

## Robotics Take Position In Subsea Revolution

HOUSTON—The downturn may have pushed oil and gas companies closer to technology as they move toward more cost-effective and operationally efficient subsea developments. But robotics could help lead to further improvements.

The focus of marine robotics in the subsea environment has expanded beyond seafloor mapping for high-resolution maps, James Bellingham, founding director of Woods Hole Oceanographic Institution’s Center for Marine Robotics, told *SEN* on the sidelines of CERAWeek by IHS Markit. Now the industry is seeing the gradual opening of new markets for autonomous, or untethered, systems to inspect subsea infrastructure, determine whether equipment is working properly, find leaks and detect changing subsea conditions.

For the oceanographic community, untethered ROVs enable travel to places that might have been difficult to get to otherwise to obtain data from the seafloor. It also eliminates the need for a ship as the vehicle is launched from the shore.

“This matters a lot because your economics are really driven by the ship for most robotics systems,” among other factors, Bellingham said while presenting “Robots, Data & Autonomy: The Subsea Revolution” during CERAWeek’s inaugural technology-focused Agora pro-

gram. Today AUVs are used to quickly collect high-quality data for high-resolution deepwater surveys, but this requires a vessel. “Looking five years out, the question is, ‘How do you remove the ship?’” dropping the cost of seafloor surveying.

The lower commodity price environment has put technology at the forefront of many oil and gas companies’ agendas to help bring down costs associated with traditionally high-cost offshore developments. Like other parts of the industry, providers of robotics such as ROVs saw vessel utilization fall as deepwater vessel activity, particularly floaters, dropped. But slowly improving offshore market conditions coupled with the push for sustainable cost savings, increased efficiency and technology that accomplishes both could steer operators of subsea developments closer to robotics.

Meanwhile, innovation continues, including in the area of powering untethered vehicles.

“We’re figuring out how to scavenge energy from the ocean environment,” said Bellingham, noting this includes wind, solar and wave energy.

He highlighted the Wave Glider, an unmanned, remotely piloted marine AUV that is powered by waves. The hybrid sea surface and underwater vehicle, which collects and transmits data in real time, was developed a



A worker recovers an ROV after inspecting an oil and gas pipeline. (Source: Karl Stury/Shutterstock.com)

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few years ago by Liquids Robotics Inc., now a Boeing Co., and Schlumberger. Its boards, which resemble Venetian blinds, hang below the surfboard and convert wave power to move the vessel.

“The Wave Glider system is now considered a proven system, and people now design entire observation strategies around using a little vehicle with a Venetian binder instead of putting together a whole mooring, which might be a million-dollar mooring,” Bellingham told *SEN*.

Besides wave-powered systems, there are also systems that power themselves off thermal differences in the ocean, he explained, while another is basically a bio-fuel cell that generates small amounts of electricity from microbial communities in the seafloor. One group has even figured out how to cultivate energy from these microbial communities into a battery to increase power output, he said. All of this creates the ability to charge robots at docking stations on the seafloor.

“These are all kind of crazy things that 10 years ago I think most of us in the robotics community wouldn’t have believed were going to exist,” Bellingham said. “Now they are actually out there operating. A combination of them gives you the ability to build a large system in the ocean environment.”

Bellingham shared the story of how a field program offshore California focused on measuring ocean con-



James Bellingham, founding director of Woods Hole Oceanographic Institution’s Center for Marine Robotics, speaks to attendees after a presentation at CERAWEEK in Houston. (Source: CERAWEEK)

ditions and currents used 20 robotic systems—some with lots of sensors and other slower systems with longer endurance—taking more measurements in two weeks than the rest of the entire oceanographic fleet combined in a year.

However, being near existing infrastructure has its advantages.

“In the oil and gas field we have a lot of power. The whole thing is basically wired, so why wouldn’t you take advantage of that with your underwater vehicles,” he said. “If your vehicle can get close to wired infrastructure, it can effectively become a tethered vehicle but tethered with an optical link rather than a hard physical link. That in turn opens up the opportunities for these resident platforms in the ocean.”

Bellingham agrees that the focus on technology could put robotics in the spotlight.

“There are other applications where you begin to join the surface platforms to undersea platforms, and that’s kind of the frontier, where we start using [vehicles] synergistically. ... In the scientific industry, we’ve been doing this for a while,” he said. But moving deeper into oil and gas, after demonstrating the potential of robotics through prototypes and creating a real system, “we have to have a better understanding of the market and mesh it with emerging needs, infrastructure and the philosophy of offshore oil and gas.”

—Velda Addison

## DEVELOPMENT

### Norway Plows Ahead As Market Conditions Improve

Project economics are becoming more viable for the Norwegian oil and gas sector with targeted exploration activity and development costs falling.

VNG Norge and its partners in the Pil & Bue development project, located in production license 586 (PL 586), have started FEED studies and plan to submit a final investment decision by year-end 2017.

In late 2016 VNG and its partners chose a subsea tieback development solution to the Njord platform as the best way forward for Pil & Bue. The Njord production platform is at Kvaerner’s Stord facility in Norway undergoing modifications to accommodate a number of new satellite field tieback developments, including Pil & Bue.

Partners in VNG-operated PL 586 are VNG (25%), Spike Exploration (35%), Faroe Petroleum (25%) and Pure E&P Norway (15%).

Progress also is being made elsewhere.

Norway’s Petroleum Safety Authority (PSA) has given

Aker BP consent to tieback the Oda Field to the Ula Field offshore Norway.

The Centrica-operated Oda Field will be developed as a subsea tieback to the Ula Field, which is operated by Aker BP. The Oda Field, discovered in 2011, is in the southern part of Norwegian sector of the North Sea. Production is scheduled to start in third-quarter 2019. The plan for development and operation for the field was submitted to the authorities in November 2016, according to the PSA.

Development work is moving forward as operators are finding new resources offshore Norway. Lundin Petroleum’s exploration well 7219/12-1 and appraisal well 7219/12-1 A on the Filicudi prospect in production license 533 (PL 533) offshore Norway in the Barents Sea recently discovered oil and gas. Preliminary estimations of the size of the discovery are between 5.5 MMcm and 16 MMcm (194.2 MMcf and 564.8 MMcf)—equivalent to 34.6 MMbbl and 100.6 MMbbl—of recoverable oil

equivalents. Further delineation and production testing of the discovery will be evaluated.

Looking at the bigger picture, the Norwegian Petroleum Directorate (NPD) has estimated total proven and unproven petroleum resources on the Norwegian Continental Shelf (NCS) to be about 14.3 Bcm (504.79 Bcf) of oil equivalents. Of this, 6.9 Bcm (243.57 Bcf) of oil equivalents, or 48%, have been sold and delivered.

“It is expected that 7.4 Bcm [261.22 Bcf] of oil equivalents are left to produce. Of this, 4.6 Bcm [162.38 Bcf] of oil equivalents are proven resources,” the NPD added.

“The estimate for unproven resources is 2.9 Bcm [102.37 Bcf] of oil equivalents. Unproven resources constitute about 39% of the total remaining resources.”

In 2016 exploration activity resulted in a resource growth estimated at 57 MMcm (2.01 MMcf) of oil equivalents. Thirty six exploration wells were started, and 18 discoveries were made: two in the Barents Sea, two in the Norwegian Sea and 14 in the North Sea.

“Many of the discoveries have not been fully evaluated, and the estimates are therefore very uncertain,” the NPD said.

—Steve Hamlen

## Shell, Mitsui Green Light GoM's Kaikias Development

Royal Dutch Shell Plc and partner Mitsui Oil Exploration Co. Ltd. have given the green light to the Kaikias subsea development in the deepwater U.S. Gulf of Mexico (GoM).

Subsidiaries of the companies—Shell Offshore Inc. and MOEX North America—have made a final investment decision (FID) agreeing to proceed with Phase 1 of the project described by Shell as “an attractive near-field opportunity with a competitive go-forward breakeven price below \$40 per barrel.”

