former Managing Director, Andrew Stead, after a short interim period where the position was held by Sturla Maehre from Miros. Maehre has now taken the position as Chairman of the Board of Muir Matheson.

2H Offshore's Brazil Adds Viana, Alvim

2H Offshore, an Acteon company, has appointed Pedro Viana and Roberto Alvim as the technical managers of its Rio de Janeiro, Brazil office to strengthen its management team and drive business growth. Viana was the first engineer hired when 2H Offshore's Brazil office opened in 2003. He has participated directly in the development of the office since its inception, and has supported both the technical and management activities of the company. Viana has experience in a range of conceptual, front-end-engineering design (FEED), detailed design and monitoring projects for many types of riser systems and complexities, and in different 2H Offshore offices around the world. His key project roles have included being the

lead systems and lead analysis engineer for the Petrobras Guar-Lula NE buoyancy-supported riser project from early pre-FEED engineering studies through to the completion of the final detailed design.

Alvim joined 2H Offshore with six years' experience in equipment design for the offshore industry. He graduated with a master's degree in mechanical engineering from Pontifcia Universidade Catlica do Rio de Janeiro in 2005. Alvim was the second engineer 2H Offshore hired in Brazil and, like Viana, has been an integral part of the growth of the Rio de Janeiro office. Alvim has worked on several analysis projects, including drilling, completion and production risers systems.



From Left: Sturla Maehre, David McMillan, Andrew Stead.

Cobis



BIRNS Appoints Hager

BIRNS, Inc. appointed Jeff Hager as its new Mechanical Design Engineer. Hager was recruited to focus on the design and development of the company's wide range of innovative connector systems. Hager holds U.S. patents for eight complex connector products for applications ranging from the NASA space station and the Hubble telescope to missiles and naval surface ships. An industry veteran, he brings more than 30 years of experience to the table in advanced engineering principles, including Finite Element Analysis, MIL-STD and injection molding design.

McGillie Joins Global Diving & Salvage

Global Diving & Salvage hired Anita McGillie to lead the Human Resources Group as the Human Resources Manager. She will direct Global Diving's Human Resources Group in the development of HR policies and compliance, ongoing companywide recruitment efforts, spearhead the EEO and Diversity programs as well as administer Global's employee benefit programs.

MSRC Enters Contract with Ocean Imaging

The Marine Spill Response Corporation (MSRC) announced an exclusive con-

Hager



tract with Ocean Imaging Corporation for remote sensing capability. Ocean Imaging will provide its proprietary aerial surveillance technology as part of MSRC's overall strategy for enhancing the ability to tactically position response resources in the optimal areas of oil migration for responding to spills.

MSRC has developed a multi-tiered approach to remote sensing in order to complement and expand on traditional human aerial spotting. This approach is based on the concept that "height of eye" and "vertical viewing angle" are key to any surveillance. The technology provided by Ocean Imaging Corporation enables MSRC to significantly enhance its day and night aerial remote sensing through infrared/multi-spectral technology.

Acquisition Brings Bibby into Surveying

Bibby Ship Management Group Ltd., announced the acquisition of Murray Fenton (India) Surveyors Limited. The acquisition was made via Bibby Ship Management India Pvt. Ltd., and will see India's service offering expand into marine, cargo and offshore surveying including marine audit services. Operations will be based in Mumbai and Gujarat, with geographic expansion into other areas of India planned for the future. Bibby Ship Management welcomes Capt. Kapil Dev Bahl. With

McGillie



17 years at sea, including five years in command, followed by 25 years in marine surveying and ship vetting, Capt. Bahl brings a wealth of experience and knowledge to Bibby Ship Management. He joins Bibby as Director – Technical Services and will head Bibby's drive into this business.

Murray Fenton (India) offers a wide range of marine surveying services, including marine hull and ship condition assessment, cargo surveying and marine audit services.