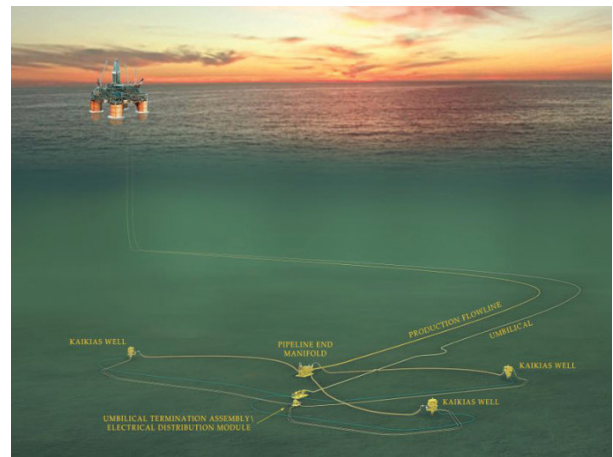
Located in the Mars-Ursa Basin, Kaikias is believed to hold more than an estimated 100 MMboe of recoverable resources, according to Shell. Costs for the development, which is operated by Shell with an 80% working interest, were not disclosed. MOEX holds a 20% interest in the development.

With the price for a barrel of West Texas Intermediate crude oil consistently trading above \$50, investors are gaining the confidence needed to proceed with offshore projects that were once stalled by a downturn that cut profits and forced companies to become more efficient. Kaikias is one of several projects gaining financial investment commitments in recent months.

“Kaikias is an example of a competitive and capital-efficient deepwater project using infrastructure already in place,” Andy Brown, upstream director for Shell, said in a statement. “The team has done a great job to reduce the total cost by around 50% by simplifying the design and using lessons learned from previous subsea developments.”

The operator redeveloped exploration and appraisal wells for production, reducing the need for new drilling. The decision to use existing oil and gas processing equipment on the nearby Ursa production, which also is operated by Shell, also saved costs by lowering the need for additional topside modifications.

Phase 1 of the planned two-phase project includes producing oil and gas from three wells tied back to Ursa via



Located in the Mars-Ursa Basin, Kaikias is believed to hold more than an estimated 100 MMboe of recoverable resources. (Source: Shell)

a flowline. At its peak, each well is designed to produce up to 40 Mboe/d, Shell said.

The project is expected to help move Shell closer to its goal of growing its deepwater business, an ambition that was bolstered by its acquisition of BG Group a year ago. The deal strengthened the company’s position in deepwater oil, including offshore Brazil, as well as in the LNG market.

“Shell’s deepwater production is expected to increase to more than 900,000 boe/d by 2020 from already discovered, established reservoirs,” Shell said in the release. “In the Gulf of Mexico, two other Shell-operated projects are currently under construction or undergoing pre-production commissioning: Coulomb Phase 2 and Appomattox.”

The Kaikias FID comes about five months after Shell started production from its Stones development in the GoM. When the Stones development is fully ramped up by year-end 2017, Shell said production is expected to be about 50 Mboe/d.

Other projects recently sanctioned include Mad Dog Phase 2 in the GoM’s Green Canyon area.

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BHP Billiton Ltd. said Feb. 9 it agreed to spend \$2.2 billion for its share of the BP-operated Mad Dog 2 project. The company holds a 23.9% stake in the field. The deepwater project was sanctioned by BP Plc, which holds a 60.5% participating interest in the field, in fourth-quarter

2016. In a U.S. Securities and Exchange Commission filing Feb. 23, Chevron Corp. said an FID was reached in February. Chevron USA affiliate Union Oil Co. of California holds the remaining interest in the project.

—Velda Addison

## Wood Group Begins Detailed Engineering For Leviathan Platform

After wrapping up seven months of FEED work for the Noble Energy-operated Leviathan Field development in the Eastern Mediterranean, Wood Group said it has started detailed engineering for the field's platform.

Work includes engineering for the topsides and jacket.

The estimated 30,000-ton fixed platform, which will be installed at a water depth of 86 m (282 ft), is being initially designed to process 33.9 MMcm/d (1.2 Bcf/d) of gas but will be capable of expanding to process 59.4 MMcm/d (2.1 Bcf/d), Wood Group said in the March 2 news release.

Combined, the FEED and detail design are valued at about \$95 million, the company said.

In late February, efforts to develop some of Leviathan's 623 Bcm (22 Tcf) of recoverable natural gas resources received a \$3.75 billion boost from Noble and partners when the Houston-based company announced the development's Phase 1 was sanctioned.

Noble's share is \$1.5 billion. Development plans call for four subsea wells, which are each capable of flow-

ing more than 8.4 MMcm/d (300 MMcf/d) of gas that will be delivered via two 117-km (73-mile) flowlines to a fixed platform. From there, Noble said processed gas will travel to the Israel Natural Gas Lines Ltd. onshore transportation grid and to regional markets.

With FEED work for Leviathan finished, Noble added it is finalizing major contracts for the projects as procurement for long lead materials continues. Up to two development wells could be drilled at the field this year. Noble also said it expects to perform completion work on all four producer wells at the field next year.

If all goes as planned, Noble and partners Delek Drilling, Avner Oil Exploration and Ratio Oil will mark first gas by year-end 2019. Noble operates the field, holding a 39.66% interest, while Delek and Avner—whose shareholders have agreed to merge—each hold 22.67%. Ratio Oil owns the remainder.

—Velda Addison

### DEVELOPMENT BRIEFS

#### Proserv, Premier Oil Seal Asia-Pacific Subsea Contract

Premier Oil has awarded Proserv a multimillion-dollar contract to supply a subsea control system and associated equipment for the Bison, Iguana and Gajah Puteri development project in the Natuna Sea offshore Indonesia.

The contract includes supplying a three-well subsea control system, which includes the company's Artemis 2G subsea electronics module, tied back to the Naga and Pelikan platforms, Proserv said. The platforms are located at a water depth of 90 m (295 ft). Bison and Iguana will tie back to the Pelikan platform, while Gajah Puteri—with a 21-km (13-mile) step-out—will tie back from a controls perspective to the Naga platform.

Each well will be equipped with a wet gas meter, with systems capable of future expansion to accommodate potential future infill drilling, Proserv said.

Delivery of the Phase 1 of equipment is scheduled for May 2018.

#### Hess Taps McDermott For Subsea Tieback Work

McDermott International Inc. has been awarded a contract from Hess Corp. for subsea tieback work for the


deepwater Penn State Deep Field in the Gulf of Mexico, according to a news release.

The field, which was discovered in 1996, is located in the Garden Banks 216 Block in about 457 m (1,500 ft) of water. Production began in 1999.

McDermott said the lump sum contract will be reflected in its first-quarter 2017 backlog.

#### Subsea 7 Bags Contract For Sole Project Offshore Australia

Cooper Energy Ltd. has selected Subsea 7 S.A. for subsea work for the Sole development project in the Gippsland Basin offshore Australia, according to a news release.



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The contract scope includes the subsea tieback of the Sole well to the Orboast Gas Plant. This includes the fabrication and installation of 64 km (40 miles) of pipeline, spool and manifold, plus installation of a 64-km umbilical and the commissioning of the system, Subsea 7 said in the release.

The contract is valued at between \$50 million and \$150 million.

Subsea 7 said it plans to begin project management and engineering immediately from its Perth, Australia, office. Offshore operations are set to begin in 2018. The company added that the material offshore operations are subject to the Sole Development Project final investment decision, which is anticipated soon.

**ExxonMobil Gets Extension For Sigyn Field Offshore Norway**

Norway’s Petroleum Safety Authority has granted con-

sent to operator ExxonMobil Corp. to extend the lifetime of its Sigyn Field in the North Sea offshore Norway until year-end 2022, the safety watchdog said on Feb. 24.

The gas and condensate field about 12 km (7 miles) southeast of the Sleipner East Field, operated by Statoil ASA, has been developed using subsea templates tied back to the Sleipner A facility.

Production from the field was originally estimated to end in 2017.

The Norwegian Petroleum Directorate said on its page the Sigyn Field’s lifetime could be extended by adding new production wells.

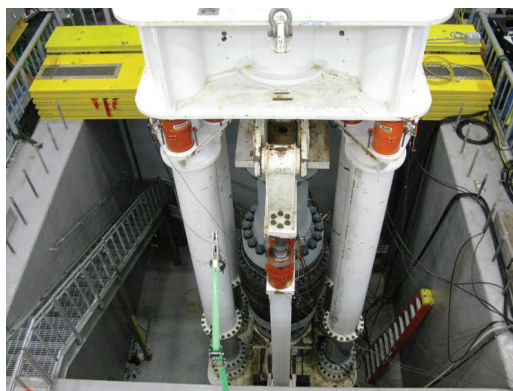
ExxonMobil has a 40% stake in Sigyn while Statoil holds 60%.

—Staff & Reuters Reports

**TECHNOLOGY**

**Developing The HP/HT Toolkit**

The economic promise of vast offshore hydrocarbon reservoirs, currently out of reach due to extreme formation pressures and temperatures, continues to motivate operators and contractors to evaluate the technology portfolio needed to safely harness these resources. GE Oil & Gas has embarked upon a comprehensive technology mission with its customers to develop enabling drilling equipment required to handle the extreme pressures and temperatures.



A 20K wellhead connector undergoes bending load testing. (Source: GE Oil & Gas)

Lower Tertiary fields such as the Shenandoah, Kaskida and Tiber in the Gulf of Mexico are a few examples where pressure and temperatures might be beyond the 15,000-psi and 121-C (250-F) ratings of currently available equipment. GE and its customers are collaboratively designing, building and testing the equipment needed to safely drill wells with pressures of 20,000 psi (20K) and temperatures of 177 C (350 F) and



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a riser with a 4.5-million-pound flange capacity for global deployment.

### Regulatory Requirements, Design Considerations

Designing, building, testing and maintaining equipment that is fully compliant with regulatory bodies is a paramount goal, yet fully balloted regulations governing 20K systems are not available. In lieu of prescriptive industry regulatory guidance, GE's drilling project initially used both the American Society of Mechanical Engineers' BPVC Section VIII Division 2 and Division 3 design paths to design each component along with following the guidelines in American Petroleum Institute (API) 17TR8. This led to a conservative approach that might yield an increased component weight. Recent industry publications have suggested that the more conservative Division 2 design path might be the preferred option for HP/HT subsea drilling equipment, which aligns with GE's design approach.

### Multiphase System Approach

This highly complex project necessitates the application of funding and resources on key equipment at staggered intervals. The BOP and wellhead connector were the first systems for HP/HT development. The GE 20K wellhead connector has been fully designed, built and qualified in preparation for deployment as part of a capping stack. The system, including GE's new 18¾-in. 20K flange, has completed a 30,000-psi hydrotest, exceeded the cycle counts for the API 16A Sealing and Locking Mechanism tests and performed combined pressure/tension/ bending load tests. Additionally, the flange and gasket have completed a PR2 test up to 20K from -18 C to 177 C (0 F to 350 F) per API 6A and pressure cycling per API 17D.

The riser and associated support equipment design is the next large 20K drilling system slated for completion.



An H4 connector undergoes post-machining inspection. (Source: GE Oil & Gas)

An extraordinary amount of finite element analysis has been conducted to date as well as a global riser analysis to validate the myriad design options such as auxiliary line load sharing, 27-m (90-ft) joint lengths and 177-C temperature ratings for the choke and kill lines. The riser connection configuration will initially be MR-6J-SE, which uses six retractable latching dogs to positively connect corresponding riser joints. The "J" is associated with the API 16R tension class of 4.5 million pounds, which also could apply to a bolted flange configuration if desired by a customer.

BOP qualification has progressed well. The development of a casing shear ram, Hydril Variable Ram, blind shear ram and pipe rams using 22-in. and 28.5-in. operators is well underway. Recent shear testing of a complex sample using a blind shear ram was performed successfully followed by a high-pressure seal at 20K for 35 minutes. GE is conducting testing above and beyond the API requirements to prove reliability for critical HP/HT equipment.

### Other 20K Developments

As part of the overall 20K system GE also has designed, developed and qualified a 20K choke and kill (C&K) connector and qualified a 20K C&K valve. GE will supply its next-generation SeaPrime I and SeaONYX controls to meet the reliability and availability demands of 20K systems.

The road to developing and providing a complete suite of 20K-ready drilling products is not without its pivots. Commercial realities arising from lower commodity prices as well as technical challenges have impacted the development pace, yet these have not lessened the commitment for success. All indications are that the industry is committed to the development of 20K drilling systems to support the development of challenging reservoir portfolios.

—Greg Myers, Viral Shah, Katie Kotarek and Jim Sauer, GE Oil & Gas

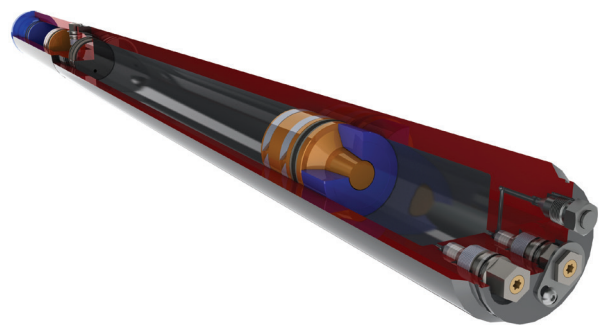
## TECHNOLOGY BRIEFS

### Proserv: New Subsea Sampling Cylinder Reduces Risks

Proserv has released a new subsea sampling cylinder that is designed to improve the quality of results and reduce risks normally associated with sample transfer, a press release stated.

Based on existing technology, the Proserv Subsea Sampling Cylinder (SSC) is the world's first fully qualified and certified "for shipping" sample cylinder to be deployed in a subsea environment. The system accurately captures well properties throughout the lifetime of a field.

Subsea cylinders allow operators to take representative production samples from a subsea system for direct



Proserv's SSC eliminates risks associated with handling and transferring samples to the surface. (Source: Proserv)

transfer to a laboratory. Proserv's SSC eliminates the risks associated with handling and transferring samples on the surface, reducing the risk of containment loss and exposure to H<sub>2</sub>S / CO<sub>2</sub>.

### Impact Subsea Launches Underwater System

Impact Subsea has released ISM3D, an underwater attitude and heading reference system that uses high grade microelectromechanical system-based accelerometers, angular rate gyroscopes and magnetometers, which feeds into a dual core microprocessor-driven advanced fusion engine driven, the company said.



The ISM3D system is depth rated to 6,000 m. (Source: Impact Subsea)

“Utilizing extremely high grade MEMS sensors have enabled the creation of a high accuracy underwater sensor in a very compact housing,” said Ben Grant, managing director for Impact Subsea.

The company added that the system, housed in titanium, is depth rated to 6,000 m (19,685 ft) with a length of 65 mm. After being installed on an under platform, such as an ROV or AUV, a hard and soft iron calibration can be performed. “In areas where a large amount of steel or other magnetic disturber is present, the unit can be switched to operate using the angular rate gyroscopes and accelerometers, without input from the magnetometer,” the company said.

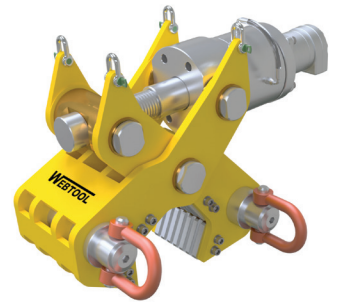
### Webtool Adds New Tool To Subsea Toolbox

Webtool has added to its toolkit a gripping and lifting tool for recovering subsea umbilical and cable during decommissioning. It's called the Cable Retrieval Tool (CRT200).

Developers say the tool is a “quicker and safer method of retrieval and improved handling,” compared to the time-consuming and costly tasks that typically involve

trenching the seabed around the cable or umbilical to allow a double choke sling to be attached using an ROV.

“Working in consultation with DNVGL, we've designed the CRT200 gripper to provide offshore contractors with a highly effective way of recovering umbilical and cable from any water depth, said Keith Elliot, engineering director for Allspeeds Ltd., which designs and manufactures the tool. “By gripping the end of the cable, it is easier to handle once onboard the vessel.”



(Source: Webtool)

The tool, fabricated from corrosion-resistant material, is capable of recovery cable and umbilical up to 203 mm (8 in.) in diameter. As explained by Webtool, the mechanically-locking gripper is guided by an ROV and lowered onto the end of the cable. It has a lifting capacity of 20 tonnes and can be used at any water depth, the company said.

### Sevan Marine Secures Framework Agreement With ExxonMobil

Sevan Marine has entered a long-term framework agreement with ExxonMobil Corp. for the use of Sevan Marine's cylindrical hull technology and services.

The value of the framework agreement is subject to the calling off of individual orders, Sevan Marine said in a news release. The first order under this agreement, involving the continuation of engineering and floating LNG (FLNG) design work, was expected to be called off in late February.