The business brings with it a team of professional and experienced Master Mariners and Marine Engineers from the main fleet and offshore sectors, and is set to expand with the addition of a Naval Architect / Structural Engineer to the team.

Hydro Group: Most Successful Year

Hydro Group Plc, a global design and manufacturer of underwater cables and connectors for subsea, underwater, topside and onshore applications, has posted its 2012-13 (to year end March 31) results with more than a 12% rise in comparable turnover from \$10.3m to 11.6m and a 136% increase in operating profit from \$890k to \$2.1m

Doug Whyte, Hydro Group managing director, said, "2012-13 has been our most successful financial year to date. Investment in previous years in new

Kapil Dev Bahl



facilities, R&D, new equipment, processes and staff has all played a part in a strategic vision for long-term growth.”

SES Adds Applied Acoustics' CSP

Sonar Equipment Services of Great Yarmouth, U.K., added the new Applied Acoustics' CSP-N seismic power supply to its equipment pool. The 1,200 Joule reverse polarity unit selected by Sonar Equipment will operate a variety of Applied Acoustics' sound sources including the triple boomer plate S-Boom System, single plate boomers and the new long-life Dura-Spark 240.

Chevron Awards Aqueos Corp.

Aqueos Corp., a subsea services provider for the offshore O&G sectors of the Gulf of Mexico and the Pacific West Coast, won an award from Chevron Environmental Management Company (CEMC) that recognizes it for being the “Best in Class Performance” for 2013. Aqueos Corporation, with offices in Broussard, La. as well as Los Angeles and Ventura, Calif., provides marine construction and specialty subsea services including a complete range of commercial diving, remotely operated vehicles (ROV) and vessel-related services primarily to the offshore oil and gas markets.

Whyte



McDermott Orders DGI Subsea Actuators

DGI from the Netherlands won a contract from McDermott for delivery of a large number of shallow water subsea actuators for flooding systems with ROV override access for the Ichthys Gas Project. The Ichthys LNG project will be executed by McDermott for the EPC part (URF part) and Heerema for the Installation part, both on EPCI contract basis. Field location of the project is WA-285-P in the northern Browse Basin, about 200km north-west of Western Australia's Kimberley coast, at the western edge of the Timor Sea. The actuators DGI will supply for this project are required for temporary use during structure flooding or ballasting operation at water depths of 250 m.



Teledyne Acquires CDL

Teledyne Technologies said its subsidiary, Teledyne Limited, has acquired C.D. Limited (CDL). Headquartered in Aberdeen, Scotland, CDL is a supplier of subsea inertial navigation systems and motion sensors for a variety of marine applications. Terms of the transaction were not disclosed. The acquired business will operate under the name Teledyne CDL Limited.

Airmar Acquires Marport

Airmar Technology acquired substantially all of the assets of Marport Deep Sea Technologies' Commercial Fishing division, a developer of sonar technology. Airmar will also acquire the Marport name and the web domain as a part of the transaction. The terms of the acquisition have not been disclosed.

Channel Technologies Acquires H.C. Materials

An affiliate of Channel Technologies Group, LLC (CTG), a manufacturer of piezoelectric ceramics, transducers and complex sonar and navigation systems used in the defense, medical and energy industries, acquired the assets of H.C. Materials Inc. and its affiliates (collectively, HCM) from Dr. Pengdi Han. As part of the acquisition, Dr. Han will become an equity owner of CTG, as well as an active board member. Other terms of the transaction were not disclosed. CTG is a portfolio company of Blue Wolf Capital Fund II, L.P. The acquisition enables CTG to capitalize on HCM's global recognition and leadership in the piezoelectric single-crystal arena, especially within the medical ultrasound market. It also consolidates CTG's position as a global leader in the ceramic-based piezoelectric industry.



(Photo: Saab Seateye)

The Sea Owl can work in any orientation, including upside-down.