The two companies have worked together since 2015. Projects have included a feasibility study exploring the use of Sevan Marine's cylindrical hull for a FLNG development. A follow-up study centered on the hull and marine aspects of Sevan Marine's unique cylindrical design is currently underway, the company said.

—Staff Reports

## FLOATERS

### Wärtsilä Targets Upcoming Brazilian Floater Opportunities

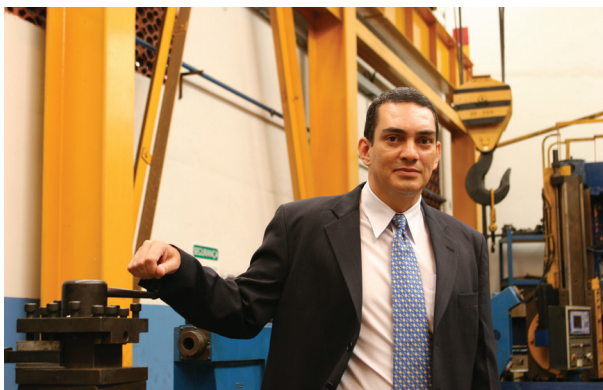
RIO DE JANIÉRO—Wärtsilä started 2017 with good news for its maritime activities in Brazil. The Finland-based company, which specializes in providing power generation solutions and services for ships and power plants, secured a 12-month contract renewal for operating Petrobras' FPSO *P-63* energy modules.

The contract, first signed in 2010, sealed a deal to supply the FPSO vessel with three main power modules. *P-63* is the first FPSO vessel in the world to use gas engines to produce more than 100 MW of power.

The vessel, operating in the Campos Basin's Papa-Terra Field, has the capacity to produce 140,000 bbl/d of oil and compress 1 MMcm/d (35.3 MMcf/d) of gas.

“Only companies that have achieved trust in the sector are able to establish a business partnership with Petrobras and have their contracts renewed,” Wärtsilä Brasil Account Manager Ribamar Ramos said.

Yet, Wärtsilä wants to go further in doing business in Latin America's largest country. According to Ramos, the company is working to take advantage of the giant



Luiz Barcellos is director of Wärtsilä's Ship Power Division. (Source: Wärtsilä)

Brazilian major's intentions to tender for the *Sépia* and *Libra* FPSO units this year. "This tender will offer good opportunities for many companies in the offshore industry, Wärtsilä included," Ramos said.

The *Sépia* and *Libra* oil fields are located in Santos Basin's presalt layer. *Libra*, the first presalt field to be auctioned in Brazil, in 2013, has between 8 Bbbl and 12 Bbbl of recoverable oil, while *Sépia* is estimated to have roughly 130 MMbbl of recoverable oil.

The tender has not been scheduled yet, but some sources believe that the bidding process will be launched this year.

"Companies considering bidding on Petrobras FPSO [units] are already looking for solutions for those projects," Ramos said, "so we are studying how we can meet their demands."

Ramos explained that Wärtsilä is able to supply FPSO equipment produced in Brazil or overseas. This is because over the past 10 years the company invested in building facilities to take advantage of the local content policy.

In 2015 Wärtsilä inaugurated its first assembly plant and production unit for generator sets and azimuth thrusters in Brazil. The unit is located at the *Açu* Port, a giant logistics center built in the state of Rio de Janeiro. With 4,000 sq m (43,056 sq ft) of floor space, the unit will be able to receive up to 200 tons of equipment. This is Wärtsilä's first ever multi-product factory. The unit received investments of 20 million euros (US\$21 million).

In its initial phase, the factory's activities will focus on midsize generators and azimuth thrusters, with the possibility of expanding the product portfolio according to market needs.

"This unit helps to give Wärtsilä a leading market position within the industry in which we operate," Wärtsilä Ship Power Division Director Luiz Barcellos said.

The Brazilian offshore sector still holds a strategic role for the company, Barcellos said. With the Brazilian government's latest moves to resume oil and gas investments, the Wärtsilä director foresees good medium- and long-term opportunities.

"The upcoming licensing rounds are very important for our business. We have the expertise in supplying main generating engines and thrusters for FPSO [units] and drillships. Most pipelay support vessels—PLSVs—operating in Brazil were supplied with our products," Barcellos said, adding that Subsea 7, Technip, Queiroz Galvão E&P and Sapura Crest Petroleum Bhd vessels have Wärtsilä's generators and thrusters.

The director also emphasized the importance of having a new schedule for vessel construction plans in Brazil to improve predictability for industry players. "Not only the auctions and other government plans are needed but also a schedule program for vessels construction in Brazil as we had years ago in the county," Barcellos said. "It helps the supply chain companies to plan their investments."

—Brunno Braga

## FLOATER BRIEFS

### Keppel Shipyard Nears Delivery Of Yinson's FPSO Unit

Keppel Offshore & Marine subsidiary Keppel Shipyard said it is on track to safely deliver an FPSO vessel to Yinson Production (West Africa) Pte. Ltd. (Yinson) on time and within budget.

Named *John Agyekum Kufuor*, the spread-moored FPSO unit will be chartered by Eni Ghana E&P Ltd. to process oil and gas from the Offshore Cape Three Points Block offshore Ghana.

Keppel said the vessel has a storage capacity of 1.7 MMbbl, with an oil processing capacity of 58,000 bbl/d and design life of 20 years without dry docking. The vessel can be moored in an average water depth of 1,000 m (3,280 ft) and has a total topside weight of almost 15,000 tonnes.

The shipyard's work included modification work; new equipment installation along with associated piping, elec-

trical and instrumental systems; plus installation and integration of the FPSO process topsides, the company said.

### COSCO Shipping Sets Record FPSO Loading

COSCO Shipping's recent FPSO vessel delivery set a record. The *Xin Guang Hua* semisubmersible ship loaded and delivered a Chinese-made floating platform that weighed nearly 32,000 tons for an offshore oilfield.

The giant FPSO vessel was built at a Nantong shipyard for Britain's Dana Petroleum. It is 118 m (387 ft) high with a platform diameter of 87 m (285 ft).

It took about two weeks to move the structure from the shipyard onto the deck of *Xin Guang Hua*, COSCO said. It the heaviest and largest structure ever handled by a COSCO vessel.

—Staff Reports



## VESSEL BRIEFS

**McDermott Acquires Deepwater Pipelay, Construction Newbuild**

McDermott International Inc. has acquired the newly built pipelay and construction vessel *Amazon* to better position the company for ultradeepwater and SURF projects, the company said.

The *Amazon*, completed in 2014, is equipped with 4,600 sq m (49,514 sq ft) of deck space with two 440-ton (400-tonne) cranes, a service speed of 12 knots and accommodation for up to 200 crew and service staff, the release said.



McDermott International Inc. has acquired *Amazon*, a newly built pipelay and construction vessel. (Source: McDermott)

McDermott said it plans to upgrade the vessel to address the ultradeepwater market with a J-lay system outfitted with the latest vessel technology. In the near term, McDermott plans to make minor capex investments to bring the vessel up to company standards. While upgrade plans are being finalized, McDermott said it plans to use the vessel on existing construction and pipelay projects.

“This is a great opportunity for the company to expand the technical capabilities of our global fleet and grow in the deepwater and SURF markets and greatly increase our ultradeepwater project coverage,” McDermott CEO David Dickson said in a news release “Due to current market conditions and the opportunistic nature of the transaction, we were able to acquire what is essentially a new, enabling asset at a fraction of the original build cost.”

Funding for the vessel acquisition was secured through a sale and leaseback arrangement under which McDermott has control of the vessel in exchange for a daily charter-hire rate, the release said. The planned upgrade to the J-lay system and related financing are expected to be considered in line with market conditions.

**Wärtsilä Will Maintain PGS’ Seismic Fleet Under Three-year Contract**

Wärtsilä is the primary service supplier for the PGS Geophysical AS seismic fleet under terms of a three-year contract signed in December. The contract was announced in February 2017.



Ramform Titan is one of the eight seismic vessels covered by the service agreement between Wärtsilä and PGS. (Source: Wärtsilä)

The agreement includes an option for two extra years and covers maintenance of engines and propulsion systems aboard eight PGS vessels. In Phase 1 of the contract, Wärtsilä will optimize operations and maintenance of the engines it has built, with the intention of cutting costs through the life cycle of the vessels.

Oslo-based PGS’ seismic vessels are used to map and analyze the subsurface ocean floor for oil and gas exploration around the world.

In Phase 2 the two companies will work to identify efficiencies that can be achieved through Wärtsilä’s digital solutions to diminish downtime and minimize risk and costs.

“We are very proud to announce this new cooperation that makes Wärtsilä the preferred partner for PGS,” Hans Petter Nesse, director of Wärtsilä’s service unit Norway, said in a statement. “Ensuring the availability and reliability of a large, globally operating fleet requires a wide service network, which we are able to offer. With Wärtsilä’s advisory service and support, PGS is able to concentrate on what they specialize in—offering seismic services for their customers.”

PGS provides 3-D images to find oil and gas reserves. The company provides a broad range of seismic, electromagnetic and reservoir services, including acquisition, imaging, interpretation and field evaluation.

**World’s First Purpose-built LNG Bunkering Vessel Delivered**

The first purpose-built LNG bunkering vessel specifically designed to service a variety of LNG-fueled ships has been delivered to customers.

ENGIE, Fluxys, Mitsubishi Corp. and NYK have taken delivery of the world’s first purpose-built LNG bunkering vessels (LBV) from Hanjin Heavy Industries & Construction Co. Ltd., at the Yeongdo shipyard in Busan, South Korea. She will run on LNG for her maiden voyage.

*ENGIE Zeebrugge*, a 5-Mcm (176-Mcf) LNG capacity vessel that will supply marine fuel to ships operating in Northern Europe, will be based in Zeebrugge, Belgium.



*ENGIE Zeebrugge* will be deployed in Northern Europe. (Source: Gas4Sea)

Two LNG-fueled pure car and truck carriers operated by United European Car Carriers will be its first customers.

The new ship was commissioned as tightening international regulations on ship emissions make LNG an important alternative fuel for the maritime industry. The bunker market amounts to about 250 million tons/year of heavy fuel oil.

The challenge in making LNG grow in the bunker market is to develop sufficient supply infrastructure to support the increasing number of LNG-fueled ships that are expected to come into operation.

Until now LNG-fueled ships have relied on fixed bunker locations or LNG trailers, which have limited bunkering capacity. With its ability to service a variety of ships, the deployment of *ENGIE Zeebrugge* marks a milestone in the European LNG bunkering chain.

In September 2016 ENGIE, Mitsubishi and NYK released Gas4Sea to market ship-to-ship LNG bunkering services worldwide, firstly via the *ENGIE Zeebrugge* in Northern Europe. Under this common brand, the partners intend to support the development of LNG as a marine fuel, thus contributing to an environmentally friendly maritime industry.

## ELA Delivers First 24 Of New Container Type

ELA Container Offshore GmbH has completed construction of the first 24 of a new, more spacious container that does not require a gangway.

The 10-m by 3-m (33-ft by 10-ft) high-cube accommodation containers, with interior hallway and two cabins, were built in Haren, Germany. Design to delivery to an offshore converter station in the German North Sea took only three months.

The new units were constructed in accordance with the regulations of DNVGL-ST-E273 "Portable Offshore Units," April 2016 and ST-E272 "2.7-2 Offshore Service Modules" Section 3, February 2016. The containers also correspond to HSE. All containers have fire detectors, fire extinguishers and emergency escape ways.



ELA's new container provides more room. (Source: ELA Container Offshore GmbH)

The new container features a modern wood look for the cabinets and beds as well as a yacht flooring to enhance comfort and aesthetics. The containers provide more space per person but do not exceed 9.5 tons in weight.

—Joseph Markman

## EXPLORATION

### Myanmar Set To Shine

Asia's offshore upstream gas sector has been hit hard by the low oil price environment in recent years. However, this has given some countries the chance to come out of the shadows and seek investment for their fledgling oil and gas industries. One such country is Myanmar.

This year could be a tough one for exploration in the Asia-Pacific region, with Wood Mackenzie suggesting that about 50 wells will be drilled. This would be down about 70% from 2014 levels.

Despite this outlook, Myanmar, which holds some of the last remaining frontier acreage in the mostly mature Southeast Asia region, appears ready to see more drilling. The country opened to foreign investment some years ago and activity seems to finally be ready to progress.



(Source: Victor Maschek/Shutterstock.com)

“We expect several wildcat wells to be drilled as several blocks from the hugely successful 2013 bid round are matured through the exploration process,” Wood Mackenzie said in its *APAC Upstream: Five themes to look for in 2017* report. “We also expect to see several companies farm down interest in exploration acreage where commitment wells are due to reduce risk and manage budgets.”

### Targeting Natural Gas

A wider trend developing in the region is the push toward gas, leaving oil in its wake.

Most upcoming projects in the region, such as Chevron’s Indonesia Deepwater Development project and the Kasawari gas project in Malaysia, are gas developments.

The main reason for this shift to gas is that Southeast Asia as well as East Asia are extremely gas-hungry. There are also ready-made markets with Japan, South Korea and China nearby.

In the past operators chased the last large oil fields in the region, leaving gas off the list of priorities. But now the time seems right for gas, with markets ready to buy.

### North Malay Moves Along

In line with this trend, Hess Corp. is reported to be preparing to tender for Phase 2 of the North Malay Basin development project offshore Malaysia following solid progress with Phase 1.

Offshore installation and drilling work for Phase 1 of the full-field development program is well underway, “with installation of four wellhead platform topsides and jackets, intra-field and export pipelines and associated SSIVs [subsea isolation valve skids], the floating storage and offloading unit [FSO] mooring systems and drilling of 13 shallow production wells all completed by fourth-quarter 2016,” Hess said.

“The completion and installation of the FSO and the central processing platform topsides and drilling of the remaining Phase 1 wells are in progress,” the company added. “First gas is expected in third-quarter 2017.”

The North Malay Basin project is “a long-life natural gas asset including nine discovered natural gas fields with an estimated gross recoverable resource of more than 42.49 Bcm [1.5 Tcf] of natural gas and more than 20 MMbbl of condensate.”

The North Malay Basin project lies in Block PM302 and is located about 300 km (186 miles) offshore the Terengganu gas terminal. The water depth is about 55m (180 ft) and multiple gas-bearing zones located at depths of 1,000 m to 3,000 m (3,281 ft to 9,843ft).

Hess is the operator of the development with a 50% stake, while Malaysia’s state-owned Petronas Carigali holds the other 50%.

### Sole Plan Finalized

Another gas project making progress is the Sole gas field, with the partners finalizing development plans for the field in the Gippsland Basin offshore Victoria, Australia.

The plan will use two horizontal wells, with the partners being encouraged by lower drilling costs.

Sole’s 2C contingent resources also recently have been upgraded to 6.69 Bcm (236 Bcf), which helps to support the development.

Field production capability also was increased from 64.45 MMcf/d (1.83 MMcm/d) to 70.14 MMcf/d (1.99 MMcm/d), Cooper added.

The upstream project cost for Sole is estimated at about \$355 million. There are “good economies in the second well” because a total cost for both wells is about \$140 million despite the first well costing \$83 million, Cooper noted.

The Sole Field lies 65 km (40 miles) from the onshore Orbost gas plant and is located in the Vic/RL3 permit.

Cooper and Santos each hold 50% stakes in the Sole project, with Santos acting as operator.

### M&A Potential

With companies suffering during the ongoing downturn, many will be considered as prime candidates for mergers and acquisition.

“Asia-Pacific’s upstream sector holds up to \$40 billion worth of opportunities in 2017 as oil majors continue to divest mature and mid-life assets in the region,” Wood Mackenzie said in a recent report.

“BP, Chevron and other majors have divested tail-end assets within the region over recent years, but that trickle looks set to gain volume as larger assets are sold in 2017. Chevron and Shell hold the largest portfolio of legacy assets in the region, and in the latter half of last year signaled their intentions to sell assets in Myanmar, Bangladesh, Thailand, New Zealand and Malaysia, amongst others.”

Prasanth Kakaraparthi, senior upstream research analyst at Wood Mackenzie, said “Between 2010 and 2016 national oil companies [NOCs] were the main buyers in Asia-Pacific, acquiring over 2 MMboe of commercial reserves. This year we expect to see more buying activity from local independents and private-equity-backed players. Domestic utilities and refiners, Japanese players and Middle-Eastern NOCs looking for growth opportunities are also possible acquirers.”