Sea Owl ROV

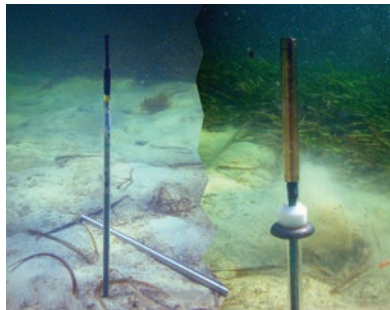
The Sea Owl concept introduced by Saab in the 1980s, has been completely reengineered with new chassis, advanced technology content and increased work capability. Now named Sea Owl XTi, the new design offers 360° orientation, allowing the ROV to work in any orientation, even upside-down. The result is a vehicle made for hard-to-reach places and hostile environments that combines the characteristics of a highly maneuverable observation vehicle with the versatility of a larger ROV. Key features: a doubling of the payload, extreme maneuverability courtesy of seven thrusters and a new depth rating to 2,000m.

www.seaeye.com

SediMeter with Integral Cleaner

Lindorm, Inc. in Miami is releasing two new SediMeter versions. The SediMeter measures a vertical turbidity profile through the bottom using an array of 36 OBSes, with 1 cm spacing. The bottom level is also estimated based on the collected data. The SediMeter was designed for studying erosion, sediment accumulation, siltation, scour and sediment transport on the bottom of the sea, lakes, reservoirs and streams. These new models are permanently sealed and use rechargeable batteries. They have an UW-pluggable connector in one end for battery charging and communication.

www.lindorm.com



MacArtney Updates MERMAC ROV Winches

MacArtney Group introduced the newly upgraded MERMAC R series of ROV winches. Featuring high power and speed, minimal maintenance requirements, a rugged and compact design, Active Heave Compensation (AHC) and a unique Remote Diagnostics Tool, the MERMAC R series promises to deliver cutting-edge winch solutions for ROV systems and tasks of all types, MacArtney said.

Employed for work class and inspection ROV systems alike, MERMAC R winches are available as standalone systems as part of launch and recovery packages or as part of complete vessel moon pool handling solutions.

www.macartney.com

Characterization of Hazardous Ocean Ice

There is an increasing need for fine scale detection and characterization of hazardous ice conditions in the Arctic. ASL Environmental Sciences Inc. has recently received funding from the Canadian Space Agency to address this need under the Earth Observation Applications Development Program. The project will develop improved techniques, tools and data products that will enhance the detection and characterization of hazardous ice conditions at fine scales, based on advanced beam modes of RADARSAT-2, and the unique capabilities of moored, upward looking sonar technology.

ASL's Ice Profiler along with Acoustic Doppler Current Profilers will provide validation data and opportunities for improvement in the analysis and interpretation of the SAR imagery. In effect, this project will combine the view of the ice canopy from below (Ice Profiler) with the view from above (RADARSAT-2 high resolution quad-polarized data), and generate enhanced ice information products. Using simulated data for Radarsat Constellation Mission compact polarimetry beam mode, the operational utility of such products will also be assessed.

LVDT Linear Position Sensors Survive Operation Underwater

To survive subsea environments, LVDT Linear Position Sensors must be housed in special alloys that support long-term operation in different elements. As a housing and core made from stainless steel will not survive well in many underwater applications, the LVDT casing must be composed of an alloy that provides chemical resistance to seawater and other corrosive acids to provide long-term reliable operations for many years. Reliability is of critically important due to the cost of replacing subsea hardware. Typically, either Inconel or Monel is used, depending upon ocean temperature and depth levels. In shallow warm waters, Monel is ideal as its metal composition resists sea life forming on it. In subsea applications with depths of 7,500 feet and external pressures surpassing 3,500 psi, Inconel offers excellent protection against corrosion due to higher content of nickel, chromium and molybdeumn. These superalloys enhance the already high-reliability of the LVDT assembly, ensuring that it can meet extended service life requirements, even if the device is fully exposed to seawater.

www.macrosensors.com



AQUALogger 210

Aquatec Group have recently supplied a significant number of their deep water AQUAlogger 210 data loggers for measurement of turbidity, temperature and depth. The loggers are being used by the RPS MetOcean team based in Perth, W. Australia, in support of the Tanzania Gas Project Metocean Survey for Statoil (Tanzania). The survey is to assist Statoil in developing a field in 2,600m of water, and consists of approximately 20 moorings at the site and along proposed pipeline routes.