—Steve Hamlen

## ONGC Plans To Drill More KG Block Exploration Wells

India’s state-run ONGC Ltd. is preparing to drill 15 more exploratory/appraisal wells in the northern part of the KG-DWN-98/2 deepwater block in India’s Bay of Bengal as part of a more than \$5 billion development plan.

The work is expected to follow the acquisition, processing and interpretation of a controlled source electromagnetic survey and additional 3-D seismic data along with integrated geological and geophysical

studies. Hopes are to identify more leads, according to ONGC.

“Additional exploratory/appraisal drilling will further enhance the commerciality of the block and will help in cost-effective implementation of the development project with upward revision of hydrocarbon production figures,” ONGC said in a report.

Plans are to drill the 15 wells—NL1 to NL15—in water depths of 530 m to 2,260 m (1,739 ft to 7,414 ft) with target depths between 2,000 m and 7,000 m (6,562 ft and 22,966 ft) in the block’s Northern Discovery Area (NDA). The well sites are located 19 km to 80 km (12 miles to 50 miles) off the Andhra coast.

Total investment of this project is estimated at about \$862 million.

Primary exploration targets in the NDA are Miocene to Pliocene submarine sands.

“[In] the area where block KG-DWN-98/2 is located, the stratigraphy consists of slope depositions systems and deepwater depositional systems. The Pliocene section is generally clay dominated with few deepwater channel and fan deposits. Miocene to Eocene consists of deepwater clays and sand deposits in the form of basin floor fans and channels,” ONGC said. “These form exploration targets over basement highs. On the slope Miocene on laps also form exploration targets. A cretaceous section is available in the rifts as well as around the basement highs and is expected to contain good quality source rocks and reservoirs as in the nearby nomination acreages.”

The NDA is spread across 3,494 sq km (1,349 sq miles) in water depth up to 1,800 m (5,906 ft) in the Bay of Bengal.

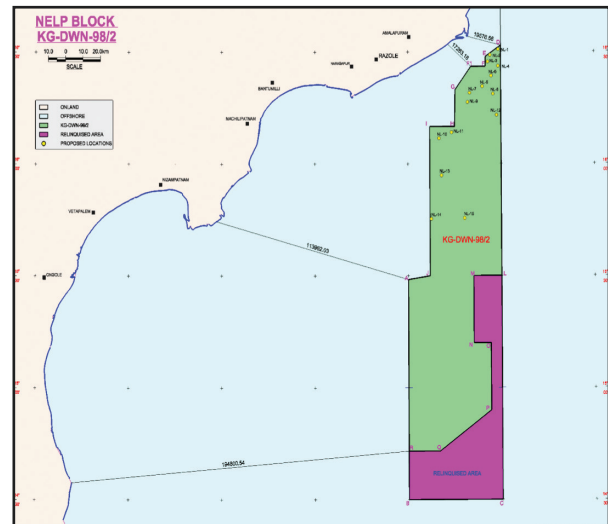
The drilling of 39 exploration wells in the initial phase has already led to the discovery of hydrocarbons in several parts of the block. Significant discoveries include Annapurna (R1), Kanakadurga (G2-P1) and Padmavati (M1) in NDA and UD-1, UD-4 and UD5 in Southern Discovery Area (SDA).

The proposed drilling is expected to lead to the discovery of more reserves as the country’s oil and gas demand grows, the report stated.

### Cluster Plan

ONGC believes the new discoveries will help to cost effectively implement the development plan for the 13 oil and gas discoveries in the NDA made after the initial exploration.

Many of the discoveries are not viable independently, so they might be tied into clusters for development. Discoveries made in northern part of NDA are grouped into Cluster-I (two gas fields) and those in the southern



(Source: ONGC)

part of NDA are in Cluster-II, which is further divided into Cluster-IIA (oil fields A2, P1, M1, M3 and G2) and Cluster-IIB (gas fields R1, E1, U1, U3, D1 and A1).

The operator in 2016 approved the development of oil and gas fields in Cluster-II with an estimated investment of \$5.3 billion. The plan envisages drilling 23 producer wells and 12 water injection wells and constructing production facilities such as FPSO units, fixed offshore platforms, and installing subsea equipment, subsea pipeline and an inland terminal.

Aban Offshore Ltd. has bagged the contract to drill some of the development wells in the NDA using its *Aban Abraham* drillship.

ONGC, according the report, expects a peak oil rate of 77,305 bbl/d and 3.81 MMscm/d of associated gas through 15 producer wells along with 12 water injection wells with a peak water injection rate of 9,400 cm/d (331 Mcf/d) from Cluster-IIA fields. The peak production rate of free gas is envisaged at 12.75 MMscm/d from eight wells in the Cluster-IIB free gas fields.

Cluster-IIA has estimated in-place reserves of 94.26 MMt of crude oil and 21.75 Bcm (768 Bcf) of associated gas. Cluster-IIB has in-place gas reserves of 51.98 Bcm (1,836 Bcf).

Gas and oil production are expected to commence in June 2019 and March 2020, respectively, from the Cluster-II fields.

Development of Cluster-I in the NDA will be taken up at the later stage.

—Ravi Prasad

## TGS, Schlumberger Take On New Reimaging Program In GoM

TGS-NOPEC Geophysical Co. (TGS) and Schlumberger are working together on a new multi- and wide-azimuth (M-WAZ) multicient reimaging program in the central U.S. Gulf of Mexico, according to a news release.

The Fusion M-WAZ reimaging program includes data covering more than 1,000 Outer Continental Shelf (OCS) blocks, which span about 23,000 sq km (8,880 sq miles), from 3-D WAZ programs previously acquired by

TGS and Schlumberger with the WesternGeco Q-Marine point-receiver marine seismic system between 2008 and 2012, the release said.

Data from the Mississippi Canyon, Atwater Valley and Ewing Bank areas will be processed using the latest imaging technology in an effort to “provide a significant uplift in data quality for upcoming licensing rounds.” According to TGS and Schlumberger, the area is expected to remain a high priority for E&P companies in the foreseeable future. The area is expected to benefit from two licensing rounds every year for the next five years under the 2017–2022 OCS Oil and Gas Leasing Program.

The custom-processing workflow for this project will include newly developed imaging technologies including 3-D WAZ de-ghosting; 3-D surface related multiple elimination; common offset RTM gather and image-guided tomography; and orthorhombic anisotropy velocity modeling, according to the release. During reprocessing, geoscientists will update the salt interpretation and add input from the latest well data released for the area.

Fast-track data will be available in 2017 for lease round bid evaluation. Final results are expected in early 2018, ahead of a period when substantial block turnover in the area is anticipated, the release said.

—Staff Reports

## CONFERENCE REPORT

### Four Oil, Gas Companies Unite To Fight Subsea Equipment Failures

PERTH, AUSTRALIA—Four of the biggest oil and gas operators in Australia have joined forces in an effort to combat an issue offshore Australia that is costing the industry hundreds of millions of dollars: replacing subsea equipment that fails prematurely.

Australia’s Woodside, Japan’s Inpex, Thailand’s national E&P PTTEP, and global supermajor Shell are seeing encouraging results from a joint industry project (JIP) initiative led by Wood Group. The JIP was launched to eradicate the swift degradation of subsea equipment in shallow, warm conditions stretching from the Northwest Shelf of Western Australia to the Timor Sea.

Collaboration and cost-cutting were key themes of this year’s Australian Oil and Gas Conference in Perth, where Australia’s ability to remain globally competitive was red-flagged in the post-LNG plant construction boom phase currently drawing to a close.

The JIP will soon launch a cloud-based reliability database of subsea equipment failures in Australian waters focusing primarily on control models, umbilicals and electrical cables, said Adriana Botto, principal engineer of subsea integrity for Wood Group.

“The end goal is to have a database that is reliable and represents the history and experience of equipment and also allows comparisons with different equipment and vendors,” Botto said during the conference. “The database will be analyzed by us to provide the operators with reliability data to facilitate lessons learned, what are the challenges, and the best ways to remediate.”

Christopher Merrick, senior subsea engineer at PTTEP, said new Australian offshore operators Shell (Prelude) and Inpex (Ichthys) were eagerly monitoring the JIP’s learnings.

“They are just about to start up and will be seeing very similar things by us,” Merrick explained.

Harvey Smith, subsea controls technical authority at Woodside, said subsea equipment was typically designed



(Source: Shutterstock.com)

to last in fields for 20 to 25 years; however, Australian operators were lucky if their equipment lasted nine to 10 years.

“Most of it seems to be temperature related, with average subsea electronics modules operating in internal temperatures of 42 to 43 degrees Celsius [C] (109 degrees Fahrenheit [F]),” Smith said. “But in our new [Greater Western Flank] Field we are now seeing new equipment at operational temperatures of 28 C (82 F), purely due to the design of the module itself.”

Every time Woodside retrieves one of the 75 control modules it has operating offshore, it costs the company about \$1 million—more than the value of the equipment itself. PTTEP’s cost of retrieval for subsea electronic modules is about \$2.5 million per unit.

Warm seas and shallow-water depths offshore Australia is fertile terrain for marine growth that, in one instance, shut down PTTEP’s Montara Field in the Timor Sea for two weeks due to a stuck valve clamped by calcareous deposits.

“We rotated it with an ROV tool and gave it maximum torque to try to turn this valve where the marine growth had penetrated. But we could not open that valve, so we could not produce from that well,” Mer-

rick said. “That resulted in a two-week delay while the vessel was in the field trying a number of tools. So, to extrapolate: 20 guys onboard, tools flying back and forth, ROV operations and a vessel on the field. Those are all

significant without integrated loss of production. And at Montara the sea temperature at the moment is 32 C [90 F], the hottest on the planet.”

—Dale Granger

## BUSINESS

### Brazil Oil, Gas Secretary Talks Opportunities, Challenges



(Source: Diego Imai/Shutterstock.com)

HOUSTON—State-run Petrobras’ plan to divest more than \$15 billion in assets is reshaping the energy scene in Brazil, creating opportunities for more players to join the pursuit of not only oil, but gas.

Still, there are challenges to overcome, including getting needed infrastructure onshore—particularly in the northeast—and crafting incentives and regulations that attract companies with the skill and capital to develop the South American country’s vast hydrocarbon resources.

Understanding the opportunities and challenges in Brazil’s oil and gas sector was the topic of a Feb. 22 event hosted by Mayer Brown and Evercore featuring Márcio Félix, vice minister of Brazil’s Mines and Energy Ministry and executive secretary of Petroleum, Natural Gas and Renewable Fuel.

“Now we are experiencing a real opening of the market. ... The Petrobras move is making the difference,” Félix said, pointing out the company’s decision to divest midstream and downstream assets as well as some of its upstream assets. “This is reshaping the sector.”

This comes as the company works to strengthen its balance sheet and reduce debt as it rebuilds from brutal market conditions and moves past a corruption scandal. Meanwhile, Brazil’s energy officials are working to attract oil and gas companies to develop some of the country’s 16 Bbbl and 453 Bcm (16 Tcf) of proved oil and natural gas reserves.

Recent efforts have included the January launching of an onshore E&P revitalization plan, which includes incentives such as a local content rule exemption and tax cuts, to lure developers. In addition, Brazilian legislators agreed last year to allow foreign oil companies to operate blocks in the presalt, something that was previously limited to Petrobras. The efforts precede auction rounds for blocks onshore and offshore.

“Brazil exports a lot of oil every year,” Félix said, later noting that OPEC forecast Brazil to have the most oil production growth in 2017. But he added that Brazil needs more refining capacity.

Brazil, home to some of the biggest offshore oil reserves in the world, also wants to increase gas production. The

country currently imports gas from Bolivia, one of its smaller neighbors to the west. It is unknown whether Bolivia will have enough gas to help Brazil meet its long-term needs, but the issue is being discussed, Félix said.

Brazil aims to triple its own production by 2030, but he said it will be difficult to produce gas from some offshore areas because of high CO<sub>2</sub> and sulfur content, which could affect recovery.

“We have big players needing gas in different areas of Brazil,” he said. “We have potential onshore to have a new gas market.”

Headway is being made on the regulatory front.

**Local Content:** Félix appeared in Houston the same day that Brazil’s government announced it was relaxing its local content rules, which could be seen as a plus for foreign investors but a negative for some Brazilians. The change drops the requirement mandating companies to buy equipment locally by about 50% for operations and production onshore.

The figure was lowered to 18% for exploration offshore and to 25% for construction of wells.

Brazil also lowered the fines against oil companies that do not meet local content percentages from a 60% minimum to 40%, and from a ceiling of 100% to 75%. The changes take affect with bidding rounds set to take place this year that did not have rules in place yet, Brazil’s Mines and Energy Ministry said.

**Bid Rounds:** “The bid rounds are coming back,” Félix added. “The fourth bid round for marginal onshore fields will be May 11. The 14th bid round for concessions is scheduled for September this year. Probably at the same time, we’ll have a bid round for presalt for production-sharing contracts.”

So far, Brazil has had only one presalt bid round. This was for the Libra Field, which was awarded to the consortium of Petrobras, Shell, Total, China National Offshore Oil Co. Ltd. and China National Petroleum Corp. in 2013.

A third round for the presalt could be held in November, with three or four exploration areas, Félix said, later adding that fourth and fifth rounds for presalt could be announced later in 2017—“one in May next year and another one probably in September/October 2019.”

Brazil aims to create a 10-year bid round schedule for onshore and offshore fields, he added.

Local content will not be a criterion for the 14th bid round for oil and gas concessions.

—Velda Addison

## Ezra Holding's Subsea Affiliate Files For Bankruptcy In US

A subsea and offshore contractor affiliate of Ezra Holdings Ltd., a struggling Singaporean oilfield services firm, filed for U.S. bankruptcy as it ran short of cash due to a lingering downturn in the oil and gas industry.

The affiliate, Emas Chiyoda Subsea Ltd, said in court papers filed in Houston that the company was suffering from weak demand for its subsea contracting work and tightening credit conditions.

Ezra has said it may have to take a \$170 million writedown on the value of its investment in Emas Chiyoda.

Oilfield service firms have been turning to bankruptcy to shed debt and raise cash after years of hunkering down after energy prices tumbled from the recent peak in 2014.

Emas Chiyoda's bankruptcy comes eight months after it teamed up with India's Larsen & Toubro Ltd. to land a \$1.6 billion contract with Saudi Aramco to expand the offshore Hasbah gas field. Onshore work has begun and the offshore phase of the Hasbah project will begin later this year, Emas Chiyoda's general counsel, Stephen McGuire, said in a court filing.

The company, which is based in Birmingham, U.K., said it had about \$550 million in debt.

"As a result of the deteriorating market conditions in the oil and gas sector coupled with the company's financial difficulties, the company's lenders have frozen borrowing availability," McGuire said in a court filing.

The company has requested court permission to borrow up to \$90 million to allow it continue its current projects with minimal disruption. The company will seek access to \$55 million of the proposed loan at a hearing on Wednesday in Houston.

The proposed loan is being extended by Chiyoda Corp. of Japan and Subsea 7 S.A. of the United Kingdom, according to court documents.

The loan requires Emas Chiyoda to file a bankruptcy exit plan in 60 days and to have the plan confirmed by U.S. Bankruptcy Judge Marvin Isgur, who was assigned to the case, in 120 days.

Ezra of Singapore owns 40% of Emas Chiyoda, Chiyoda owns 35% and Nippon Yusen KK of Japan owns the remainder, according to court documents.

A creditor of a subsidiary of Emas Chiyoda filed a court petition this month to liquidate the unit.

—Reuters

### BUSINESS BRIEFS

#### McDermott Expands Reach In Middle East With Saudi Deal

McDermott International Inc. has signed an agreement with Saudi Aramco in an effort to expand its capabilities and capacity in the Middle Eastern and Caspian offshore and subsea markets among others.

As part of the long-term lease signed with Saudi Aramco announced March 8, McDermott said it will build a new fabrication and marine complex expected to use state-of-the-art facilities, increased automation and an optimized layout.

"The future fabrication facility at Ras Al Khair is expected to provide up to 16-million manhours of capacity, up from 8-million manhours at McDermott's current Jebel Ali facilities, with a gradual transition from McDermott's operations in Jebel Ali expected by the mid-2020s," the company said in a news release.

The Saudi Arabia facility could also assist McDermott in reaching offshore and subsea markets in the Eastern Mediterranean Sea, offshore India and East Africa, the company said.