Triton Subs

Triton Submarines (Triton) continued to promote its new four, six and eight passenger deep-diving submersibles at the 2013 Fort Lauderdale International Boat Show (FLIBS). Triton's booth at FLIBS featured a Triton 1000/2 (the same 1000/2 that made the first-ever manned submersible dives in Antarctica last year) as well as a scale model of a Triton 3300/3. Triton will also be promoting its new iPad application.

www.tritonsubs.com

Vectron Measures Tide Speeds

The Fundy Ocean Research Center for Energy (FORCE), in partnership with Nortek Scientific, announced the construction of what is touted as the world's first instrument to provide high-resolution, real time measurements of turbulent water flow at turbine hub height, called the Vectron. Vectron is designed to capture accurate measurements of turbulence at a specific height above the sea over long periods of time, beneficial to understanding turbine performance. The FORCE test site in the Bay of Fundy, Nova Scotia, offers unique challenges and opportunities: the tidal flow boasts 14 billion metric tons of water moving at speeds in excess of five meters per second.

"The Vectron represents a significant international achievement in science, engineering and collaboration – the first continual, reliable measurement of turbulence through the water column," said Eric Siegel, Innovation Director for Nortek Scientific. Vectron will be deployed on FORCE's Fundy Advanced Sensor Technology (FAST) platform. The FAST platform is a recoverable instrument platform designed to monitor and characterize the FORCE site. Using a variety of onboard sensing equipment, the platform enables operation and testing of multiple underwater sensing instruments; new instrument improvements for success in high flow environments; new Canadian expertise in site characterization, instrumentation and deployment methods; and new standards for high-flow monitoring – a "black box" prototype for all tidal turbines.

www.fundyforce.ca

Kraken Debuts

AquaPix MINSAS

Kraken Sonar Systems Inc. announced the development of AquaPix MINSAS, a next generation Miniature Interferometric Synthetic Aperture Sonar designed for operation to depths of 3,000m. The system integrates the latest electronics, transducer arrays and signal processing software and is optimized for the demanding size, weight, power and cost constraints of Autonomous Underwater Vehicles (AUV), Unmanned Surface Vehicles (USV) and high speed towfish platforms.

MINSAS uses a subset of Kraken's award-winning AquaPix INSAS transducer array, but has the addition of an innovative SAS gap filler transmitter that produces high resolution data in the nadir region. A lower frequency transmit element, unique to MINSAS, provides a SAS resolution gap fill directly under the platform. The transmitter and receiver elements are integrated into single monolithic arrays which are mounted close to the electronics module. The system also uses two rows of identical receiver elements to deliver precision bathymetry data.

The system will be provided in two configurations. MINSAS 60 uses a transducer array assembly that measures 60cm in length and is designed for AUVs with body diameters as small as 6 inches. MINSAS 120 uses a transducer array assembly that measures 120cm in length and is designed for larger AUVs as well as for high speed towfish operations. Both systems produce ultra-high resolution, real-time image quality with unparalleled sharpness. Advanced 3D motion compensation and beamforming technologies nullify blurring caused by platform motion.

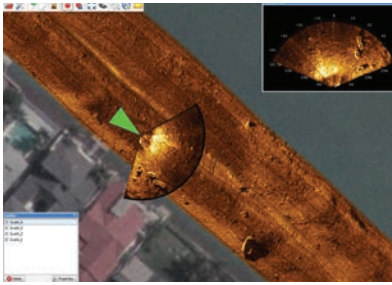
www.krakensonar.com



SeaLite Sphere LED Light

The SeaLite Sphere has evolved to offer field-serviceable connector replacement for a quick and easy repair in the field. The SeaLite Sphere advances beyond other LED lights by separating the connector from other internal electronic components to avoid downtime and costly repairs due to connector failures. The 8,700 psi pressure resistant compartment separates the connector and the rest of the light; which will make flooding due to a connector failure a thing of the past.

www.deepsea.com



Stand-Alone Mosaicking Module

Oceanic Imaging Consultants, Inc. (OIC), of Honolulu, Hawaii, introduced the first Stand-Alone Mosaicking Module (SAMM) for forward-look sonar (FLS). SAMM is a plug-and-play add-on to forward look sonar systems that automatically creates mosaics in real time from FLS data. SAMM's Data Acquisition Features Include: Stand-alone module, seamlessly compatible with an existing FLS system; Simultaneous mosaicking and logging of broadcast data; Interactive control of track layering, processing and sensor offsets; Background display of air photos, satellite imagery, raster and vector charts; and Pan, zoom, target marking and vessel track.

www.oicinc.com

OSIL Fracking Monitor Solutions

OSIL will offer a full fracking monitoring system to enable clients to monitor local water quality before, during and after operations. Hydraulic Fracturing (fracking), where gas is extracted from shale rock, is becoming an increasingly popular means of extracting gas. The implementation of a reliable monitoring system is essential to this process. The quantities of chemicals and minerals used in the process, along with the huge volumes of water required, pose a potential threat to the surface and ground water network. OSIL provide the means to monitor ground water quality and potentially help prevent the contamination of surrounding water supplies. The OSIL system offers multi parameter monitoring equipment that is used to collect vital background data prior to the commencement of operations, in order to better understand the existing ground water structure.

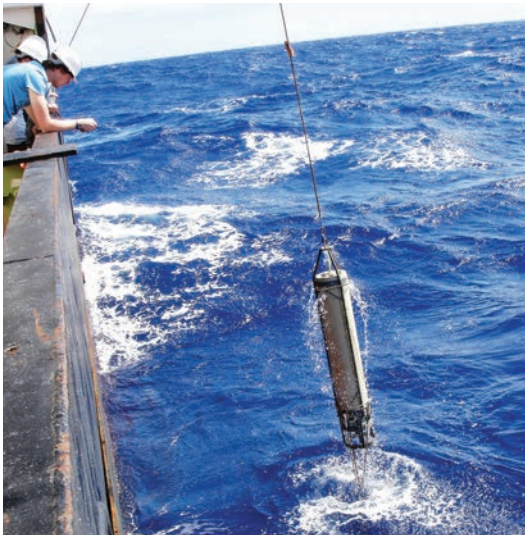
www.osil.co.uk



Immersion Suit Drying System

Pronomar received an order from OutSmart in Velp/NL, for a Pronomar - Top Trock drying systems for delivery to their Operation Control Center in Emden/Germany. The drying systems, made from long-lasting stainless steel, for seven survival suits work using a powerful, yet energy-efficient blower which blows a lot of warm air directly into the suits, drying them efficiently and fast from the inside. Proper drying prolongs the lifetime of the costly work outfits, which means less purchasing costs.

www.pronomar.com



(Courtesy of NOC)

OSIL Giant Snow Catchers for NERC Research

The National Oceanography Center (Southampton) has recently purchased two Giant Snow Catchers from Havant-based oceanographic systems company OSIL (Ocean Scientific International Ltd.), for use in the NERC funded Shelf Sea Biogeochemistry research program next year. Marine Snow Catchers are crucial to Carbon Flux studies, Marine Snow Analysis and the examination of the food chain. They provide means of collecting the delicate biological material (Marine Snow) from the water column by allowing a large volume of seawater to be captured and subsequently concentrated through controlled separation with minimal turbulence to produce an undamaged concentrated sample of biological matter.