"We are excited about this strategic move and believe it expands and strengthens our ability to service all our growing Middle East markets and our decades-long leadership position with Saudi Aramco and in the Middle East," said McDermott CEO David Dickson said in the release. "When we look at our next 50 years of business in the Middle East, we see strong benefits to moving our business operations to Saudi Arabia, including the opportunity to modernize our facilities, move closer to Saudi Aramco and other key customers in the region as well

as provide McDermott's world-class training programs to Saudi Arabia's talented workforce to further enhance McDermott's Middle East operations."

#### Optime Subsea Taps Tautra For Chairman Role

Jarle Tautra has been appointed chairman of the board of Norwegian subsea well access company Optime Subsea AS, the company said March 7.

Described as a "seasoned industry leader," Tautra has held executive vice president positions for Aker Solutions and Hydro as well as the CEO role at Eureka Pumps AS. He has also served as a board member for Minox Technology AS.

"Optime Subsea offers an innovative technology long sought after in the subsea industry. In addition to this, they are changing the business model of how to compete in the future subsea oil and gas industry," Tautra said. "I look forward to supporting the company in the best way I can."



(Source: Optime Subsea)

#### Forum Energy Technologies Names CEO

Prady Iyyanki has been appointed as CEO and president of Houston-based Forum Energy Technologies as part of a long-planned transition, according to a news release.

Iyyanki, who currently serves as president and COO of the global oilfield products company, will succeed C.



Forum Energy Technologies' board of directors has named Prady Iyyanki, left, to succeed C. Christopher Gaut, right, as CEO. (Source: Business Wire)

Christopher Gaut, effective May 16. Gaut will become executive chairman, the Business Wire news release said. In addition, the company's board of directors nominated Iyyanki to stand for election as a director at the 2017 annual

stockholders' meeting in May.

Iyyanki joined Forum in 2014 after a 16-year tenure with General Electric, where he served in various senior management roles. These included president and CEO of GE Genbacher/Gas Engines from 2006 to 2011 and president and CEO of turbomachinery equipment from 2011 to 2012.

### Subsea 7 Q4 2016 Earnings Beat Forecast

Subsea 7 reported forecast-beating core earnings March 2 and announced plans to pay a special dividend.

The company said its board would recommend a one-off dividend of 5 Norwegian crowns per share, equivalent to a total payout of about \$200 million, reflecting a strong operating performance and good liquidity.

Subsea 7 reported adjusted earnings before interest, tax, depreciation and amortization of \$288 million for the fourth quarter, 54% ahead of the average forecast of \$187 million in a Reuters poll of analysts.

"This performance reflected successful implementation of our cost reduction measures, while maintaining high standards of execution and preserving the group's expertise and capability," Subsea 7 Chief Executive Jean Cahuzac said.

Since the start of 2014, the company's workforce has been cut by over 40% to some 8,000 by early 2017, while it has reduced its fleet by 12 vessels, including four moth-balled vessels, to 33 vessels.

The company maintained its guidance for 2017 revenues to be in line with 2016 and for a drop in operating margins. It said there were prospects for an increase in subsea project awards within the next 12 months as oil prices have stabilized.

### M<sup>2</sup> Subsea Names Stuart Bannerman As CFO

M<sup>2</sup> Subsea appointed Stuart Bannerman as its new CFO, according to a March 1 press release.

Bannerman has more than 30 years of executive management experience and previously was COO for BW Offshore. Prior to that, he was CFO for Remedial Offshore, and the regional CFO at Technip, the press release said.

Mike Arnold, CEO, said Bannerman's finance and business expertise, and experience in deal making and commercial management, will benefit M<sup>2</sup> Subsea.

### Flowserve Appoints Jay Roueche Interim CFO

Flowserve Corp., a provider of flow control products and services, announced that John E. (Jay) Roueche III, Flowserve's vice president, investor relations and treasurer, will assume the role of interim CFO, effective immediately.

Roueche's appointment follows Karyn Ovelmen's departure from the company as executive vice president and chief financial officer.

Flowserve will initiate a search to identify a permanent CFO under incoming president and CEO Scott Rowe's direction.

### Fugro Expects Offshore Services Market To Drop Further

Dutch deepsea energy prospector Fugro said it expects a further significant decline in the offshore oil and gas services market in the first half of 2017 before oil companies prepare for new investments later in the year.

Fugro is still suffering the impact of low oil prices, which have fallen by more than 50% from mid-2014 highs, affecting its business as makes it uneconomic to prospect for the hard-to-reach subsea deposits in which it specializes.

"Both the stabilization of our backlog over the last few months, and clear signs that pressure on the oil supply side is beginning to build, indicate that our market may bottom out towards year end," CEO Paul van Riel said in a statement.

The company expects its revenue to fall further in the first half of 2017. It also expects margin pressure to continue in the first half, but sees positive cash flow for the full year. It responded to a tough market by cutting 1,430 jobs during 2016 and reduced capex by 42% to 92.5 million euros. Core profit, while well down on the previous year, came in ahead of forecasts.

### Dane Whitehead Joins Marathon Oil As CFO

Marathon Oil Corp. appointed Dane Whitehead as executive vice president and CFO, the Houston-based company said.

Whitehead has most recently served as executive vice president and CFO of both EP Energy Corp. (NYSE: EPE) and EP Energy LLC since May 2012. His appointment at Marathon is expected to take effect March 6.

On the effective date, Patrick J. Wagner, interim CFO, will return to his leadership role as senior vice president of corporate development and strategy.

### Erin Energy CEO Segun Omidele Resigns

Erin Energy Corp., an independent exploration company focused on sub-Saharan Africa, said that Segun Omidele has resigned as CEO and as a member of the board of directors, effective Feb. 22. Omidele's departure from the company is expected in the coming weeks while he assists in the transfer to Interim CEO Jean-Michel Malek.



Malek is senior vice president, general counsel, and secretary, and will serve while the board conducts a search for a permanent CEO.

### Sembcorp Marine Swings To Profit In Q4

Singapore's Sembcorp Marine Ltd. (SembMarine) swung to profit in fourth-quarter 2016 after provisions pulled the rig builder into a loss the year earlier, but a downturn in oil prices pushed annual revenue to its lowest in a decade.

SembMarine and compatriot Keppel Corp Ltd. have been suffering from an oversupply of offshore oil drilling rigs, with customers delaying contracts and refraining from placing orders while oil hovers at about half its 2014 peak.

SembMarine, majority-owned by conglomerate Sembcorp Industries Ltd., posted S\$34 million (US\$24 million) in profit for the three months through December, vs. a S\$537 million loss a year prior. Revenue fell 38% to \$830 million. Profit for the full year stood at S\$79 million, vs. a 2015 loss of S\$290 million, while revenue fell 29% to S\$3.545 billion. The revenue decline was the

steepest on record, and the amount was the lowest since 2006, Thomson Reuters data showed.

New orders stood at S\$320 million at December-end, with net orders at S\$7.8 billion. Excluding drillship orders from rig lessor Sete Brasil, which has filed for bankruptcy protection, SembMarine's order book was worth S\$4.7 billion.

### Ikon Science Appoints Mark Bashforth As New CEO

Reservoir science software and services provider Ikon Science appointed Mark Bashforth as its new CEO and as a board member, according to a Feb. 27 press release.

Former CEO and company founder Martyn Millwood Hargrave becomes executive chairman following the retirement of Peter Dolan, previously non-executive chairman.

Bashforth has top management experience for several internationally known companies in the reservoir characterization sector including FEI Co., CGG Geoscience (Jason/Hampson Russell) and Roxar Software Solutions.

—Staff & Reuters Reports

## UPCOMING

The next issue of *Subsea Engineering News* will be distributed March 23. Until then, visit [epmag.com](http://epmag.com).

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## CONTACT INFORMATION

**LEN VERMILLION** Group Managing Editor,  
Digital News Group  
[lvermillion@hartenergy.com](mailto:lvermillion@hartenergy.com)

**VELDA ADDISON** Senior Editor  
[vaddison@hartenergy.com](mailto:vaddison@hartenergy.com)  
(713) 260-6400

### CONTRIBUTORS:

Ariana Benavidez (Houston)  
Brunno Braga (Brazil)  
Dale Granger (Australia)  
Steve Hamlen (U.K.)

Joseph Markman (Houston)  
Erin Pedigo (Houston)  
Ravi Prasad (India)

### GUEST CONTRIBUTORS:

Greg Myers, Viral Shah, Katie Kotarek and Jim Sauer, GE Oil & Gas

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