www.osil.co.uk

ISSUE	EDITORIAL	BONUS DISTRIBUTION	AD CLOSE
JANUARY/ FEBRUARY	<p>Subsea Vehicles: UUVs</p> <p>Market: Harsh Environment Systems: Arctic Ops Tech: Scientific Deck Machinery Product: Training Resources</p>	<p>Arctic Technology Conference Feb. 10-12, Houston Subsea Tieback March 4-6, San Antonio</p>	January 21
MARCH	<p>Instrumentation: Measurement, Process & Analysis</p> <p>Market: Oceanology Intl '14 Technology Spotlight Tech: Umbilicals, Cables, Connectors & Power Supply Product: Sonar Systems & Seafloor Mapping</p>	<p>Oceanology International March 11-13, London</p>	February 18
APRIL	<p>Offshore Energy</p> <p>Market: Seismic Vessels & Systems Tech: Deepwater Positioning, Mooring & Anchoring Product: Subsea Pipeline Survey & Inspection</p>	<p>Offshore Technology Conference May 5-8, Houston AUVSI 2014 May 12-15, Orlando</p>	March 27
MAY	<p>AUV Operations</p> <p>Market: Offshore Renewable Energy: Wind, Wave & Tide Tech: Salvage & Recovery Product: Remote Sensing & Environmental Monitoring</p>	<p>Energy Ocean International June 3-5, Atlantic City</p>	April 24
JUNE	<p>Hydrographic Survey</p> <p>Market: Comms, Telemetry & Data Processing Tech: GPS, Gyro Compasses & MEMS Motion Tracking Product: Underwater Imaging: Lights, Cameras, Sonar</p>		May 27
JULY/ AUGUST	<p>MTR100</p> <p>Annual Listing of 100 Leading Subsea Companies Special Report: Oceans 2014 Preview Region Focus: Newfoundland and Labrador, Canada</p>		July 21
SEPTEMBER	<p>Ocean Observation: Gliders, Buoys & Sub-Surface Networks</p> <p>Market: Research Vessels Tech: ROV Tech: Workclass to Micro Systems Product: Geospacial Software Systems for Hydrography</p>	<p>Oceans 2014 Sept. 14-19, St. John's, Newfoundland and Labrador, Canada</p>	August 21
OCTOBER	<p>Subsea Defense</p> <p>Market: Oil Spill Monitoring & Tracking Tech: Seafloor Engineering & Remote Operations Product: Fiber Optic and Electrical Connectors</p>	<p>Clean Gulf Dec. 2-4, San Antonio</p>	September 25
NOVEMBER/ DECEMBER	<p>Fresh Water Monitoring & Senors</p> <p>Market: Subsea Engineering & Construction Tech: Offshore Inspection, Maintenance & Repair (IMR) Product: Commercial Diving: Lights, Cameras, Helmets</p>	<p>Underwater Intervention 2015 New Orleans</p>	November 26

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5	SeaBotix Inc.	www.SeaBotix.com	(619) 450-4000
9	Seacon	www.seaconworldwide.com	011 44 149 365 2733
47	Seamor Marine Ltd.	www.seamor.com	(888) 729-8890
27	Sensor Technology Ltd	www.sensortech.ca	(705) 444-1440
23	Shark Marine Technologies Inc	www.sharkmarine.com	(905) 687-6672
43	Sidus Solutions LLC	www.sidus-solutions.com	(866) 978-1276
25	Sound Metrics	www.soundmetrics.com	Please visit us online
41	Specialty Devices, Inc.	www.specialtydevices.com	(972) 429-7240
3	Teledyne Blueview	www.blueview.com	(206) 545-7260
29	Teledyne TSS Ltd.	www.teledyne-tss.com	44 (0) 1923 216020
19	Tritech International Limited	www.tritech.co.uk	Please visit us online
15	Valeport Limited	www.valeport.co.uk	44(0) 1803869292
7	VideoRay LLC	www.videoray.com	(610) 458-3000



We couldn't resist one final image of the **SeaOrbiter**, the self-touted "space station of the sea," featured on page 10.

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